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PREFACE

EAPRIL is ...

EAPRIL is the European Association for Practitioner Research on Improving Learning. The association promotes practice-based and practitioner research on learning issues in the context of formal, informal, non-formal, lifelong learning and professional development with the aim to professionally develop and train educators and, as a result, to enhance practice. Its focus entails learning of individuals (from kindergarten over students in higher education to workers at the workplace), teams, organisations and networks. More specifically

- Promotion and development of learning and instruction practice within Europe, by means of practice-based research.
- To promote the development and distribution of knowledge and methods for practice-based research and the distribution of research results on learning and instruction in specific contexts.
- To promote the exchange of information on learning and instruction practice, obtained by means of practice-based research, among the members of the association and among other associations, by means of an international network for exchange of knowledge and experience in relation to learning and instruction practice.
- To establish an international network and communication forum for practitioners working in the field of learning and instruction in education and corporate contexts and develop knowledge on this issue by means of practically-oriented research methods.
- To encourage collaboration and exchange of expertise between educational practitioners, trainers, policy makers and academic researchers with the intent to support and improve the practice of learning and instruction in education and professional contexts.
- By the aforementioned goals the professional development and training of practitioners, trainers, educational policy makers, developers, educational researchers and all involved in education and learning in its broad context are stimulated.

Practice based and Practitioner research

Practice-based and practitioner research focuses on research for, with and by professional practice, starting from a need expressed by practice. Academic and practitioner researchers play an equally important role in the process of sharing, constructing and creating knowledge to develop practice and theory. Actors in learning need to be engaged in the multidisciplinary and sometimes trans-disciplinary research process as problem-definers, researchers, data gatherers, interpreters, and implementers.

Practice-based and Practitioner research results in actionable knowledge that leads to evidence-informed practice and knowledge-in-use. Not only the utility of the research for and its impact on practice is a quality standard, but also its contribution to existing theory on what works in practice, its validity and transparency are of utmost importance.

Context

EAPRIL encompasses all contexts where people learn, e.g. schools of various educational levels, general, vocational and professional education; organisations and corporations, and this across fields, such as teacher education, engineering, medicine, nursing, food, agriculture, nature, business, languages, ... All levels, i.e. individual, group, organisation and context, are taken into account.

For whom

Practitioner researchers, academic researchers, teachers, teachers educators, professional trainers, educational technologists, curriculum developers, educational policy makers, school leaders, staff developers, learning consultants, people involved in organisational change and innovation, L&D managers, corporate learning directors, academics in the field of professional learning and all who are interested in improving the learning and development of praxis.

How

Via organising the annual EAPRIL conference where people meet, exchange research, ideas, projects, and experiences, learn and co-create, for example via workshops, training, educational activities, interactive sessions, school or company visits, transformational labs, and other opportunities for cooperation and discussion. Via supporting thematic sub communities 'Clouds', where people find each other because they share the same thematic curiosity. Cloud coordinators facilitate and stimulate activities at the conference and during the year. Activities such as organizing symposia, writing joined projects, speed dating, inviting keynotes and keeping up interest/expertise list of members are organised for cloud participants in order to promote collaboration among European organisations in the field of education or research, including companies, national and international authorities. Via newsletters, access to the EAPRIL conference presentations and papers on the conference website, conference proceedings, regular updates on cloud meetings and activities throughout the year, access to Frontline Learning Research journal, and a discount for EAPRIL members to the annual conference. More information on the upcoming 2016 Conference as well as some Afterglow moments of the 2015 Conference can be found on our conference website www.eaprilconference.org

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ENHANCING THE DIVERSITY APPROACH AMONG MIGRANT LEARNERS & TUTORS TO STRUGGLE AGAINST DISCRIMINATION IN THE LABOUR MARKET IN EUROPE

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ABSTRACT

Enhancing diversity and struggling against discrimination has been a main public policy launched in 2000 by the European Union with the adoption of two main directives in the field. It followed the spirit and first initiatives launched by the Council of Europe – CoE- since 1950 with the adoption of the European Convention for Human Rights and its implementation with the creation of a permanent body after the collapse of the Berlin wall in 1989. In the nondiscrimination approach, the first step was to implement a legal framework in the different EU countries with the adoption in 2000 of two fundamental texts in the fight against discrimination on a EU level: the Racial Equality and Employment Directives. Each EU country had to transpose this general framework in its legal system. The non-discrimination approach is now facing new challenges - such as including this main principle into the educational practices and learning in Europe. On the basis of a European project- the Di&Di- implemented in the framework of the Lifelong learning Programme (2007-2013), we intent to show how far the diversity approach can be a challenging issue both for the learners/trainees and the trainers/teachers as there are still many obstacles to be overcome both on an external and internal level. The Di&Di project addressed graduate students and low qualified women, both sharing a migratory background. Its theoretical content - nondiscrimination approach- is closely linked to a practical approach – implementing the diversity approach on the ground by designing an appropriate educational strategy- a training for learners and a tutoring for teachers/trainers.

A RESEARCH AND PRACTICE-BASED PRACTITIONER RESEARCH FOCUSED ON NONDISCRIMINATION AND DIVERSITY

The two main directives adopted by the EU countries in 2000 to struggle against discrimination were the basis to enhance diversity and equality of chances. Since then, several European countries have implemented different strategies to promote the nondiscrimination approach especially in the access to vocational education and training (VET) in order to include learners who may suffer from discrimination in the general access to the labour market, including training, employment and development of a professional career. Many vocational training and educative strategies were designed taking into account the legal perspective: identifying and legally characterizing discrimination. This is a preventive approach to enhance equality of chances and equal treatment. Another approach is to promote diversity - identifying and valuing diverse skills and competences, required by the EU labour markets. In this perspective, a pedagogical approach needs to be focused on tools and strategies to support migrants in their professional integration. This is the main aim of the Di&Di project, a European project supported under the Lifelong Learning programme. The first year (2014) was focused on the designing of a training programme for young graduate migrants and low qualified female migrants together with a mentoring for trainers/teachers & professionals working with them. The second year (2015) was dedicated to the implementation of both the training and mentoring. Our article is mainly focused on the training.

Sessions were delivered among migrant learners who may have suffered from discrimination in the labour market. In order to reinforce the diversity principle, the two different profiles of trainees were associated in the training sessions. The pedagogical approach combined the knowledge of discriminations (mainly legal issues) together with the understanding and identification of the major obstacles to be faced: language, recognition of a diploma/qualification obtained in the native country (third countries i.e non EU members), and access to credit. The training offered to learners also included the understanding and use of existing tools designed to combat the identified obstacles. The main reference was the Migrapass portfolio- basis of the Di&Di project – to identify skills and competences. It was combined with the SWOT analysis in order to be able to build a realistic action plan to improve one's professional opportunities.

We will first explain the content and pedagogical approach used in the designing of the training for learners. We will then explain the experimentation implemented in the different countries focusing on the main difficulties faced. On this basis, we will try to answer, in a third part, more general questions raised such as : how far can we enhance the diversity approach in vocational education and training (VET)? Is diversity really taken into account in educational practices and learning in the EU? What could be relevant educational strategies to enhance to reach the goal- such as empowerment process or any other inclusive or cooperative educational strategy?

A TRAINING PROGRAMME FOR MIGRANT LEARNERS IN THE SPIRIT OF THE LIFELONG LEARNING PROGRAMME

As the legal aspect of non-discrimination issue has been quite developed since 2000, the innovative approach of the Di&Di was to be focused on diversity and the lifelong learning perspective. The Di&Di is a Leonardo da Vinci project¹ gathering 5 European countries with different backgrounds both in Vocational Education and Training (VET) and antidiscrimination approach- France (two partners), Bulgaria, Germany, Italy and Switzerland. It combines both a theoretical and practical

¹ Lifelong Learning programme – 2007-2013

background as the general public policy to struggle against discrimination is to be implemented on the ground with appropriate pedagogical tools and strategies.

The Di&Di project involves different publics or target groups. A first "public" gathers learners with a migratory background faced to discrimination; this is the public addressed by the training. A "second" public gathers trainers/teachers and professionals working with migrants (HR staff); this is the audience of the mentoring. A third public- any person working in VET & Migration issues was involved in the national steering committees to enhance the sustainability of the project. Our article is mainly focused on the training programme.

In the Di&Di, the struggle against discrimination is to be understood in the access to the labour market by offering appropriate learning/teaching strategies. The educative and formative approach is a main issue to equip learners/trainees with appropriate tools and strategies to allow them to value their specific profile in a more and more demanding professional environment and so to be able to overcome situations of discrimination. The training programme was designed by keeping in mind 6 main issues.

The first one was to insist on the diversity approach: changing the perspective and bringing something new on the labour market (new profiles, new skills & competences) and so avoiding a negative approach (justice, security, status...) of the presentation of the two publics by themselves towards potential employers. The second issue was to avoid any stigmatisation among our target groups - young graduate migrants and low qualified female migrants – by being as clear as possible on “what is” / “what is not” a discrimination linked to the migratory background. The third issue was to combine the top-down & bottom-up approaches by referring to the legal basis together with concrete actions to be conducted on the ground. The fourth issue was to offer an innovative support of training on the basis of existing tools and methods – such as the Migrapass portfolio (expressing experience in terms of competences) or Allinhe strategy (enhancing access to VPL). The fifth issue was to enhance a European perspective: some European countries may be more in advance in this field and could share with other countries’ experience. The sixth issue was to keep in mind the “mutual recognition” approach: integrating both employees’ and employers’ sides in order to remain as neutral as possible. The training programme was designed according these issues (Halba, 2014).

Understanding the lifelong learning approach and the support to be provided to target groups facing specific obstacles in the labour market

The first part of the training explains the institutional context – the Lifelong Learning programme and the migration trends with a focus on special profiles of migrants. There are different reasons for leaving one’s country - work, family reunification, studies, political asylum.... European societies have to cope with new waves of migrants (push/pull factors). Most of them come from North Africa and Sub-Saharan Africa, Turkey. They have different religions, and different cultural backgrounds. It is raising the issue of multiculturalism, interculturalism and diversity and how to cope with them. A better knowledge of migration policies both on European and national levels is crucial to give appropriate information to migrants and sometimes to institutions often ignoring the European perspective. Two publics are especially vulnerable in the labour market: youngsters and women. It explains the choice of the two main target groups – of the Di&Di training programme. The difficulties to build a professional future raise specific challenges. In a context of feminization of migration and growth of mobility of qualified youngsters, it is crucial to take into account the special needs of these groups. The main problems that are specific for workers with migratory background are the following: inappropriate skills and competences when a change occurs in the economic situation ; low qualified workers are usually the first fired in firms faced to economic crisis ; difficult working conditions and

inability to express one's problem because of lack of information ; access to the information on the labour market when unemployed ; black market with no rights at all, including no access to any legal support ; illegal activities (human traffic such as prostitution especially with young women or men coming from Albania, other countries of Eastern Europe or from Africa) (Halba, 2009).

Knowing the non-discrimination approach on a European and national levels with key stakeholders and references in the field

The second part of the Di&Di training is dedicated to the legal framework of Diversity & Struggle against discrimination both on a European and national levels. If the term European non-discrimination law may suggest that it existed a single Europe-wide system of rules relating to non-discrimination, it in fact includes a variety of contexts (European Union Agency for Fundamental rights & Council of Europe, 2010). There are two reference organisations: on the one hand the Council of Europe (CoE), on the other hand the European Union (EU). There are also two key texts of reference- mostly the European Charter of Fundamental rights and the United Nation Human Rights treaties, all of which contain a prohibition on discrimination. The CoE Member States adopted the European Convention on Human Rights (ECHR) in 1950. It is considered as being the first of the modern human rights treaties drawing from the Universal Declaration of Human Rights. The principle of non-discrimination is a governing principle in many documents published by the CoE. The European Social Charter (1996) "includes both a right to equal opportunities and equal treatment in matters of employment and occupation, protecting against discrimination on the ground of sex." Additional protection against discrimination is also included in the "Framework Convention for the protection of National Minorities" (articles 4,6 and 9). It is seen as a fundamental freedom. In 2000, the European Union, currently made up of 28 countries, adopted two directives: the Employment Equality Directive prohibited discrimination on the basis of sexual orientation, religious belief, age and disability in the area of employment; the Racial Equality Directive prohibited discrimination on the basis of race or ethnicity in the context of employment, but also in accessing the welfare system and social security, and goods and services. The non-discrimination law under the EU recognised that "in order to allow individuals to reach their full potential in the employment market, it was also essential to guarantee them equal access to areas such as health, education and housing". The reference to the key actors (CoE and EU) and texts (ECHR and directives) on a European level is crucial for migrant learners who would like to update their knowledge. They are also given the legal reference and key stakeholders on a national level- for instance in France the Law of 2008 and the *Defenseur des Droits* for the key actor and/or the legal process they would have to go through.

Identifying the main obstacles faced in the access to the labour market by migrant learners- language, qualification and access to creation of activity

There are three main barriers to be overcome by migrant workers in the labour market. The first is linked to the linguistic level required explicitly or implicitly in the EU labour markets for a migrant worker². The first support to be provided to migrant learners is on the one hand to give the tool to identify their linguistic level (CEFR) and the information to improve their linguistic skills. The second main barrier is the non-recognition of the diploma or qualification. Graduate migrants coming from third country nations are faced to a form of a downgrading: neither their professional experience nor the diplomas passed in their countries of origin are recognized in the EU labour market. According

² B1- linguistic level provided by the *Common European Framework of Reference for Languages* (CEFR) implemented by the Council of Europe-CoE since 1991. In 2007 the CoE recalled that in educational matters responsibility lies with the member states as a result, *it is towards one's own learners and one's European partners that one has a responsibility for making coherent, realistic use of the CEFR*.

to the principles of recognition for further studies³, in the EU countries, migrant workers must contact a national public belonging to the ENIC NARIC network⁴ - to certify that their diplomas are genuine. This process only certifies the validity of the diploma, and does not entail the recognition nor assessment of the diploma. Low qualified women are not familiar with the levels of qualification or may have a level of qualification they are not aware of. Graduate and low qualified migrants must be explained the ways to go through the process for example of Valuing Prior Learning. The third and last obstacle migrants may be faced to in the labour market is the process to create their own activity. The information is not so clear and quite demanding. It is also linked to the access to financing. The only way to overcome this last barrier is to be properly informed by professionals in the field for instance specializing in micro-credit. They can support the candidates in the process to avoid any situation of discriminations – for instance too many information to be provided, no answer, unnecessary documents...

Using tools and strategies to overcome the obstacles and/or situation of discriminations

The fourth part of the Di&Di Training programme designed for migrant learners is to learn how to use existing tools and strategies in order to overcome the obstacles and so struggle against discrimination and enhance diversity in the labour market. The pedagogical approach is the one implemented thanks to the Migrapass portfolio (Halba, 2012) : in a first step, identifying a professional experience (gathering paid, unpaid and voluntary experience) ; in a second step, expressing it in terms of competences (on the basis of a set of 12 main competences linked to a migratory path); in a third step building an action plan with three main options (direct access to the labour market, training, VPL). The portfolio is an ongoing process. The learners are asked to use it as a basis to update their resume with new professional experiences or training followed but also as a way to prepare themselves to a professional interview as a potential employer may ask them to detail their experience, or a specific competence required by the employment or some elements on their professional future⁵. The pedagogical strategy offered by the Di&Di is to fill the portfolio in small groups composed of one young graduate migrant and a low qualified female migrant so they can exchange their experience and work commonly on an exercise they both discover with the idea that the first ones might be more familiar with the written part and the second ones more easy with the oral part (exchanges of ideas to find the information to fill the portfolio).

³ one EU country recognizes qualifications - whether for access to higher education, for periods of study or for higher education degrees- given by an institution/programme that is recognized as belonging to a system of higher education. This academic recognition is stipulated in the Convention on the Recognition of Qualifications concerning Higher Education in the European Region (Lisbon Convention, 1997)

⁴ To implement the Lisbon Recognition Convention and to develop policy and practice for the recognition of qualifications, different tools and frameworks have been implemented at the European level : the Council of Europe and UNESCO have established the ENIC Network (European Network of National Information Centres on academic recognition and mobility). It cooperates closely with the NARIC Network of the European Union. The NARIC network is an initiative of the European Commission created in 1984. It aims at improving academic recognition of diplomas and periods of study in the Member States of the European Union (EU) countries, the European Economic Area (EEA) countries and Turkey; in addition, the network is part of the Community's Lifelong Learning Programme (LLP), which stimulates the mobility of students and staff between higher education institutions in these countries

⁵ This learning strategy has been improved since 2012 (end of the Migrapass project where it was designed) in the framework of the monthly clubs offered by iriv Conseil at the Cité des Métiers- <http://club-iriv-paris.blogspot.fr/>

Building an action plan using the SWOT analysis

The last part of the Di&Di is possible after the learners have been through the four previous parts. In the beginning of each session, the learners are asked to introduce themselves to others through a roundtable. The first time, it takes time as it is not easy to introduce oneself in a group. After each collective session, learners have become more self-confident thanks to the empowerment process which is both a step by step and collaborative approach. The learners are also asked to work in small groups in order to work on their Strengths and Weaknesses on one hand - thanks to the Migrapass portfolio - presented in part 3- and on the Opportunities and Threats- thanks to the work on the obstacles they might be faced to - language, diploma & qualification, access to credit... presented in part 2. They are asked to include different lengths of time in their scenario: in the short term (6 months), in the midterm (one year) and in the long term (2 years). They may be successful and achieve their best professional scenario in the short term; most of the time, their best scenario is more realistic in the long term. The learners present their different options among the group in order to be asked questions and to be able to defend their project. They have to be precise and to discuss on the basis of concrete information they have gathered thanks to the step by step process of the Di&Di approach.

Learning outcomes (LO)

At the end of the Di&Di training, the learners have experienced the competence approach implemented by the Lifelong learning perspective and to make the difference with the legal approach of the discrimination (LO1). They have enriched their knowledge on the non-discrimination approach and are able to identify a situation of discrimination linked to the ethnic origin on the basis of the legal framework they can find and update (LO2). They have identified the main obstacles faced on the labour market – language, non-recognition of diploma and experience, access to credit- and are able to find alternative solutions and strategies to deal with them and even to overcome them (LO3). They have experienced a specific tool to valorise their diverse professional profiles and so to enhance diversity in the labour market- mainly thanks to the Migrapass portfolio (LO4). They have built an action plan to take advantage of the diversity approach in the labour market, taking into account different lengths of time (LO5).

EXPERIMENTATION OF THE DI&DI LEARNING STRATEGY- THE CASE OF FRANCE

The DI&DI training programme was experimented in France in 2015. The experimentation took place in the region Ile de France- Paris and Montereau (Seine et Marne).

Networking- a key issue for involving relevant and motivated learners

The results have been quite positive. The reason for the success was very linked to the profiles and the relationship built with key stakeholders. They were contacted through different networks. A first meeting of information was held at the Embassy of Croatia (January) where Croatian nationals were invited. Thanks to this meeting, we could involve a Croatian teacher of French as a Foreign Language (FLE) at the association *Atouts Cours*. Two other meetings were held for tutors at the *Cité des Métiers*, in February and March 2015. In these meetings attended the Croatian teacher at the association *Atouts Cours* together with representatives of the Club *El Taller* - gathering nationals from Latin America meeting regularly at the *Cité des Métiers*- and a teacher in French as a Foreign Language (FLE) in

Seine et Marne - contacted in a former project Migratrices in 2013. The content of the training programme was also presented.

After this necessary phase of preparation, the experimentation among the first target groups- young graduate migrants & low qualified female migrants- could take place in Paris and in Seine & Marne from April to June 2015. In Paris, the location was the Maison des associations of the XIth district of Paris. Surprisingly no representative of associations of the XIth district attended. The participants were involved thanks to the support of the association *Atouts cours* and the network of Latin-American associations of the Cité des Métiers. In Seine & Marne, the participants were selected by the teacher in charge of FLE. The experimentation took place at the Maison des familles in Montereau, a social center supported by the City hall to offer trainings to migrant publics both qualified - mainly asylum seekers- and/or low qualified female migrants – mainly arrived in France to join their husbands..

Involving relevant profile of the learners- answering the appropriate Di&Di target-groups

The profiles of the learners were quite diverse and gathered the two expected profiles for the Di&Di “first” target groups. In both series of sessions held in Paris (April 2015) and Seine & Marne (May & June 2015) a total of 25 people attended. They were not so young: 7 participants were under 35 years ; 28 persons were 35-55 years. They were in France for 3 to 20 years. Their level of qualification was different: 17 participants (mainly in Paris) were graduate, 11 participants (mainly in Montereau) were low qualified. The minimum linguistic level was A2 - according to the CECR- and up to C2 - for graduate who registered in French Universities. The regions of origin were Africa - mainly Morocco, Benin , Ivory Coast and Senegal- Europe – mainly non EU members)- Latin America - Argentina, Colombia and Peru- and Asia - Afghanistan, India and Syria. The reasons for participating (explicit and implicit needs) were linked to forms of discrimination they have suffered in the labour market , due to their origin-mainly their linguistic level or the non-recognition of their professional experience or diploma/qualification. They also wanted to improve their techniques/methods in seeking a job/enhancing their professional career. They also expected to be supported to find enough motivation to go back to the labour market. Some of them clearly required updating their skills and competences – they were informed that a voluntary experience could be considered as a real professional experience (Law on VPL adopted in France in 2002). Their needs were in the first place identified by tutors/trainers and updated during the sessions through interviews and questionnaires dispatched during each session.

Achieving relevant Learning outcomes for the Di&Di thanks to appropriate learning pedagogy

The achieved learning outcomes were also various- in terms of Knowledge, Skills, but also Understanding & attitudes. Learners have improved knowledge about discrimination issues - both on a national and European level. Most of them didn't know the existence of such a non-discrimination framework. They were trained to acquire the appropriate skills to play an active role in searching a job and also to change their professional perspectives. They found new professional opportunities both in expected employment or in potential training to could follow. They have discovered new pedagogical approaches- especially the portfolio approach designed by the Migrapass and updated since 2012 thanks to the monthly club at the Cité des Métiers. They particularly enjoyed the proposal to build their own action plan after a SWOT analysis - a brainstorming approach was organised combining two participants ideally a low qualified female migrant and a graduate migrant.

To achieve the learning outcomes participation methods and didactical strategies and methods combined different strategies. The round tables- at the beginning of each session - were useful means to enhance the empowerment process among the learners. They were asked to make a presentation of their professional profile in a given length of time (3 minutes maximum). There has been an improvement in the presentations made by the participants between the first session and the last session: it was shorter and clearer. The pedagogy combined theoretical and practical content with interactive participation- participants being asked to illustrate specific situations. A brainstorming was offered after the presentation of each “content” . It was meant to confront the different approaches and perspectives. Role plays were also proposed - for instance, one of the participants was supposed to be a job councillor or a potential employer and asked some questions to a pretended candidate. The work in small groups- especially to fill the Migrapass portfolio and to build the action plan- combined a low qualified female migrant and a graduate migrant. After the work in small group, all participants gathered the results of their work in a plenary session. The collective approach aimed at creating a real synergy in the group. The face to face sessions (5 sessions of 3 hours each) were followed by at a distance support consisting in sending documents. A constant reference was made to the weblog implemented as a complementary pedagogical tool with the reminding of the theoretical approach and some main documents (resources) uploaded⁶.

Applying the SWOT analysis to build a realistic action plan

The “Strength” was the information both on the framework of the discrimination (negative side) and the diversity approach (positive side) and the ways & means to overcome the barriers/obstacles by using appropriate tools & methods. The legal framework applied in France is the law n° 2008-496 of the 27th of May 2008⁷ implementing the EU non-discrimination directive. The National Agency is the *Défenseur des droits* since 2008. It is in charge to struggle against discrimination in the following domains: employment, housing, education and access to goods and services. The “Weakness” was the collective approach as individual support was most necessary after the training in order to adapt the training to specific cases and to offer a personalised support. In this context, a series of interviews were conducted with some participants after the training sessions⁸. The “Opportunities” were clearly new professional perspectives and more self-confidence among the learners. The empowerment process succeeded with very positive feedbacks received from the participants and the professional projects built. They could be better explained during the face to face interviews. The “Threats” are directly linked to the status of some participants (asylum seeker, migrants in a process of regularisation of their situation or updating of their documents) or the lack of recognition of their diploma/professional experience which may be main barriers on the labour market.

LESSONS LEARNT IN TERMS OF LEARNING STRATEGY FOR ENHANCING DIVERSITY AND STRUGGLING AGAINST DISCRIMINATION IN THE LABOUR MARKET

Many questions can be raised on the Di&Di approach such as how far can the diversity principle be considered as a main issue in the educational practice and learning in the EU in 2015? How is it possible to combine theoretical approach (non-discrimination principle) with practical approach (educational strategy to enhance diversity in learning courses) ? What are the main obstacles/barriers

⁶ Weblog implemented in France : www.di-di.fr

⁷ modified in February 2014 with a consolidated version published the 7th of July 2014-

⁸ in the framework of the monthly Club of iriv at the Cité des Métiers- <http://club-iriv-paris.blogspot.fr/>

to be overcome - internal ones (coming from learners) or external ones (rules and behaviours considered as barriers for the access to vocational education and training for certain publics) ? What should be the balance between the non-discrimination principle and the diversity approach in the educative/formative systems?

On the basis of the experimentation implemented thanks to the Di&Di project many lessons could be learnt. The first lesson is to be as clear as possible on the definition of Diversity to avoid any misunderstanding as the notion may have different meaning depending on the national context- for instance in Belgium or Luxembourg the focus would be on the linguistic diversity⁹. In the framework of the Di&Di, the definition of diversity is very specific as it concerns the access to the labour market by diverse profiles of workers- migrants, taking into account both their qualifications and professional experience. They should have an equal access to positions according to their professional profiles. Promoting diversity means to support migrant learners to identify the situations of discrimination, to overcome the obstacles they are faced to on the labour market (which are not considered as discrimination) thanks to appropriate learning tools and strategies.

The second lesson learnt concerns pedagogy. It is necessary to combine two approaches- non-discrimination and diversity. Firstly the trainers must remind the legal approach of the non-discrimination framework -both on a European and on national levels. Secondly the trainers have to explain that the diversity approach is supposed to enhance on the ground the access to the labour market by all professional profiles. The Di&Di project is a training programme designed in the framework of the lifelong learning perspective – it is human resources oriented. This is different in other programmes where the focus is made on the legal issues- with case studies of discrimination and legal literature attached to them. During the experimentation, it was decided to focus the training on the diversity approach and the mentoring on the non-discrimination approach. On the one hand, the Di&Di training addresses young graduate and low qualified female migrants. They were trained to learning strategies to overcome barriers in the labour market after reminding the general framework of the non-discrimination. On the other hand the Di&Di mentoring addresses trainers, tutors, and professionals working with migrants and so they were trained to work on case studies detailing situations of discriminations.

The third lesson learnt is to answer the expectations of the participants. As far as the training is concerned, migrant learners were interested in knowing the definition of a discrimination to better understand what is and what is not a discrimination in order to avoid any victimisation. For instance they perfectly understood that the access to specific employments, such as public employments, might be restricted to nationals in the European Union. They were also aware that some professions, especially in the health sector or in accountancy or legal professions, are restricted to the acquisition of a national diploma or qualification. On the other hand, the requirement for a job should be proportionate to the employment- for instance asking for a linguistic level of C2 for a job with very basic content can be considered as an unfair condition and so a form of unequal treatment of candidates. The pedagogical approach consisted in finding ways to overcome the obstacles and barriers on the labour market, and not to detail the situation of discrimination.

The fourth lesson learnt is to find relevant tool & strategy to enhance the empowerment process thanks to a better self-confidence and self-esteem of the participants. The expected outcome of the training was to change their professional perspectives and to avoid any stigmatisation or self-censorship. A main barrier is the internal/psychological one which consists for migrants to feel incompetent or unskilled for an employment even if they have the relevant qualification or experience. The Migrapass

⁹ Feedback received during the roundtable offered at the EAPRIL conference, University of Luxembourg, 27th of November 2015

portfolio has been a main reference tool in this perspective as it allows a biographical approach (experience in the country of origin/in the host country), a holistic approach (professional, social and personal experience), a competence approach (the experience is expressed in terms of competences), and an active approach (an action plan). The Migrapass portfolio will be enriched by outputs of the Di&Di approach, especially in the first step with a discussion among the participants on the three main barriers identified by the Di&Di (language, qualification/experience, access to credit) and in the third step (action plan) on the ways to overcome these barriers.

The fifth lesson learnt is that the diversity and non-discrimination approaches have also to be combined with other pedagogical approaches. For instance the Di&Di training could be included in a linguistic programme offered to migrants arriving in the EU country. As far as France is concerned, the legal contract migrants have to sign¹⁰ includes a linguistic training (a basis of 400 hours so far that should be increased in the years to come), a presentation of the national institutions and life in France and a “bilan de compétences” (half a day to give a professional profile). The Di&Di approach could be an added value to the training programme offered to migrants. Moreover, many associations offer a linguistic support to migrants (an average of 2 to 6 hours per week) and are particularly interested in enriching their vocation training with some other topics such as the access to the labour market, the diversity and non-discrimination approaches.

The sixth lesson learnt is that the Di&Di training have to be enriched by the further feedbacks of participants. In France, the weblog implemented for the Di&Di project presents different feedbacks gathered among participants and the impact of the Di&Di training on their professional opportunities. Four participants decided to start a VPL process (access to a national diploma/qualification), three other participants decided to create their own activity (FISPE, an association to combine linguistic learning and VET, and a professional studio of photography), two participants answered job applications and were selected. In complement, two examples of good practice are presented: a website presenting examples of success stories of migrants and a tool/referential to struggle against discrimination. The experience of the practitioners (teachers & trainers) working in a multicultural context could also enrich in the future the Di&Di approach.

CONCLUSION

The DI&DI project is an example of applied research in the field of practice-oriented, incorporated and explicit vocational education & training (VET) activities designed in the Lifelong learning programme – a Leonardo da Vinci project focused on a better support for the access to labour market, a decrease of the segmentation and a way to up-skill jobseekers. The Di&Di designed a training for migrant learners together with a mentoring for professionals working with these learners. Our article was mainly focused on the “publics” addressed and content of the training programme, explaining the pedagogical approach together with the feedback received from the participants (young graduate migrants and low qualified female migrants) during the experimentation. We intended to show how far the promotion of diversity and the struggle against discrimination could be a main issue in the educational practice and learning in the EU in 2015 and so how it could contribute to the international world of Practitioner-based Research.

¹⁰ Contrat accueil intégration (CAI) compulsory since 2007. Migrants are supported by the services of the Office français pour l'Intégration et l'immigration (OFII)-
http://www.ofii.fr/s_integrer_en_france_47/la_formation_cai_21.html

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CO-CREATION: DESIGNING A HYBRID CURRICULUM IN VOCATIONAL EDUCATION WITHIN A 'DESIGN AND MEDIA' TRACK

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ABSTRACT

In this paper, we discuss the findings from the research project 'Cross-media' which aimed to investigate the collaboration between vocational education and the labour market in a co-creation process. To this date only limited knowledge has been yielded about co-creation as part of design-based research on improving curricula in vocational education. In this study two teams of teachers teaching 'design and media' tracks in their institutions for vocational education in Enschede and Hilversum, were asked to develop a hybrid curriculum in a co-creation process with two media business partnerships. Research data were collected through questionnaires, interviews and focus group interviews. The results show how teachers perceive the co-creation processes, how they design a new curriculum in collaboration with the professionals from media companies and how resources and interactions influence the professional development of the teachers and media employees involved. We concluded that the two teams of teachers actively collaborate in the co-creation process to foster the development and implementation of a hybrid curriculum and reflect on their new environment. Teachers shifted the emphasis of their traditional role towards coaching and tutoring.

Keywords: Vocational education, hybrid curriculum, co-creation, collaboration between teachers and media company trainers.

INTRODUCTION, CONTEXT AND RESEARCH GOALS

Introduction

Vocational Education and Training (VET) institutes play an important role in society creating new learning practices in firms and at the same time fostering innovations in a collaborative trajectory between VET and the workplace. Tracks in VET deliver domain-specific educated practitioners who integrate knowledge, skills and attitudes in authentic learning environments and develop a professional identity related to the field of the labour market in which they participate (Geijssel & Meijers, 2005; Gulikers, Bastiaens, Kirschner, & Kester, 2008; Baartman & de Bruijn, 2011). The learning pathway in VET comprises a gradual shift from school-based learning to more workplace learning (OECD, 2009; Nelen, Poortman, De Grip, Nieuwenhuis, & Kirschner, 2010; Schaap, Baartman, & De Bruijn, 2011). For a smooth transition between the context of the classroom and the workplace context in the enterprises, the classroom environment is also adapting to a broader and new concept with an emphasis on social, collective learning and the contextual nature of learning (Zitter & Hoeve, 2012). In this new concept the formal school-based learning environment is closely connected with workplace experiences (Zitter & Hoeve, 2012). This implies that the traditional school based learning environment in VET is not sufficient to ensure learners to develop an integrated knowledge base whereas it does not represent an authentic VET learning environment. The traditional VET curriculum should be more attractive and adaptive to the economic needs of the region. Therefore Zitter (2010) introduced the concept of a 'hybrid learning environment' and shows how formal, school-based learning and workplace experiences can be closely connected. The aim of this study is to design in co-creation between VET (teachers and students) and media enterprises (trainers) a hybrid curriculum within a 'design and media' track' in two VET institutions in the Netherlands: ROC van Twente in Enschede and ROC van Amsterdam in Hilversum.

Context

The VET institutions in Amsterdam and Enschede in the field of Media & Design train students for media and event technology, media design and sign making. Driven by the rapid technological developments and the increasing competition between the public and private broadcasters, both VET institutions have designed an extracurricular education program (in the form of a hybrid learning environment) focused on the development of creative, technical and perceptual skills. The teachers developed this educational program in co-creation with trainers (experts) from local as well as national media companies. Teachers (managers as well from the media broadcasters and production houses) and students of the 'design and media' track of the ROC van Twente (Enschede location) and the ROC Amsterdam (location Amsterdam and Hilversum) had worked for three years on the design of a hybrid cross-media learning environment. After two years the researchers van Liere and Ritzen (2013) published the preliminary results of the design based research. Subsequently the design activities were based on the concept of co-creation in which the teachers and the trainers collaborated designing the hybrid learning environments. They all added from their own experience, knowledge and attitude value into the design process. At the same time not only the students but also the teachers and the trainers improved their professional skills during the design process.

Research goals and questions

In this paper we explore the antecedents of the interpretation of co-creation and we demonstrate how the model of co-creation supported researchers to design a hybrid curriculum for students from a 'design and media' track in two colleges for vocational education (located in Enschede and Hilversum). The purpose of this study is (1) to contribute to the professional development of the

participating teachers in co-creation with two media companies creating a hybrid curriculum, (2) to broaden our understanding of co-creation fostering students' competencies and (3) to investigate what kind of influence resources, interactions and effects in the co-creation model have on the teachers' learning processes and the students' competence development and learning results. Therefore, we want to explore in this study what the effects of the hybrid curriculum are on the learning experiences of students enrolled in a hybrid 'design and media' track and how the teachers and trainers have collaborated in designing a hybrid curriculum for their students.

This resulted in the following summarized research question: How do teachers in co-makership with two media business partnerships design a hybrid curriculum fostering students' competencies from a cross-media perspective and what kind of value is co-created for whom, by which resources and interactions?

In this multiple case study we used a mixed methods model for answering this general research question.

Derived from the main question five sub-questions are formulated:

Sub-questions:

1. What have the students, teachers and trainers learned during the project?
2. What experiences do students have during their learning and talents' developing process and how can teachers influence this?
3. How did the students collaborate in this co-creation process and what aspects of co-creation do matter?
4. How did the competences of teachers and trainers improve while developing a hybrid curriculum?
5. What conditions are important for the successful accomplishment of a hybrid learning environment in vocational education?

Conceptual research model

In this study, two hybrid learning environments are evaluated and assessed. On the one hand pertaining to the students' learning results and on the other hand concerning the degree to which teachers and trainers have professionalized themselves. The outcome gives students, teachers and media company trainers insight into the factors that influence the co-creation of this hybrid learning environment. In Figure 1, the research model is shown. The independent variables are the teachers' and trainers' beliefs about what furthers their students' competences most while designing a hybrid curriculum within the 'design and media' track. The dependent variable is the design of the hybrid learning environment and the mediating variable is the co-creation process. Based on literature, the 'active' ingredients of co-creation and hybrid learning environments materialize in the form of professional development and organization of the hybrid learning environment. This involves not only how co-creation takes place, but also how this collaborative process between VET and business can be measured (operationalization).

Independent variables:

- Teachers' beliefs about their VET students
- Trainers' beliefs about the

Dependent variables:

- Hybrid learning environment Enschede
- Hybrid learning environment

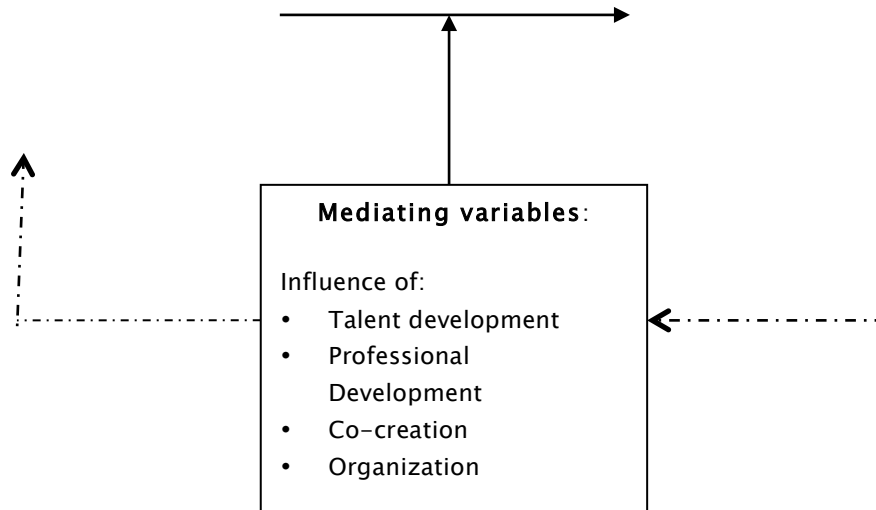


Figure 1 Conceptual research model designing a hybrid learning environment in co-creation

THEORETICAL FRAMEWORK

This chapter is based on the scientific literature and delivers a framework of five components: a hybrid learning environment, students' talent development, professional learning, co-creation and organization.

Hybrid learning environment

A hybrid learning environment is a model of a curriculum design that combines traditional, school-based learning which is organized in a formal curriculum with work-based learning which is unintentional and informal. In this curriculum teachers and media company trainers use a combination of explicit and tacit knowledge and skills, contextualized actions and collaborative learning (Zitter & Hoeve, 2012). According to Zitter and Hoeve (2012) a hybrid learning environment is an intertwining of learning and working processes combining the strengths of the formal school-based learning and the real working life experiences, depicted in the Figure on the next page.

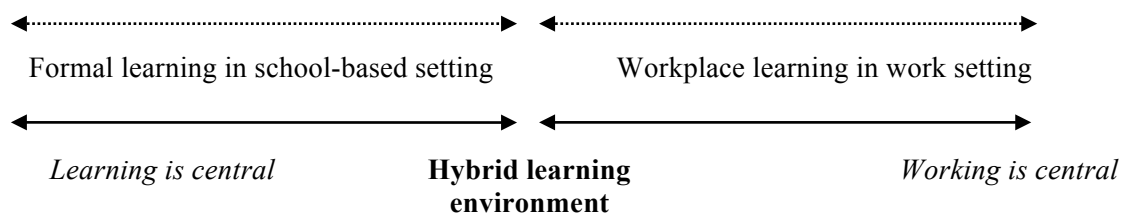


Figure 2 Interweave learning and working processes (Zitter & Hoeve, 2012, p. 7)

The hybrid curriculum within the 'design and media' track integrates the (traditional) emphasis on theory, skills, reflection and work, professional attitude and the application of knowledge and skills in the school. In more traditional vocational education these learning environments are separated in a 'school setting' while the internships are separated in a 'workplace setting'. Actually in a traditional school-based curriculum there is not an intensive connection between the school and workplace

curriculum (Huisman, de Bruijn, Baartman, Sofa, & Aalsma, 2010). The theories of workplace learning, situated learning and learning in communities of practices, but also the active learning theory emphasizes the need for students to actively participate in their learning process to get most out of their experiences (Zitter & Hoeve, 2012; Zitter, De Bruijn, Simons, & Ten Cate, 2011; Billett, 2004, 2008; Wenger, 1998; Prince, 2004). According to Prince (2004) there is a concurrence between the active learning theory and the hybrid model. On a general European level even the demands of the knowledge-based economy, the 21st century skills and general societal changes of politicians, citizens, parents, teachers and company trainers have changed the educational practices in VET as well as the relationships with their environment (OECD, 2013; Ananiadou & Claro, 2009). Finally a hybrid learning environment is characterized primarily in a teaching department of a hospital, a school or company like in this case in a media company. This new learning environment can be organized in a new way and needs theory, reflection and practical experience offered not separate but as a whole, bringing both synergy and excitement. In this way the hybrid learning environment refers to the combination of the traditional teaching environments (school and professional) that are combined into a new productive learning and working environment in school or in the enterprise.

Talent development

According to Terlouw and Pilot (2010) we distinguish in this study multiple definitions of ‘talent’ with two main conceptions. The first conception of talent is based on the exclusive approach of talents focused on a select group of students. The second is an inclusive approach which implies that all students have/are talents. The action plan of talent development of the Dutch government uses the broad definition of talent, literally: “Talent is the ability to excel in one or more subject or skill. That ability is not solely innate; it is often a matter of practice and perseverance. Top talent can be found everywhere in education in cognitive, practical, technical, creative or social areas. For the talented pre-vocational students in the mixed and theoretical pathways in the prevocational education, it revolves around talent for “craftsmanship” with the ultimate goal of the “leading practitioner”, (OC&W, 2014, p.3). Individual talent development is a longitudinal development process starting at a very early age. This talent development relates primarily to motivation, aspiration level, inquisitiveness and the interest for professions (Heckhausen, Wrosch, & Schulz, 2010; Sodano & Tracey, 2007). Individual differences between students should also take gender differences into account (Segers & Hoogeveen, 2012). Girls generally have less confidence in their own abilities than boys (Reis & Hébert, 2008). Individual talent development is optimal when conditions on the micro-, meso- and macro levels of education are well matched. According to Terlouw and Pilot (2010) at the micro level the teacher plays a crucial role in stimulating the curiosity of the student, asking for commitment, perseverance and self-discipline of the learner and ultimately challenges the student to spend his learning time in a motivated way. At the meso level, the focus is the organization and management of the school curriculum (Terlouw & Pilot, 2010; Terlouw, 2012). The conditions for developing sustainable talent include space for additional elected educational components to respond to differences in student interest, possibilities for deepening and broadening, options to accelerate and the ability to use external educational activities, for example by participating in technical projects. At the macro level, the opportunities for learning in further education and work are crucial. So it revolves around educational policy that focuses on decompartmentalisation and intertwining with the previous and following educational institutions (Terlouw, 2012). Central in this study is the Differentiated Model of Giftedness and Talent (abbreviated DMGT) of Gagné (2004; 2010) reflecting a dichotomy between giftedness and talent. Giftedness is in his view an innate capability that is reflected in at least one talent domain (ability domain). Gagné sees talent as an extraordinary mastery of systematically developed capacity which he calls competencies (knowledge and skills). Gagné (2004; 2010) defines talent as a process of gradual transformation of one’s giftedness into talents. These three components - giftedness, talent and talent development process - form the ‘basic trio of DMGT’. Two additional

components supplement the development process (LP) within the theory: intrapersonal catalysts (IC) and environmental catalysts (EC). The factor of chance or luck ‘chance’ (CH) also plays an important role in the DMGT model. In order to develop skills from a natural capability, the learning arrangement (curriculum) can be performed under six conditions (Gagné, 1995): (1) The learning arrangement differing in difficulty from the regular curriculum. (2) Operationalization of goals that challenge students and enable them to divide their learning in sub-processes (targets) without obscuring their learning outcomes. (3) Selecting students on the basis of their results in order to participate in the learning arrangement. (4) Students motivated to work more than half a day on the learning arrangement (between 7 and 10 hours). (5) Periodic progress reviews to determine the extent to which students develop their talents. (6) Offering acceleration pathways within the learning arrangement focused on individual capabilities of the student. Finally Gagné believes that talent development improve as the learning arrangement satisfies more than one of the above six conditions.

Teachers’ professional development

Garet, Porter, Desimone, Birman and Yoon (2001) indicate three core features of professional development activities that have significant, positive effects on teachers’ self-reported growth in knowledge and skills and changes in classroom practice: (a) focus on content knowledge; (b) opportunities for active learning; and (c) coherence with other learning activities. According to these researchers the following structural core-features significantly affect teacher learning: (a) the form of the activity (e.g., workshop vs. study group); (b) collective participation of teachers from the same school, grade, or subject; and (c) the duration of the activity. The study by Penuel, Fishman, Yamaguchi and Gallagher (2007) in a sample of 454 teachers engaged in an inquiry science program, examines the effects of different characteristics of professional development on teachers’ knowledge and their ability to implement the program. Consistent with findings from earlier studies of effective professional development, these researchers found significance in the teachers’ perceptions about how coherent their professional development experiences were during the implementation of the project. The authors also found that the incorporation of time for teachers to plan for implementation and provision of technical support were significant for promoting content implementation in the program. But the teachers must have enough time to plan for implementation and enough support helping them to integrate the materials into their curriculum and developing ways to promote student research through the program’s activities and materials (Penuel et al., 2007). Also the context configuration (in our situation Enschede and Hilversum) and the demands of teachers and their adaptability to their local context might be different (Penuel et al., 2007) and has to be tailored both to the program and to the local context. To ‘localize’ the teachers’ professional development activities within their own VET contexts lead to a ‘fit’ between the hybrid curriculum and the local context.

During the design of the hybrid curriculum the teachers’ as well the trainers’ attitudes will change. Together they develop their professional identity during the perceived professional process that takes place by designing the cross-media learning environments and curricula. According to Verbiest (2002, 2004) they develop their identity during collective learning processes in VET.

Co-creation

The concept of co-creation has mostly been used in the business domain and recently the concept appeared also in education. Still the current research encompasses a multitude of approaches resulting in many definitions, perspectives, and interpretations (Ehlen, 2015; Powell, 2004). Co-creation is in this study according to Ehlen (2015) conceived as a collective process where teachers and trainers conceive new educational products (e.g. a hybrid curriculum) or services (as talent developing) developed. Value co-creation emphasizes from a perspective of a formal and informal dialogue the

interaction of individual, social and organizational characteristics and consists of three elements: (1) value specifies for whom; (2) co-specifies by what kind of actors; and (3) creation specifies through what kind of mechanisms co-creation occurs (Ehlen, 2015).

Co-creation in the school practice is a communication process in which students and teachers and vice versa the trainers of the media companies focus on creating added value (Prahalad & Hamel, 2004a, 2004b; Wikström, 1996). These actors are the co-creators during the educational design process. The value is for both (teachers as well as trainers) the creation of a renewed hybrid curriculum. Their experiences during the curriculum design process lead to implicit learning processes (Prahalad & Hamel, 2003; Bitter-Rijkema, Verjans, & Bruijnzeels, 2011; Saarijärvi, H. Kannan Hannu Kuusela, 2013).

Co-creation within vocational education is evident in hybrid learning environments in which school learning and workplace learning are intertwined (Sofa & Hoeve, 2012). The communication during the co-creation process consists of the following components: (1) dialogue: learning from each other through involved communication; (2) access to inform the media mix; (3) risk assessment by jointly assessing the risks; (4) the transparency of products, technologies and systems (Prahalad & Ramaswamy, 2004a, 2004b). The ultimate success of co-creation is influenced by four factors: listen, engage, respond and organize (Ramaswamy & Gouillart, 2010a, 2010b).

Key actors in the co-creation process are on the one hand teachers and students and on the other hand trainers. Both have different roles (school versus media business) and perspectives (goals and needs) while participating in the design process and adding 'value' to the hybrid curriculum.

The teacher, student and trainer *act as individuals*. They enter into dialogue (formal and informal *communication*), through the perspective of their own *organization* (goals and needs), and also their *culture* (values and norms of respective vocational education and media companies) and their orientation or acceptance of the concept of *co-creation* (open and transparent access to each other's domains). The interdependence between the perspectives is depicted in the Figure below.

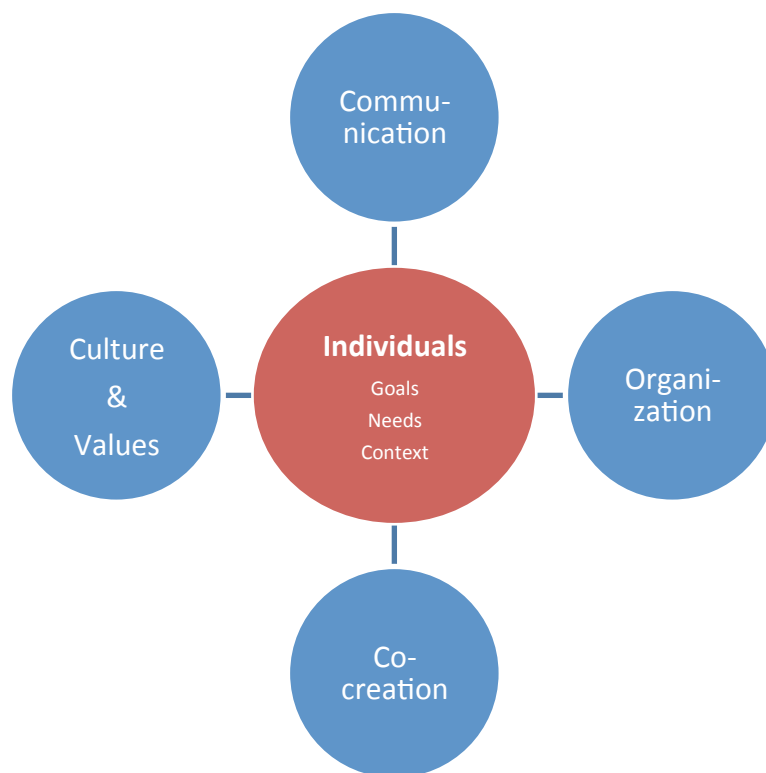


Figure 2 Coherent perspectives of co-creating concept

Organisation

The cross-media programs should take into account the conditions on the micro-, meso- and macro levels of education.

- At the micro level, the teacher and the trainer play a crucial role designing the curriculum and also to challenge the student, to appeal within the curriculum to his perseverance and self-discipline and finally to challenge all the students within the hybrid learning environment.
- At the meso level, the organization of VET must meet conditions for developing a sustainable curriculum: space for additional vocational components in the field of the ‘design and media’ track, addressing students’ career choices and -decisions by giving students space in which they can develop personal interests related to their perspectives on the labour market, possibilities for deepening and broadening their interests and capabilities, as well as the ability to use external professional assignments.
- At the macro level, the opportunities for learning in higher professional education and the transition from VET to an Applied University or to a challenging job is crucial.

Based on the theoretical framework we composed a variables scheme, depicted in Table 1.

Table 1:

Concepts, variables and dimensions

Concepts	Variables	Dimensions
Hybrid learning work environment	Curriculum	Guidance and coaching, Features of development Project “round-about” Team spirit development Self-employment
	Professional pedagogy	Coaching and teaching methods Roles and tasks of teachers and trainers Creating a culture of professional behaviour Integration of theory and practice
	Vocational course content	Workshops integrating theory and skills Digital content self-study Marketing, business and self-employment training Real third party assignments and projects Blended learning Innovations
	Bind to participants	Peer to peer Crossovers Training & Courses
Talent development	Appreciation	Appraisal Professional pride
	Initiative	Self-steering Professional curiosity Insight in the scope to develop
	Competence	Recognition and reflection on experiences Enriched course content
	Qualification	Checklist criteria optimal talent development content Challenging aptitude tests Post vocational education top course (TV Academy) Ready to be self-employed
Professional development	Knowledge development	Coaching perception of new practices and applications Integration of knowledge and skills in practice
	Personal work theory	Developing process Concept of professional requirements Applying integrated acquired competences
	Attitude	Role-definition and exercising thereof by student/teacher/trainer Craftsmanship and punctuality
Co-creation	Arrangements	Checklist optimal characteristics Context-managements Logistic layout
	Cooperation	Alignment and integration Pairing, team composition
	Added value	Cooperation and coaching students/teachers/trainers Demand driven course-content for media companies Optimal preparedness for the job
	Interaction	Participation and network-building Job opportunities and try-outs for students
Organization	Communication	Formal/informal Engagement Tuning of objectives of the partners: coherence
	Terms	Resources Facilitation Production site,
	Conditions	Activities Clustering Flexibility
	Sustainability	Implementation Evaluation

METHOD

In this study we investigate the effect of the designed hybrid curriculum and the contribution fostering students' competencies and teachers' professional development and we evaluate the co-created value, resources and interactions within the co-creation process. The research consists of a quantitative part (questionnaires) and qualitative part (focus interviews with teachers, trainers and students who participated in the hybrid curriculum). Accordingly a mixed method is used.

The quantitative research is a 'one-group post-test only design' in which the students after the intervention (active participation in the hybrid learning environment in the media company) were questioned on (1) their learning process, (2) study results and talent development and (3) quality of cooperation, guidance and co-creation. The results of this questionnaire provides feedback on the learning process in the hybrid learning environment, to improve the learning process in school and the working processes in the media companies.

The qualitative research is based on program evaluation research (Rossi, Lipsey, & Freeman, 2004) in which we investigate how co-creation with students, teachers and trainers and their implicit learning processes (talent and professionalism) has developed. Therefore a case study method (Yin, 2003) has been applied.

Participants

54 Students participated in the quantitative study. 41 Students (76%) were enrolled in the 'ROC van Twente' (location Enschede) and 13 students (24%) in the 'ROC van Amsterdam' (location Hilversum). The students have voluntarily completed the questionnaire. The total group consisted of 42 males (78%) and 12 women (22%). The students were between 16 and 25 years old averaging 18.56 years (Std. Dev. 1.776). 12 students (22%) were first-year students and 42 (78%) second and third years. 49 students (Std. Dev. 0.515) have actually been working in the hybrid learning environment; five students in the hybrid environment weren't aware of it. The students from both VET institutions were analysed as a single group.

The respondents in the qualitative study are students (n=16), teachers (n=12) and trainers (n=6) of the cross-media projects in Amsterdam, Enschede and Hilversum. Students participated in a group of four persons in focus group discussions. The teachers were interviewed individually or in small groups of two or three people and the trainers were interviewed in pairs. The composition of the group is as follows:

- 16 students consisted of 8 men (50%) and 8 women (50%). They were between 17 and 26 years old and had an average age of 20.31 years (Std. Dev. 2.789). All 16 students have been actively working in the hybrid learning environment.
- 10 teachers and two 2 instructors participated in the qualitative research. The whole group consisted of 9 males (75%) and 3 females (25%). The age was between 32 and 61 years with a mean age of 46.5 years (Std. Dev. 10.587).
- 6 trainers were men between 24 and 46 years old with a mean age of 32 years (Std. Dev. 6.603). The six trainers work as media managers, editors, editing, format development and production. They have all actively participated in the hybrid learning environment.

Procedure

The research is prepared in November and December 2014 and took place in the months of January to September 2015. 70 students were invited to fill in the questionnaire, 54 students (77%) completed the questionnaire. 16 students (23% non response) have forgotten to fill in, were ill, or in apprenticeship. The students filled out the questionnaires via a login account. Participating in the interviews was voluntary.

Analysis

The online questionnaire has been developed for the students and is based on the theoretical framework, the project objectives compiled by the researchers and pre-assessed by two experts (a researcher and program manager). Based on the Mann-Whitney U test for independent populations (Twente and Amsterdam) two questions were rejected, namely the question "I've learned the most from company employees (0,015 at level of significance $p < .05$) and the question of 'my talents also come to fruition through the lessons at school (, 037 level of significance $p < .05$). The questionnaire consists of three subscales and has a reliability of 0.90 which means good (Baarda et al., 2012):

- Learning experiences (questions 1 to 13; reliability subscale alpha 0.83).
- Study Results and talent (questions 14 to 25; reliability subscale alpha 0.73).
- Co-operation, guidance and co-creation (question 27 to question 42; reliability subscale alpha 0.89).

The collected qualitative data were analyzed according to the methodology of 'Grounded Theory' (Egan, 2002). The essence of 'Grounded Theory' is that the perceived perception and appreciation of the actors are central to the investigation. The perspective of the participating actors: students, teachers and trainers are explained as much as possible (Malterud 2001; Holloway & Wheeler, 2011). Data processing and analysis is performed based on the steps defined in The Qualitative Analysis Guide of Leuven (QUAGOL) also called the Quagol method and developed by Dierckx and Casterlé and others (2012). This method works as follows. The qualitative analysis guide of Leuven (QUAGOL) is a method of data analysis. For this purpose we followed two methodical steps within the data analysis, namely, (1) a thorough preparation of the coding process, and (2) the actual encoding process. Both parts consist of five phases of iterative processes in order to dig up the data. The analysis process starts after the last focus group discussion had been concluded. QUAGOL presumes a thorough preparation of the coding process by using only paper and pencil. This provides a 'first look' at the data and the researcher obtains an useful empirical framework for the coding. In the second part of this study, the data have been analysed based on the deductive variable schedule (the theoretical framework provides the concepts, variables and dimensions). From this deductive analysis framework the interview abstracts could systematically be processed in an empirically based description of the interview results.

In the semi-structured panel interviews the following topics were discussed:

- The characteristic values of the innovation project to determine the impact and added value of the cross-media activities.
- The involvement of stakeholders in shaping and experienced co-creation when performing the cross-media activities.
- The experienced partnership involved between the educational institution and the media companies.

RESULTS

In this part we present the research results concerning the students' learning experiences. The results are described for each sub-question.

Results sub-question 1

Sub-question one: what did the students learn through the hybrid learning environment developed by teachers and trainers as a result of the co-creation process?

9 students did not complete the questions about their learning experiences during the cross-media projects, because they participated partially in the projects. The questionnaire was completed by 34 students of the ROC van Twente and 11 students of ROC Amsterdam, total N = 45.

Students have learned a lot during the execution of their assignments and productions as a result of collaboration and co-creation by teachers and staff (supervisors) of the media companies (N = 45 and average score 3.62). Based on the five-point scale, the students have learned the least from their fellow students (N = 45 and average score 2.95) and most from executing business orders and production as a result of the process of co-creation (N = 45 and average score 3.83). Students learn more from practice supervisors of the companies (N = 45 and average score 3.29) than from their own teachers (N = 45 and average score 3.00). The students think working in a hybrid learning environment important (N = 45 and average score 4.10), and mostly have committed themselves (N = 45 and average score 4.05). For an overview of the learning processes of students Table 2.

Table 2

Results students' learning process

Variables	Average scores on the learning process of students for the co-creation of company assignments and productions of students:			
	N=54		Mean score	Std. Dev.
	Valid	Missing		
Much learned during the implementation of the company orders and productions	45	9	3,62	,936
Most learned from fellow students	45	9	2,95	,854
Most learned from the trainers and work practices	45	9	3,29	1,195
Most learned from the teachers	45	9	3,00	,911
More learned during the implementation of the media business orders than in school	45	9	3,83	1,034
Students find working with company assignments productions important	45	9	4,10	1,008
Participating as students during the productions	45	9	4,05	,936

Finally, the assignments that students have accomplished within the hybrid learning environment fitted well with classes in the hybrid learning environment within both VET institutions (N = 45 and average score 3.62). By-catch is that students participating actively in the hybrid learning environments knew exactly which profession they would be pursuing later (N = 45 and average score 3.33), saw their

talents flourish (N = 45 and average score 3.90) and were proud of their work (N = 45 and average score 3.69).

In a hybrid learning environment the two components learning and work are integrated in the curriculum. The students shared their experiences in the panel interviews. All students have mostly positive experiences with the designed hybrid learning environments. Several times the students noted that working in this learning environment is challenging through simulating real life in a school context. A student quotes:

"It's nice that you get the chance to be able to create a media production for real."

Important for students' learning results is the group composition. Teachers have to be clear about their decisions in regard to group composition. Students report:

"Working in groups will work, but make them smaller; not five, no more than three. Think about working as a skilled worker and person."

The pedagogical approach is often assessed positively by the students. This is clearly articulated by all panel groups when they told about the connection with the practice. For improving their learning results the students want to have the freedom to develop their own creativity and to cross over their own profession. Some students' quotes:

"You encounter and you see more than when just sitting in the classroom. You get in touch with people and can ask, see and experience things. "

"On your own level you learn more from each other in real practice about what you do not know yet. You complement each other from the various education programs. "

"You look over each other's shoulders as a model for your own learning process."

Results sub-question 2

Sub-question 2: What experiences do students have during their learning and talent-developing process and how can teachers influence this?

16 Students have ignored the question in terms of their learning experiences during the cross-media projects, because they (1) alternately participated in the projects, (2) they didn't know how to answer because they were not familiar with the hybrid learning environment, (3) the questions were not applicable to them. 38 students have completed the questionnaire.

If students are well prepared for their lessons (N = 38 and average score 3.50) and actively participate in the hybrid learning environment (N = 38 and average score 3.45), they show better study results. The students' results improve when they, together and in co-creation with the teachers and media company supervisors, may develop curriculum content (N = 38 and average score 3.82) and when they are allowed to work on real company assignments (N = 38 and average score 3.97). Within the hybrid learning environment students get better study results if they are allowed to join the discussion about curriculum content with their tutors and trainers (N = 38 and average score 3.84) and feel taken seriously by them (N = 38 and average score 3.73). Good guidance by teachers and career counsellors also contribute to better study results (N = 38 and average score 3.78). For an overview of the perception of students on their study results see Table 3.

Table 3
Students' learning results

Variables	Average score on students' perception achieving better academic results when students...			
	N=54		Mean score	Std. Dev.
	Valid	Missing		
prepare themselves in advance for the lessons.	38	16	3,50	0,688
actively participate in the hybrid learning environment.	38	16	3,45	0,795
develop lessons in co-creation with teachers.	38	16	3,82	0,954
work on professional assignments.	38	16	3,97	0,752
discuss the lessons with their teachers.	38	16	3,84	0,678
notice that the teachers are taken their learning experiences seriously.	38	16	3,73	0,890
be well accompanied by their study and career counsellors.	38	16	3,78	0,777

An important objective of the project 'Cross-Media' is how students optimally develop their talents. Students become aware of the opportunity to develop their talents during the execution and assignments of the cross-media tasks (N = 38 and average score 4.05) and vice-versa their teachers get an eye on those talents (N = 38 and average score 3.42). In the perception of students talent development takes place when the hybrid learning environment (particularly the teachers) supports their talents (N = 38 and average score 3.84), which they then develop further in the curriculum (N = 38 and average score 3.00). Scoring well for cross-media assignments has a positive impact on students' talent development (N = 38 and average score 4.16). For the results of the part of students' talent, see Table 4.

Table 4
Students' individual talent development

Variables	Average score of students' perception of their talent development if they know...			
	N=54		Mean score	Std. Dev.
	Valid	Missing		
they make progress in cross media.	38	16	4,05	0,733
that teachers discovered their talents.	38	16	3,42	1,030
the education supports their talents.	38	16	3,47	1,032
their talent in school is deployed.	38	16	3,00	0,900
they get high marks for their assignments.	38	16	4,16	0,886

To develop students' talents is perceived by teachers as 'difficult'. They do not really know how they can identify the talents of their students. Also for students who make beautiful productions, they

cannot distinguish whether it is due to the students' talent (giftedness) or the quality of the production specification or even the student's motivation? Within the hybrid curriculum talents should emerge and blossom, which has not always been the case. A quote from a teacher:

"The student's competencies, coming to their own in practical assignments, can be judged much better. That's very nice. You can look at their real talents including their commitment as a competence."

According to the teachers they are amazed how the students develop themselves and how they grow by participating in the hybrid curriculum. The teachers all agree that it is good that students participate in work based practices. Providing students a degree of freedom in independent learning is also boosting their motivation for the study work and their future profession. One teacher says:

"Giving more freedom to the student leads to better appreciation of the program."

The practical assignment is more a personal choice of the student. Their talents grow in the hybrid learning environment. The fact that students become aware of their own creativity and ability has been very surprising for the teachers. A teacher expresses this as follows:

"They go outside their comfort zone and investigate and show what they dare to do."

Teachers are motivated to encourage their students to uncover new opportunities and the change in the educational program must be seen, heard and valued through the manifestation of their student's skills and talents. The hybrid learning environment offers them enough opportunities from a creative perspective. The teachers are starting to see their students in a different context. Students who are somewhat reclusive show their commitment. Teachers value the hybrid teaching practice in which students develop supplementary skills (working together, set goals, plan, reflect, work independently). When performing practical tasks, students take up new roles and create their own jobs. According to a teacher this installs much more passion in the students':

"The passion they have not been able to show in the classroom curriculum is shown in their practical assignments."

"At a certain moment someone's abilities emerge, which is partly dependent on the task / role he / she performs in the project."

Spotting actual talent by teachers and in consultation with the trainers is more reliable in a hybrid learning environment. In a different environment they see students changing. The autonomy of the students is part of the hybrid curriculum and stimulates to perform tasks, to set goals, to analyze the process and to evaluate the product. One teacher says:

"It's nice to see that students 'put the bar higher' and increase the pressure in their work."

Results sub-question 3

Sub-question 3: How did the students collaborate in this co-creation process and what aspects of co-creation do matter?

The students collaborated well with the teachers (N = 42 and average score 3.81), fellow students and staff members of the media companies (N = 42 and average score 4.00). The collaboration will

improve if students' behavior is taken seriously (N = 42 and average score 3.50; N = 42 and average score 3.74). See Table 5.

Table 5

Collaboration between students and teachers

Variables	Average score of students on their collaboration with...			
	N=54		Mean score	Std. Dev.
	Valid	Missing		
teachers.	42	12	3,81	0,772
teachers, students and trainers.	42	12	4,00	0,796
teachers when they will be involved in the decision-making.	42	12	3,50	0,944
teachers when they take students seriously.	42	12	3,74	1,037

Students are part of the co-creation process. Within the hybrid learning environment the assignments have been adapted to the students' aspirations (N = 42 and average score 3.74), and by cooperating the students could estimate their deadlines well (N = 42 and average score 3.55). The learning environment makes all products, technologies and media systems available to the students (N = 42 and average score 3.50). Teachers and trainers have been listening carefully to the students (N = 42 and average score 3.67) and students were engaged in all activities (N = 42 and average score 3.64). The students feel free to provide feedback and feed forward (N = 42 and average score 3.57) and are permitted to organize activities themselves (N = 42 and average score 3.36). See Table 6.

Table 6

Co-creation in the hybrid learning environment

Variables	Average students' score while working in the hybrid learning environment when...			
	N=54		Mean score	Std. Dev.
	Valid	Missing		
talking about ambitions and providing appropriate work assignments.	42	12	3,74	0,912
collaborating and estimating deadlines.	42	12	3,55	0,942
having the opportunity to use all products, technologies and systems.	42	12	3,50	0,773
was listened to the students.	42	12	3,67	0,754
students were involved in all activities.	42	12	3,64	0,759
students felt free to respond on work from themselves or others.	42	12	3,57	0,914
students had to organize many activities.	42	12	3,36	0,905

Prior to the availability of learning in the hybrid environment students on average scored insufficiently for their modules; their average mark is 4.7. Students assessed making their cross-media productions

with a 7.5 and rated their learning revenue with a 7.1. They rated the study guidance by teachers and trainers with an average mark of 6.6. See Table 7.

Table 7
Students' average grades

Variables	Average grades:			
	N=54		Mark	Std. Dev.
	Valid	Missing		
Corporate o media orders and productions	46	8	7,5	1,068
Marks on exams / tests	45	9	4,7	1,483
Learning in project teams	44	10	7,1	1,099
Guidance from teachers	44	10	6,6	1,372
Guidance by trainers (and business supervisors)	44	10	6,6	1,543

The students executed their media production assignments in eight groups. The participating students shared responsibility for the delivery of a production that was to be broadcast or published. Typical in the media companies is how the quality of content for a broadcast that is to be rich learning material for students, is safeguarded. Quote of a trainer:

"For external (contract) jobs we consciously form groups focused on putting the participants in their strength and quality."

Co-creation is to work together, listening to each other, discussing and coordinating the preparation of productions made by students for the needs of the media world. The characteristics of the production assignments should fit the participating students. For example: real-time production which doesn't allow a step back; or direct contact with the client and coordination and planning of the work assignment. In the alignment between training and practice in the learning process there is friction between the planned roster of education (curriculum and period) and the dynamics of the media world (resources and deadlines). A company trainer described this as follows:

"The school as an institution is tied to a particular curriculum fixed for a period of 10 weeks. With us work comes on its own conditions, it has to be produced and finished before a certain deadline. For the students, planning under these conditions makes out quite a challenge."

If the partners (education and business) find a modus to accomodate the pedagogical and educational planning and the dynamics of the media profession, they can create a sustainable hybrid learning environment. The accommodation must be established between the partners and stakeholders. By participating in the educational activities, the connection between education and the media will be strengthened. A quote from a trainer:

"Our added value is that we (practice teachers) - knowing the dynamics of the profession - can transfer how to cope with this to the students during the execution of the projects."

These values are perceived by the different actors:

- the companies are getting new content that would otherwise not be made;
- the teachers can develop the competences the students need;

- the students ("it's so cool that we can do this") get motivated and committed.

The thresholds are lower, the teachers and trainers communicate intensively. This is seen as a plus.

Conclusion of a company trainer:

"You get closer to one another and after the project you understand a lot more of each other."

Results sub-question 4

Sub-question 4: How can teachers and trainers become professionals in developing and sustaining a hybrid curriculum?

Teachers' and trainers' professionalization is part of their social process which comes from their professional experience and involves engagement, participation and negotiation within the groups of teachers and trainers and between the groups. Their shared domain of learning and interests is the media profession. Teachers recognized their professional development which they attributed to the intensive collaboration during the process of co-creation by designing the hybrid curriculum. They designed new forms of practices and applications. As one teacher says:

"We're learning as well as the audio-visual designers; I'm for example curious about programs the trainers professionally use and whether these could be used by us in the classroom."

Teachers' insights on the talent development of their students and on the co-creation processes with the trainers have improved their action repertoire. They shared new insights while working together in the hybrid learning environment. Between the teachers an exchange of media products took place as a consequence of the hybrid curriculum development which constituted an important contribution to their new understandings. The teachers reflected on their educational program and on the products of their students, which also enriched their knowledge and had an innovative influence their role. Some teachers indicate that they took much more account on the students' conditions and their contact with the business. A teacher mentioned:

"For me I look further, widening my practical knowledge. I dare say that I am more in compliance with my students and I know better what they may encounter in practice and how to anticipate there on in my curriculum."

The teachers of both locations (Enschede and Hilversum) regret that there didn't occur a direct exchange of each other's projects and products. The interaction only took place at the location where they carried out the project and not between the teachers of the two locations; a missed opportunity!

Results sub-question 5

Sub-question 5: What are the desirable conditions when organizing a hybrid learning environment in vocational education?

The prime condition is communication between the teachers, trainers and students as part of the creation of a meaningful process inside and between organizations (Amsterdam, the TV Academy and Enschede, the TVEnschedeFM) focused on designing the hybrid curriculum. The communication took place with their local suppliers within their individual, curricular and organizational contexts. The first condition is that the designing process of the hybrid curriculum should be tailored to their different processing systems and within their specific local learning environment. Important is the alignment in

co-creation between the educational system and the media dynamics; a major hurdle to take! A trainer from a media company expresses this as follows:

"We live in a world of deadlines and then you meet education taking quite some time to make decisions. That's sometimes difficult to accept."

In an extensive organisation-oriented research among all participants (Beune, 2015), the following has been concluded. The necessary conditions for co-creation comprise three main areas: vision, resources and communication:

Vision

Co-creation can only be made to work when these three conditions are met:

1. Common benefit (win-win) agreed upon by the cooperating partners.
2. Shared support from the actual participants in the co-creation process.
3. Students participate in the complete workflow and can learn from mistakes.

Means

1. Sufficient time and resources, including provisions for building a fruitful working relationship by the partners, essential for a sustained commitment.
2. Synchronized planning of availability of the actual participants in the project.
3. A project manager, familiar with and supervising all instances of the project, monitoring and tuning the goals and products.
4. Strict financial planning and coaching by the project owner.
5. Timely payment of company costs.

Communication

To reach an unimpeded exchange of ideas, expectations, interests and needs there should be:

1. An equally footed, eager to learn attitude based on mutual respect and trust.
2. Open communication on everybody's goals and expectations.
3. Feedback on goals and expectations on a regular basis.
4. Clear and concrete agreements on goals, planning and deadlines and how to act when agreements are not met.

CONCLUSIONS

Both cases are rich in information on how teachers and employees of the media companies collaborated as co-creators in a non-linear process, designing a hybrid curriculum. The design process recombines 'new' (media companies) and 'old' (teachers) work practices, offering opportunities for the development of students' competences. Creating learning environments in the experimental studio(s) has had an impact on all levels of the school organization. The teachers adjust their notions about co-creation during the design research project and actually change their routines responding to the new insights offered by the co-creation process with the employees/trainers of the media companies. Being engaged and inspired during the design process, positive interaction with the employees and students has led to this change of attitude. The added value of the companies lies in providing new insights in the field of cross-media training involving their expertise. This leads to a

drastic change in the roles of the teacher (traditionally only providing lessons) and the student (traditionally a lesson 'consumer').

The main conclusions are:

1. The confrontation between teachers' traditional knowledge and employees' applied knowledge being used in the media studios has led to a change in the teachers' perceptions, knowledge, attitudes, and mindset. This is the foundation for developing and organizing attractive vocational education.
2. These changes are reflected in the role perception-shift towards more coaching and tutoring in the learning process.
3. The design of the hybrid curriculum based on the model of co-creation has led to new content which is integrated in an updated curriculum.
4. The framework of interactions that influence the design of a hybrid curriculum form the participants' reference. This framework of interactions should be part of their mutual interactive learning process.

DISCUSSION

A lot of teachers experience difficulties in collaborating with employees from enterprises or with supervisors from internships. Some teachers in vocational education even interpret their knowledge and vocational experiences as a depreciation of their own professional role. It is important to let teachers experience that co-creation implies positive interaction between teachers, students and employees. The results can be used to stimulate schools and teachers to explicitly discuss co-creation and to use the outcomes to improve the development of the curriculum and learning results of their students. As stated before, designing a hybrid curriculum based on a process of co-creation is an important precursor for realistic learning in a professional context.

Several factors in the work environment of the school and the media seem to help determine this form of learning: variation of the work as the school versus the media practice, responsibility for others, for example, wear and supervisors for the educational process of the students, together with students and teachers, liaise with clients, get feedback, regulate pressure of students by assisting them in meeting the deadlines, students opportunity to reflect with teachers and students. It is a way that is learned in the process of co-creation.

Several aspects in the work environment of the school and the media seem to help determine this form of hybrid learning, namely: variation of learning in school versus the work in the media practice, taken responsibility for others, for example, the trainers from the media enterprises for the educational process of the students, together with teachers, liaise with clients, get feedback from each other, regulating the pressure of students by assisting them in reaching the deadlines, the opportunity to reflect with teachers and students. It is a way the actors have learned in the process of co-creation by learning through negotiating and developing their identity as a co-educator in vocational education.

This program evaluation is a search for the 'truth' for all participating actors and knowledge delivering as by catch for design based researchers. The program evaluation is actually a process of converting data into relevant, actionable knowledge and at the same time a process of signification. Investigating concerns the activities aimed at new knowledge, insights or skills which can be used in vocational education. The research group has provided this contribution by evaluating the interventions (the hybrid learning environment as an independent variable) and to investigate its effectiveness.

The new hybrid learning environment as a result of an intensive co-creation process between teachers and practitioners from the broadcasting companies shows promise. A hybrid curriculum encourages innovation and promotes the involvement of teachers and trainers into the learning process. The hybrid learning environment is not a cure-all for the connection between school based and workplace learning for providing a new productive learning and working environment for all students.

This innovation has limitations as well, for example the shortcomings and blind spots in the teachers' and trainers' learning processes. But also the lessons which we as authors have learned from our reviewers, for example by the submitted posters and papers revealed about this project (De Vries, Ritzen, Van Wijk, & Van Mazijk, 2015). The lessons learned offer the members of the lectureship new opportunities for further research improving the concept of a hybrid learning environment!

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ASSESSING SITUATED KNOWLEDGE IN SECONDARY TEACHER TRAINING BY USING VIDEO CASES

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ABSTRACT

Experienced teachers subconsciously make use of situated knowledge, which is knowledge that is readily available, holistic, contextual and linked to specific situations, in order to solve incidents in everyday teaching. Situated knowledge is important in teaching and should therefore be assessed in teacher training programmes. Situated knowledge can be assessed by using cases and by setting higher learning objectives, on condition that both explicitly address the situated nature of this knowledge. The main question in this study is: Do teacher trainers use cases that are aimed at acquiring situated knowledge? Empirical research carried out in eleven secondary teacher-training programmes revealed that only one of these programmes indeed assessed situated knowledge. However, considering its importance, it is crucial that all secondary Dutch teacher-training programmes assess it. To help institutions achieve this goal, this article provides suggestions for the construction of tests with cases to assess the acquired situated knowledge.

INTRODUCTION

Experienced teachers subconsciously make use of situated knowledge, which is knowledge that is readily available, holistic, contextual and linked to specific situations, in order to solve incidents in everyday teaching. This situated knowledge is generated by a direct interaction between previous experiences and the current context in daily teaching practice (Borko, 2004; Putnam & Borko, 2000). Situated knowledge differs from cognitive knowledge by taking a wider view of the teaching process. When undergoing teacher training, it is not just important to acquire knowledge, but also to learn to function in a complex environment involving other people and materials. The value of situated knowledge has been understood for several decades (Brown, Collins, & Duguid, 1989; Greeno, 1997; Opfer & Pedder, 2011; Putnam & Borko, 2000). Pre-service secondary school teachers, who have limited practical experience, need to develop situated knowledge in order to be able to teach in varying contexts. In order to help pre-service teachers learn to develop situated knowledge, teacher educators set learning objectives for their courses that explicitly address the situated nature of this knowledge.

Situated knowledge can be acquired by setting higher learning objectives, working towards these objectives in lessons, and testing them in the summative assessment. The most commonly used taxonomy, internationally, for the levels of learning objectives in teacher training programmes is Bloom's taxonomy (Athanassiou, McNett, & Harvey, 2003; Furst, 1981; Krathwohl, 2002). This taxonomy consists of a hierarchy of six cognitive levels at which learning objectives can be mastered: Remember, Understand, Apply, Analyse, Evaluate, and Create. The first three levels are known as the lower learning objectives, and the final three as higher learning objectives. The various levels can be linked to various kinds of knowledge that have to be mastered during a course. The lower levels apply to factual knowledge and knowledge of procedures (Momsen, Long, Wyse, & Ebert-May, 2010). Higher learning objectives are, for instance, applied to the ability to analyse and evaluate complex teaching situations. These higher learning objectives aim to have pre-service teachers think critically about the practice of teaching in connection with theoretical concepts and strategies, which helps them prepare for their own future teaching practice. Higher learning objectives can be attained by using cases that foster the development of situated knowledge, which includes both holistic and contextual knowledge. By studying written or filmed cases, pre-service teachers can link theoretical knowledge to unfamiliar, complex situations. The drawback of written cases is that the holistic character of real situations is mostly lost in the description (Geerts, Van der Werff, Hummel, & Van Geert, 2015). Video cases present information in a holistic and contextual manner, which corresponds to the way in which teachers are confronted with pedagogical and didactical problems in daily practice (Blijleven, 2005) and can contribute to the acquisition of situated knowledge. The consequence is that pre-service teachers have to be able to distinguish between important and unimportant aspects in order to make sense of the case. It has been shown that this is not possible with written cases, because such cases are often already structured by the author (Blijleven, 2005). By watching video cases and applying their own theoretical knowledge, pre-service teachers are able to analyse specific real-life teaching situations and discover how experienced teachers deal with these circumstances (Blijleven, 2005; Kurz, Llama, & Savenye, 2004). By analysing real-life situations through video, students step out of their role as a teacher and are able to observe a teaching situation objectively and 'from a distance' (Rosaen, Lundeborg, Cooper, Fritzen, & Terpstra, 2008; Van Es & Sherin, 2002). Video analysis contributes to the students' belief that they can acquire the skills, knowledge and attitudes necessary to function effectively as a teacher (Shulman, 1992). This means that the use of video cases is an excellent way of helping pre-service teachers develop situated knowledge, although practical experience in the classroom remains important as well, of course.

If a teacher-training course aims to help pre-service teachers achieve higher learning objectives in a situated context, these learning objectives should also be reflected in the corresponding assessment.

Setting the same learning objectives for the test is the only way to determine whether the students have achieved the objectives. The learning objectives of a course should therefore guide the construction of a test. A summative test with content validity should reflect the contents of the course. If the course is built on higher learning objectives, then these must be addressed in the summative test (Hamp-Lyons, 1997; Spratt, 2005). If the objectives of the test do not correspond with the objectives of the course, there is a risk that students will not achieve the course objectives, because they may focus solely on the objectives of the test instead (Hamp-Lyons, 1997). A representative summative test should adhere to several rules in order to assess situated knowledge and be valid.

When it comes to assessing situated knowledge, authentic assessment would be a suitable way. Such an authentic assessment would require pre-service teachers to solve a realistic, life-like problem (Brush & Saye, 2014; Gulikers, Kester, Kirschner, & Bastiaens, 2008). For efficiency reasons, an authentic assessment is often simulated by means of a test with an authentic (video) case. This is because tests with (video) cases are readily available, which allows teacher educators to plan and implement tests efficiently. When confronted with tests with authentic cases that contain realistic situations, pre-service teachers are able to apply what they have learned during the course in a practical way (Brush & Saye, 2014; Wiggins, 1998).

A case is authentic when (Darling-Hammond & Snyder, 2000; Gulikers et al., 2008; Ploegman & De Bie, 2008; Wiggins, 1998):

- It is a realistic problem;
- It requires pre-service teachers to evaluate the situation and come up with a solution of their own (innovation);
- It requires pre-service teachers to actively deal with a given situation;
- It has a realistic context that professionals would deal with on a regular basis;
- It tests how efficiently and effectively pre-service teachers can complete a complex task by making use of a large repertoire of knowledge and skills;
- It gives pre-service teachers the possibility to repeat and to practice, enabling them to use resources and to receive feedback to improve their performance and achieve better learning outcomes.

The first requirement for testing situated knowledge is for the case to be as authentic as possible. An authentic case does not necessarily need to be long; a short case can also be authentic. Short cases have the added advantage of having a greater reliability and validity than longer cases (Van Berkel & Bax, 2006). In order to solve a case, pre-service teachers will need to make use of their situated knowledge, which consists, among other things, of a wide array of context-specific knowledge and the ability to solve incidents in everyday teaching practise. In an hour of testing time, several short cases can be used, which increases the validity of the test. Additionally, cases illustrate that experts can differ greatly in the way they deal with complex situations, even though the outcomes are the same. This is also known as idiosyncrasy: Experts develop individual ways of dealing with problems (Adams & Wieman, 2011; Regehr & Norman, 1996), based on their own specific situated knowledge. Furthermore, experts are often more efficient than non-experts, which allows them to skip steps in the problem solving (Regehr & Norman, 1996). In order to account for this wide variety in effective problem solving processes of experts, students should be exposed to a representative variety of cases, which is the second requirement for a case test. That way, it is possible to test whether pre-service teachers can flexibly make use of their problem-solving skills.

When considering tests, a written test is often the first thing that comes to mind. The written test is also the most common test in Dutch teacher-training education. However, oral tests are far more realistic and authentic when it comes to testing situated knowledge. Moreover, an oral answer offers a

more complete and accurate picture of the pre-service teacher (Huxham, Campbell, & Westwood, 2012). To assess situated knowledge, it is therefore advisable to include oral questions in the test, the third requirement for case tests.

Solving a case problem requires situated knowledge. An example of a problem could be a classroom situation in which there is a certain amount of chaos. In order to test the situated knowledge, the test questions need to focus on key feature decisions (Farmer & Page, 2005; Opfer & Pedder, 2011; Van Berkel & Bax, 2006). Using key features, the essential decisions that need to be made to solve the problem, is the fourth requirement for a case test. In this example dealing with a chaotic classroom situation, the student needs to answer the following questions:

1. Is the chaos caused by the pupils or the teacher?
2. Is the chaos caused by classroom management or the layout of the lesson?
3. Is the chaos caused by the strategy chosen by the teacher or by the way the teacher implements this strategy?
4. Should the teacher interfere straight away or wait?

In order to formulate suitable test questions for testing key features and situated knowledge, verbs should be used that reflect the higher learning objectives. This is the fifth requirement for a case test. The verbs that are used in a test question indicate whether a question focuses on analysis, evaluation or creation (Van Berkel & Bax, 2006). Testing analysis can be done using verbs such as ‘distinguish’, ‘relate’ and ‘clarify’. For evaluation, verbs such as ‘interpret’, ‘justify’ or ‘appreciate’ can be used. Finally, for creation, questions can include verbs such as ‘revise’ or ‘design’. These verbs should be used in test questions that reflect the situated character of higher learning objectives. Wiggins (1998) states that higher learning objective test questions should be formulated in such a way that they:

- Can assess whether students have understood the full situation;
- Can assess whether students have understood the actual goals of the skills, actions and knowledge, instead of simply implementing an action plan;
- Require students to change perspectives;
- Can assess the completeness and accuracy of the knowledge independently from understanding;
- Test the student’s self-knowledge.

Although the majority of the test questions should be based on higher learning objectives, it is important not to focus all of the questions on them, because lower learning objectives (such as factual knowledge) require independent testing (Wiggins, 1998).

The sixth and final requirement for a good test is the presence of so-called ‘overarching questions’. Overarching questions are central to the course and offer students insight into the practical application of the course for their future teaching practice (Wiggins, 1998). These broad questions enable students to use different elements of their knowledge to fully understand the subject matter and to enlarge their situated knowledge. Examples of overarching questions are “How can you define good teaching?” or “Are there any recent developments in education?”.

The introduction indicates the importance of assessing higher learning objectives that aim at situated knowledge. This testing is best done with (video) cases. For the construction of these tests with cases and for the formulation of suitable test questions, the following six requirements were derived from literature:

1. The case needs to contain an authentic problem.
2. The test contains multiple short cases to increase the validity.
3. The test contains only oral questions or a combination of oral and written questions to increase the reliability of the test.
4. The test questions are constructed by means of key features.

5. The majority of the test questions focus on higher learning objectives.
6. Overarching questions are included in case tests.

Aim of this study

The preceding section shows that developing situated knowledge is an important requirement when properly training teachers, meaning that if the acquisition of situated knowledge is aimed for in teacher training curricula, this should be reflected in the course content. The course content should be reflected in the test. The test format is derived from teacher-educator practice. Pre-service teachers' learning processes are determined by the content and format of the test, if they are aware of this during the course. This is why a relatively easy way of determining whether the acquisition of situated knowledge is indeed facilitated by the course content, is to examine the test format. Thus, the main question in this study is: Do teacher trainers use case tests that are aimed at acquiring situated knowledge?

In order to answer the main question, we investigate whether the case tests at accredited teacher-training courses meet the six requirements for testing situated knowledge. The fifth requirement plays a particularly important role, as a case test can only be aimed at testing situated knowledge if the corresponding test questions test higher learning objectives. This is because higher learning goals are relevant for every test subject. Therefore, the first step in our research is to test whether test questions are testing higher learning objectives. The first hypothesis is that the majority of the test questions do focus on higher learning objectives that define situated knowledge. If requirement five is not met (and thus the first hypothesis is wrong), the case test cannot be considered to be testing situated knowledge. The remaining five requirements are meaningless if there are no questions that test higher learning goals. Finding that hypothesis one is correct is, however, not enough to establish whether the test in question is aimed at testing situated knowledge. That can only be established if most of the five remaining requirements are met. Hypothesis two is, therefore, that tests are generally constructed in accordance to the six requirements for tests with cases.

METHOD

Sample survey and response

For this study, all 11 accredited secondary-teacher-education institutes in the Netherlands were asked to send in a copy of a test. These institutes have been accredited by the independent Dutch and Flemish accreditation organisation (NVAO), which has established that these courses meet the quality requirements. Of these institutes, ten submitted a test that met the selection criteria as described in the 'Procedure' paragraph below, and these were included in this study. The tests are aimed at higher learning objectives that pre-service teachers need to achieve. The tests were used in the academic years 2011-2012 or 2012-2013 and were all in Dutch. All tests were used to complete a course in vocational training. Just one institute submitted a test that included a video case. All others used written cases. The test with the video case consisted of one video case and five written cases. The cases vary considerably, both in length and subject. Here is an example of a written case and the corresponding test questions.

It is late October, and Johnny from class 1C is a difficult pupil, according to several teachers. The team leader is getting complaints about him from colleagues, and Johnny has been sent out of the class on several occasions, which is more than usual for a first-year pupil.

The team leader decides, after consulting the mentor, to set up a protocol. Johnny is given a separate desk, and is first given a warning if he shows disruptive behaviour. If that doesn't help, he is moved to the front of the class and put to work copying lines. If he is still difficult, he has to leave the class and report to the office. If he behaves well, he is complemented, and it is noted in the class ledger.

The team leader and mentor have created the protocol together, and sent it to the teachers of 1C. The email began with 'Due to Johnny's behaviour, we have come to the following agreements', followed by the description given above. Unfortunately, these measures have not worked.

- A. At what point in the process concerning Johnny do you think it went wrong? Give three explanations for the failure of the team leader and mentor's measures (3 points).
- B. As Johnny's mentor, how would you tackle the problem? Explain your choice (2 points). (From 'Test 7' in this study)

Materials

To assess the way in which the tests measure higher learning objectives, a custom-made assessment form was developed, based on the above-mentioned six requirements for tests with cases. One aspect, namely that an authentic case must "[give] pre-service teachers the possibility of repeating and practicing, using resources and gaining feedback to enhance their performance and get better learning outcomes" (Wiggins, 1998), was not included on the form. This was because it mostly applies to the procedure of completing a course and does not really apply to test construction. The assessment form was originally written in Dutch. As can be concluded from the literature studied in the introduction, the previously described six requirements vary in nature. A sole question can sometimes suffice to determine whether the requirements are met by the test. For other requirements, multiple questions need to be asked to assess whether all aspects of the requirements are met. A requirement was met when the requirement or the majority of the aspects of this requirement were found in the test with cases. This is described in more detail in Table 1.

Table 1
Overview of the requirements in the assessment form

Requirement	Number of aspects on the assessment form	Requirement is met if:
The case must contain an authentic problem;	5	≥ 3 aspects
The test contains several short cases in order to increase validity;	1	≥ 3 cases
The test consists of just oral questions, or both oral and written questions, in order to increase its reliability;	2	≥ 1 oral question and ≥ 1 written question
The test questions have been formulated using key;	1	≥ 3 key terms for at least half the number of cases
The majority of the questions focus test higher learning objectives;	6	A positive score on ≥ 5 of the 6 aspects
The test with cases includes overarching questions.	1	≥ 1 overarching question

Procedure

Senior learning plan experts working at Dutch universities of applied sciences selected a test used at

their institutions to examine whether a test meets the requirements for a test with cases. The following instructions for selecting the test were given to the learning plan experts: 1) Select a summative test on vocational training that includes a video case. Are there two or more summative tests with a video case? Then select the summative test that contains most questions on the case. 2) Are there no summative tests on vocational training that include a video case? In that case, select a summative test with a written case according to the instructions under 1). 3) Are there no summative tests on vocational training that include a video case or a written case? In that case, do not submit a test.

The tests with cases obtained were assessed by experienced teacher educators, using the newly developed assessment form. Two teacher educators were selected from each of the three departments of the teacher trainer education at the NHL University of Applied Sciences (Social Sciences, Science and Languages). These six teacher educators were informed that they would be testing the tests using an assessment form. The form only allowed for them to answer in numbers, with yes or no answers or by ticking off the correct answers. The tests were randomly assigned to the teacher educators. The teacher educators were given forty minutes for the evaluation of each test, and a random sample measurement previously showed that this was a sufficient amount of time. The two teacher educators from the different departments all evaluated five tests individually. This made it possible for all tests to be evaluated three times, each by a teacher educator from a different department. This was done to prevent the teacher educators' backgrounds from influencing their evaluation of the tests and to increase the reliability of the data. An inter-rater reliability analysis was carried out to determine the consistency between the assessors by calculating Fleiss's Kappa (Fleiss, 1971). Because there were two groups of three assessors, the Kappa was calculated separately for the two groups. The inter-rater reliability analysis was carried out on the items that made use of answer categories (25 in each group). The first group consisted of three assessors who assessed the first five tests. The percentage of agreement was 51,6%. There was fair agreement between the three assessors, Fleiss's $\kappa = .395$ (95% CI, .352 to .438), $p < .005$. This fair agreement means that the assumption can be made that these three assessors made a sufficiently equal assessment. The second group consisted of three assessors who assessed the remaining five tests. The percentage of agreement between these three assessors was 48,1%. The agreement between these assessors was also fair, Fleiss's $\kappa = .352$ (95% CI, .310 to .395), $p < .005$. These results indicate that the assessment form is suitable for a uniform assessment. The results of the teacher trainers' assessments of the tests are the input for accepting or rejecting the hypotheses mentioned earlier.

In order to ascertain whether teacher educators set higher learning objectives for their tests (hypothesis 1), requirement 5 on higher learning objectives for constructing tests with cases was used. The test met requirement 5 if it complied with two conditions: a) The test questions include at least five of the six aspects of higher learning objectives, and b) the majority of the test consists of test questions on higher learning objectives, which means that it is possible to get 51% of the points by answering these questions correctly. This last condition was established by adding together the number of available points for questions testing higher learning objectives. The first condition was assessed by the teacher educators, and the second condition by the researchers. The first hypothesis is accepted if a majority of the tests examined does comply with the two aforementioned conditions.

The second hypothesis in this research is that the tests were constructed in accordance with the six requirements for tests with cases. A test with cases is evaluated as being "sufficient" if it meets four out of the six requirements for tests with cases. Moreover, it was determined that the following two requirements should at least be met: The problem in the case should be authentic (requirement 1) and the test questions are aimed at the higher learning objectives (requirement 5). Requirement 5 was tested in hypothesis 1. This implies that the second hypothesis can only be true if the first is proven. These two requirements were chosen because they are an adequate representation of testing situated

knowledge using a test with cases. The second hypothesis is accepted if a majority of the examined tests is considered 'sufficient'.

After analysing the completed assessment form, brief discussions were held with the assessors. During these discussions, the researchers asked the assessors about their experiences with the form, possible gained insights and possible resolutions for developing their own tests with cases for their own courses. These analyses and discussions were the basis for developing teacher educator requirements for constructing tests with cases.

RESULTS

Hypothesis 1: The Majority of the Test Questions Does Focus on Higher Learning Objectives That Define Situated Knowledge

The first condition of the fifth requirement for constructing tests with cases consists of six aspects that together determine whether or not the tests of secondary school teacher training courses contain questions on higher learning objectives. This condition is considered to have been met when at least five of these aspects are found in the test. It can be concluded from the assessment of the tests that four out of ten tests comply with the first condition of the fifth requirement (see Table 2).

Table 2

First conditional requirement 5: Test questions that test higher learning objectives; number of achieved aspects per test.

Aspects of first condition 5: Questions on...	Test									
	1	2	3	4	5	6	7	8	9	10
Overview of complete situation	1	1	1	1	1	1	1	1	1	1
Perspective changes	1	0	1	0	1	0	0	0	0	0
Awareness of the relevance of the subject material	1	0	1	1	1	1	1	1	1	1
Knowledge independent from comprehension	1	1	1	1	1	1	1	0	1	1
Self-knowledge	0	0	0	1	1	0	0	1	0	0
Analyse, evaluate, create	1	1	1	1	1	1	1	1	1	1
Total number of aspects found	5	3	5	5	6	4	4	4	4	4
Assessment: "sufficient" if ≥ 5 aspects found	1	0	1	1	1	0	0	0	0	0

Table 2 shows that two aspects were found in all tests, namely questions that ask for an overview of the whole situation and questions focussed on analysis, evaluation, and creation. Questions about changing perspectives and self-knowledge were found in only three tests out of ten.

Points could be scored for test questions aimed at higher learning objectives and these scores were added up to assess the second condition of requirement 5 (a focus on higher learning objectives). An overview of the total number of points and corresponding percentages can be found in Table 3.

Table 3

Second conditional requirement 5: Percentage of questions on higher learning objectives

Points in the test	Test									
	1	2	3	4	5	6	7	8	9	10

Total points	20	50	80	50	60	25	35	100	76	38
Number of points for higher learning objectives	8,85	35	28	25	60	23	27	79	54	18
Percentage of points for higher learning objectives	44	70	35	50	100	92	77	79	71	47

It is striking that tests in Table 3 scored either quite high (70% or higher) or quite low (50% or less). The tests that met five or more criteria for test questions centred on higher learning objectives, as shown in Table 3, are tests 1, 3, 4, and 5. Three of these tests scored lower than 50% on the number of points available for questions related to higher learning objectives, and thus did not meet the requirements for hypothesis 1. Out of these four tests, only test 5 scored over 50%. This means that test 5 alone meets both conditions of requirement 5 and thus hypothesis 1 (The test questions are aimed at achieving higher learning objectives and these questions yield most of the points that can be obtained).

Hypothesis 2: Tests Are Constructed in Accordance With the Six Requirements for Tests With Cases

As test 5 is the only test that met the requirements of hypothesis 1, it is the only test that was assessed for hypothesis 2. Table 4 provides an overview of the requirements for hypothesis 2 that the test met:

Table 4
Overview of the requirements met by test 5

Requirement	Test 5
Authentic problem	1
Several short cases	0
Oral and written questions	0
Three or more key terms	1
Questions testing higher learning objectives	1
Overarching questions	1
Total number of requirements met	4

When a case test meets at least four requirements, among which requirement 1 and 5, the test is considered sufficient. Table 4 shows that test 5 does not meet two of the requirements for a case test. The test only includes one case, instead of various short cases, as stated in requirement 2. The test also does not meet requirement 3. The test exclusively consists of written questions. Test 5 does meet the remaining four requirements, including requirements 1 and 5. It can therefore be concluded that test 5 meets the postulated requirements concerning constructing tests with cases and thus matches hypothesis 2.

Support for the Use of Tests With Cases

In this study, the tests were assessed by six experienced teacher educators. The process led to discussions about testing using cases. From discussions with these experienced teacher educators, it was concluded that evaluating the tests with the assessment form yielded new insights about tests with cases. For instance, one teacher educator stated that the instrument helped him realise at which level of mastery the questions should be formulated. The use of the assessment form encouraged the teacher

educators to reconsider the construction of tests aimed at higher learning objectives. They had all stated that they were already currently doing so, but that the assessment form would help them keep the higher learning objectives in mind. Reformulating the assessment criteria as instructions has turned the assessment form into a practical instrument that can be used when constructing tests with cases aimed at higher learning objectives that help develop situated knowledge. That is why the assessment form has been transformed into a list of instructions that can easily be used by teacher educators for secondary education. This list of instructions is enclosed in Appendix 1.

CONCLUSION AND DISCUSSION

Ten out of eleven secondary teacher education programmes in the Netherlands are currently working with tests with cases. We can conclude from the fact that ten of the institutes sent us tests with cases that there is an intention to test situated knowledge. This intention was also expressed to the researchers when they requested the tests. The ten submitted tests with cases were evaluated by means of a newly developed assessment form with six requirements for such tests. The first hypothesis was that the majority of the test questions do focus on achieving higher learning objectives and therefore do adequately facilitate the development of students' situated knowledge. This hypothesis was not confirmed; only one test included five out of the six aspects for testing higher learning objectives, and this same single test allocated more than 50% of the points that could be scored on the test to questions leading to higher learning objectives. The second hypothesis, that tests are constructed in accordance with the requirements for tests with cases, cannot be confirmed either based on these results. As only one test confirmed hypothesis 1, only that test was used to test hypothesis 2. The test did confirm hypothesis 2. However, because only one test confirmed it, hypothesis 2 was also rejected. Because both hypotheses were rejected, the main conclusion should be that teacher educators scarcely set higher learning objectives for their tests with cases that explicitly address situated knowledge. Additionally, this means that tests with cases are not being used to their full capacity. This outcome is supported by previous research (Geerts et al., 2015) that has shown that higher learning objectives are currently not optimally being achieved through the use of tests with cases in teacher education.

If the requirements for the tests with (video) cases are followed correctly, this will contribute to pre-service teachers' acquisition of situated knowledge. A test is the conclusion of a course with learning objectives. If the test quality is improved, the course quality is also improved. The suggested improvement focuses on gaining situated knowledge. Gaining situated knowledge contributes to becoming a better teacher. Better teachers improve the education at secondary schools.

The results from this paper show that it is possible to improve the quality of tests. Moreover, the study has led to instructions for the construction of tests with cases aimed at testing situated knowledge. It is recommended that the adapted assessment form containing the list of instructions for the construction of tests with cases is made available for use by all secondary teacher training education institutes, in order to encourage attention for situated knowledge in tests. Further research could focus on how to raise consciousness about the importance of these requirements for tests with cases, so students can develop themselves optimally. Hopefully, this will lead to situated knowledge gaining a permanent place in the teacher training curriculum and tests.

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Appendix 1: Instructions for the Creation of a Test with Cases

The questions on this first page are only about questions that accompany cases .				
Instruction: Multiple cases in a test.				
Does your test contain at least three cases? Better three short cases than one long one.				
Instruction: The case should concern an authentic problem.				
Are the situation descriptions in the cases realistic? (In other words, is it a situation that a teacher in training is likely to face in practise?)				
If a test contains more than one case, answer the following questions for each case in turn . You can give the score for a second case in the second column, and any further cases in the remaining columns.				
	Case1	C. 2	C. 3	C. 4
Does the case contain realistic <i>tasks</i> that the student will encounter in this manner in practise? Answer 'yes' if: 1) the case is meant for all subjects in your teacher education, or 2) the case is meant for your own subject.				
Does the student have to think of their own solution, for each case, based on their assessment of the situation?				
Does each case have a question that asks how the student would act?				
Does each case have a question about a complex task in the case, and does the student need acquired knowledge and skills in order to answer it?				
Instruction: The questions about the case are made using key features.				
Do most of the cases have at least three corresponding questions about the most important decisions needed to solve the case? (Key features: The essential decisions that the student must make in order to solve the case)				
Instruction: The test questions test higher learning objectives.				
Does each case have at least one question that tests whether the student grasps the situation as a whole?				
Does each case have at least one question that requires the student to shift perspective?				

(see next page)

<u>The following questions concern all questions in the test.</u>	
Does your test contain at least two questions that lead the student to understand why they must master the subject matter? (In other words, they must apply theory in practise.)	
Does your test contain at least two questions that test whether the student's knowledge is complete and correct, independently from the student's level of understanding? (For example, first test knowledge and then comprehension, even if it is within the same question.)	
Does your test contain at least one question that tests the student's self-knowledge (the knowledge they have about themselves)?	
Does your test contain at least two questions that test comprehension? (It should contain verbs such as criticise, conclude, contrast, deduce, illustrate, interpret, distinguish, support, analyse, justify, relate, sketch, explain, validate, defend, compare, or judge.)	
Instruction: The test contains overarching questions.	
Does your test contain at least one overarching question? These questions have the following characteristics: They concern the core of being a teacher, don't have just one correct answer, test the higher learning objectives in Bloom's taxonomy, recur throughout the programme (with a constantly developing answer), are formulated in such a manner that they challenge and interest the student, and are connected to other essential questions.	
Instruction: The test contains oral and written questions.	
Does your test contain at least one oral question?	
Does your test contain at least one written question?	

ADVANTAGES AND CHALLENGES OF FORMATIVE PEER-ASSESSMENT IN INQUIRY-BASED EDUCATION AT PRIMARY SCHOOL LEVEL

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ABSTRACT

In this study, peer-assessment as a method of formative assessment is trialled in the context of inquiry-based education in Swiss primary classrooms. The questions that will be dealt with are (1) what advantages the Swiss primary school teachers see in peer-assessment in order to enhance the students' inquiry learning, and (2) the challenges the teachers encounter when trialling this assessment method. Data for qualitative analysis are collected from the perspective of the teachers.

The results suggest that teachers are able to integrate formative peer-assessment meaningfully in their inquiry teaching and that they see many advantages of it: they identify a number of mechanisms through which the students can benefit from peer-assessment, including two mechanisms that direct towards the concepts of self-regulated learning and motivation. The teachers also anticipated learning gains caused by the peer-assessment in a number of transversal competences.

Besides these advantages, the teachers named various challenges related to the use of peer-assessment in inquiry units that are linked to judging the peers' achievements and to communicating about them. The Swiss teachers did not mention any challenges related to processing the feedback and deciding on the actions to be taken, though. This might be due to the fact that Swiss primary school students are not used to processing peer-assessment for their next steps of learning. The results are relevant for the uptake of more formative assessment as expected in the guidelines of the new, nationwide curriculum in Switzerland.

INTRODUCTION

This article is on peer-assessment in the context of inquiry-based science education at primary school level in Switzerland. The article summarizes the results of an explorative study that investigated the perspective of the teachers. This is relevant because the new curriculum in Switzerland expects teachers to regularly use formative assessment methods in their teaching practice.

Formative assessment is not often used at primary school in Switzerland, even though several methods such as formative peer-assessment would be rather easy to integrate in inquiry-based science education. So in this study, 11 teachers did exactly this. Questionnaires with open questions where the teachers reported about the advantages and challenges experienced were analysed. The results provide first ideas about what kind of support the teachers need for the uptake of regular formative assessment in Switzerland.

The article starts with the theoretical part on the different concepts, followed by the explorative study.

THEORY

This section will introduce the concepts of inquiry-based science education (IBE), of formative assessment and particularly of peer-assessment as a method of formative assessment.

The concept of inquiry-based science education

Inquiry-based education (IBE) is a term that subsumes a wide range of teaching approaches that can enhance student motivation and the learning outcomes (Hattie, 2009; Dolin, 2012). Inquiry-based science education includes students' involvement in questioning, reasoning, searching for relevant documents, observing, conjecturing, data gathering and interpreting, investigative practical work and collaborative discussions, and working with problems from and applicable to real-life contexts (Anderson, 2002). Inquiry-based science education gives students an active part in learning. It is not a new teaching method; however, it is often used as a contrast to more traditional teaching approaches where the teacher presents results and methods and the students are trained to "apply" them.

Inquiry-based science education (IBSE) can promote achievement of two different types of objectives: (1) Objectives related to domain-specific competences in science, and (2) objectives related to transversal competences.

Domain specific competences in science that should be fostered by IBE include (Linn et al., 2004; NRC, 1996): to observe and describe natural and technical phenomena accurately; to ask questions and to generate hypotheses; to plan, perform, and evaluate experiments; to reflect on the plan, performance, and evaluation of the experiments; to label, systematise and arrange phenomena, materials, and living beings by characteristics and functions; to consider claims and conclusions critically in relation to available evidence; and to ask and answer questions related to science and its impact on society.

Transversal competences that should be fostered by IBE are (Dolin, 2012): To ask questions and to work on problems independently and with others; to plan stages of work and to perform projects; to argue and communicate with peers and experts; to reflect on her/his own learning, to control and steer it; and to develop a sense for responsibility and to become a responsible-minded citizen.

The line of separation between these two sets of competences is not sharp and even within each type of objective there might be considerable overlap.

The concept of formative assessment

One possible way of scaffolding and enhancing the students' learning in inquiry-based education is formative assessment: Formative assessment has the *purpose* of assisting learning and for that reason is also called 'assessment *for* learning'. It involves *processes* of "seeking and interpreting evidence for use by learners and their teachers to decide where the learners are in their learning and where they need to go and how best to get there" (ARG 2002, p.2).

Many formative assessment methods have been described for use in science learning (e.g. Keeley, 2008; Angelo & Cross, 1993). Some of them are best usable for diagnosing the students' conceptual understanding (e.g. the often mentioned traffic lights; Keeley, 2008). Others are expected to support the students in autonomous learning activities such as inquiry-based learning (Ruiz-Primo & Furtak, 2007; Black & Harrison, 2004). One of the latter, which is frequently mentioned in the literature, is peer-assessment (e.g. OECD, 2005; Harlen, 2013). It will be described in more detail in the next paragraph.

Peer-assessment as a formative assessment method

Peer-assessment follows the idea of "activating students as instructional resources for one another" (Leahy et al., 2005, p.21): Students take both the role of the assessor and the assessee, by assessing each other's work. The aim of peer-assessment is to assist peers in identifying the strengths and weakness of their work and in addition to provide suggestions for improving their learning process (Topping, 2003). A number of advantages and challenges that are associated with peer-assessment have been identified in the literature.

Advantages of peer-assessment

- Feedback from peers who had the same difficulties in the learning progress might suggest direct ways to overcome those difficulties, and formulate them in a language that is naturally used by the students (Black et al., 2004).
- Students who assess their peers' work engage in cognitively demanding activities, such as critical thinking (Hanrahan & Isaacs, 2001; Lin et al., 2001; Lindsay & Clarke, 2001; Topping, 2003; Harlen, 2007; Tsivitanidou et al., 2011).
- Students get the opportunity to see examples of other students' work. This can potentially lead to self-assessment: By comparing their own work and that of their peers, hence reflecting on their own learning achievements. (Topping, 1998; Hanrahan & Isaacs, 2001; Lin et al., 2001)

Challenges of peer-feedback

- When doing peer-assessment, students need the skill of judging the performance of a peer. This may be a challenge (Topping et al., 2000).
- Students need to communicate their judgments to their peers and provide constructive feedback about their learning process. This needs communication skills (Black et al., 2003).
- The assessees need to critically review the feedback received and decide on the actions to be taken: Since peer-feedback might include flaws, the assessees need to filter it and then decide

whether there is a need to adopt peers' suggestions and recommendations. They also have to decide whether there is a need to revise their work (Sluijsmans, 2002).

Context and research questions

In Swiss schools, formative assessment practices are not much established (Rönnebeck et al., 2013). There are a few new schoolbooks in mathematics as well as in French as a foreign language at primary school level, which provide ideas for teachers on how to embed formative assessment in their lessons (Rönnebeck et al., 2013). Swiss teachers are generally familiar with the concept of formative assessment but due to the lack of time in the lessons and also in the preparation time before classes, the uptake of more formative assessment is hindered (Smit, 2009). Teachers in Switzerland have a high autonomy in their teaching, so the formative assessment practices vary between individual teachers and between school levels in their frequency and quality. Apart from the literature mentioned, there is little research on formative assessment practices in science education in Switzerland. This is striking because the role of formative assessment has become more important with the implementation of the new curriculum (D-EDK, 2014) which will be valid for all German-speaking parts of Switzerland (grades 1-9). Contrary to earlier curricula, formative assessment is prominently mentioned as part of the everyday teaching- and learning activities there.

Under these circumstances, it appears interesting to explore the teachers' opinion on whether and how formative assessment can be used in inquiry-based science learning. In this article, the usability and challenges related to formative peer-assessment is explored. The questions dealt with are:

1. What are the advantages of peer-assessment in the context of inquiry-based education, as evaluated by Swiss primary school teachers?
2. What are the drawbacks of peer-assessment in the context of inquiry-based education, as evaluated by Swiss primary school teachers?

The study is embedded in an EU-funded project: ASSIST-ME (assess inquiry in science, technology and mathematics education). This is a collaborative project with ten partner institutes, led by University of Copenhagen representatives. The project's duration is January 2013 to December 2016. In ASSIST-ME, formative assessment methods are investigated in order to support and improve inquiry-based approaches in European science, technology and mathematics education (Dolin, 2012).

METHODS

In the study, 9 science teachers from primary school (integrated science) and 9 science teachers from upper secondary school (biology, chemistry, physics) collaborate for two semesters (August 2014 – August 2015).

The teachers are provided with theoretical descriptions of several formative assessment methods and with examples of inquiry-based units with integrated formative assessment. The examples have been previously developed in the project. As part of their work, the teachers are asked to pick one of the assessment methods in each semester and try it out in an inquiry-based unit. This resulted in 36 cases of implementation (18 teachers*2 semesters). In this article, the results from 11 cases from primary school where peer-assessment was implemented are analysed and discussed. One example of implementation will be discussed in detail in the next chapter.

All the 11 teachers are asked to fill out a questionnaire with open questions on their preparation for the trial with their teaching plans and –materials such as worksheets. Next, the teachers implement the

assessment method in their science inquiry teaching. The teachers are then asked to report on their trials in a questionnaire with open questions on the evaluation. The data are coded using open coding and analysed with qualitative content analysis (Mayring, 1994).

EXAMPLE FROM IMPLEMENTATION

In this section, an example from implementation will be introduced. This will help to show that the trials looked like and to exemplify the results with a concrete case.

Two primary school teachers from the project worked at different grades (3rd grade and 5th grade) at the same school. They collaborated in the planning phase of the project and agreed on implementing peer-assessment in a unit on buoyancy.

So the inquiry part of the unit included investigating different objects (such as pens, paperclips, coins, wood, rock, magnets) in terms of their floating abilities. The instructions on the worksheet were as displayed in figure 1 below.

- 1) Chose an object and describe it.
Example: coin. Small, flat, round, shiny, heavy, silver, smooth
- 2) Formulate a hypothesis on the floating abilities of the object chosen and to justify it
Example: The coin will float because it is shiny.
- 3) Test the hypothesis by placing the object in a box with water. Describe your observations
Example: the coin immediately sank to the ground of the box and remained there.
- 4) If the hypothesis was falsified, find reasons and test a new hypothesis
Example: the coin sank immediately although it was shiny. We think it is because the coin is flat. Our new hypothesis to test is that everything that is flat will sink.
- 5) If the hypothesis was confirmed, repeat the experiment with an object with the same characteristics
Example: It worked. We now test other shiny objects such as a CD, a paperclip, a spoon.

Figure 1: Instructions on the worksheet.

For the peer-assessment at both 3rd and 5th grades, the students observed each other investigating one object and provided feedback based on what they had seen. The students from both grades got a number of questions that scaffolded their peer-assessment. The 3rd graders were asked to answer these questions with different types of smileys, whereas the 5th graders wrote short sentences. Since the students investigated many different objects, they would be able to use the feedback from the peers right in this unit; for the investigation of subsequent objects.

Below, in Figure 2, are excerpts from the questionnaire on the evaluation where the two teachers told about their impressions of the assessment method. Answers like this one were coded in order to answer the two research questions mentioned in the introduction.

Question in the evaluation questionnaire: Was the peer-assessment worthwhile?

Teacher 1 (teaching 5th grade students): Yes, definitely. The students improved on observing each other, on reasoning and on providing feedback to others. It was also valuable for me because I could hand that responsibility over to the students. That gave me some room for other stuff.

Teacher 2 (teaching 3rd grade students): Partly. The reasons for the smileys [assessment was not provided with words but with smileys because the students are young and writing is hard for them] were missing. That was quick but not very sturdy. But I was released from the duty of assessing. The students learned to assess based on criteria rather than on sympathy. And the students really enjoyed doing this, despite saying it was a hard task!

Figure 2: Excerpts from the questionnaire on the evaluation of the inquiry unit with peer-assessment.

RESULTS

The section is divided into two parts that summarize the results linked to the two research questions.

Advantages of peer-assessment in the context of inquiry-based student learning at Swiss primary school level, as evaluated by the teachers

Table 1 below displays the three categories that were summarized as “advantages of assessment method in the context inquiry-based student learning”. Three other categories, which related to organisational issues and not inquiry-based student learning directly are not displayed. The three categories are:

1. Mechanisms by which peer-assessment facilitates inquiry learning («how the students learn»)
2. The students’ learning gains through formative assessment («what the students learn»)
3. Role of the teacher.
4. The data were taken from the questionnaires on the evaluation of the trials.

Table 1

Primary school teachers’ statements on the advantages of peer-assessment

	Primary school teachers’ statements (n=11)
Facilitation of learning («how the students learn»)	Feedback can be used immediately and can therefore help to solve tasks (it is not „feedback for next time“) Planning of the next steps in learning facilitated by language that is naturally used by students Praise during student-centred activities motivates to proceed Getting an insight into peers’ work broadens the horizon
Learning gains from peer-assessment («what the students learn»)	Collaboration in groups Communication abilities Ability to reflect upon own actions
Role of the teacher	Responsibility for assessing is with the students; this gives the teacher room for other duties

In the first category, the teachers' opinions on the mechanisms that help students learn through peer-assessment, it was mentioned that the feedback comes on a task-based level and can be used in the same task, not at some later occasion. The teachers also mentioned that peer-assessment is provided in a language that is naturally used by students and therefore is easy to process for them. The teachers reported that they felt that the peers' feedback was motivating the students to proceed in independent tasks. Finally, the teachers mentioned the benefits of the broadened horizon.

In the second category, the learning gains from peer-assessment as evaluated by the teachers are summarized: they include collaboration, communication and reflection skills. The illustrative quote from figure 2 falls into that category:

"The students improved [...] on reasoning and on providing feedback to others."

In the third category, advantages of peer-assessment that are linked to the role of the teacher were mentioned. The illustrative quote from figure 2 falls into that category:

"It was also valuable for me because I could hand that responsibility over to the students. That gave me some room for other stuff."

Challenges of peer-assessment in the context of inquiry-based learning at primary school level, as evaluated by Swiss teachers

Table 2 below displays the two categories that were summarized as "challenges of peer-assessment in the context of inquiry-based learning". Three other categories which related to organisational issues and not inquiry-based student learning directly are not displayed. The two categories are

1. Challenges associated with providing feedback to peers
2. Challenges associated with the role of the teacher

Table 2

Primary school teachers' statements on the challenges of peer-assessment.

	Primary school teachers' statements (n=11)
Providing feedback	<p>Students may have problems with rules of communication; with the vocabulary and the tone of their feedback</p> <p>Students' feedback may be little concrete; it may be hard to draw conclusions on the future learning from them</p> <p>Students are not always objective but confuse sympathy and assessment criteria</p> <p>Not all students are equally critical, not all students take the task serious</p> <p>Writing feedback is time-consuming</p>
Role of the teacher	<p>Teacher cannot control everything, does not know all the details of what is going on in the classroom</p>

In the first category, challenges associated with providing feedback are collected. These include that students are not familiar with the rules of communication and that their feedback is rather general and not concrete so that it is difficult to draw conclusions from it. Furthermore, the teachers also mentioned that the students sometimes have difficulties in being objective and that not all students are equally critical. Finally, it was mentioned that writing down feedback for peers is time-consuming at primary school level. In the example from implementation in the first part of this section, the teacher of the 3rd graders therefore decided to let the students draw smileys instead of writing sentences.

In the second category, the teachers mentioned a challenge that is associated with the role of the teacher: when the students provide feedback to each other simultaneously as in the example with buoyancy in the first section of this chapter, the teacher cannot control everything that is said or done.

INTERPRETATION

In this chapter, the results of the study will be interpreted and linked to the review of literature from the beginning of the paper. The chapter is divided into three parts, with the discussion of the two research questions followed by suggestions for means of support in order to enhance the implementation of formative peer-assessment in the context of inquiry-based education at primary school level.

Research question 1: Advantages of peer-assessment in the context of inquiry-based learning

The Swiss primary school teachers in the study agreed that peer-assessment can be meaningfully integrated in their inquiry units.

The teachers offered a number of explications through what mechanisms they think their primary school students learn when doing peer-assessment. Two of them have been found in the literature earlier: the idea that peer-assessment is easily understandable because it is easy in terms of language (Black et al., 2004) but also the opportunity to see examples of other students' work which broadens the horizon (Topping, 1998; Hanrahan & Isaacs, 2001; Lin et al., 2001). Two other mechanisms through which the students are expected to learn have not been mentioned in the literature reviewed: firstly, that task-based feedback can be used immediately and is not "for next time". This has been found an advantage in the context of self-regulated learning (Järvelä, 2015), but not in the context of formative assessment. The second mechanism that had not been mentioned in the literature reviewed is that peer-assessment, particularly praise, can motivate students to proceed during student-centered activities. The effects of formative assessment on learning gains have been described in the literature, but not its effects on motivation.

As introduced earlier in this paper, inquiry-based education can foster both domain-specific and transversal competences (Linn et al., 2004; NRC, 1996; Dolin, 2012). Through peer-assessment, the teachers in the study expected the students to improve in the transversal competences (collaboration, communication, reflection) only. Learning gains in domain-specific competences were not mentioned. A possible interpretation is that the teachers only considered the actual event of providing and accepting peer-assessment but not its use for the next steps in learning: in Swiss primary classrooms, the students are not used to frequently doing peer-assessment (Rönnebeck et al., 2013) and they might therefore be so busy concentrating on the techniques of judging and providing feedback that they have little capacities left for using the feedback in order to develop domain-specific competences. Further evidence for this interpretation can be found in the next paragraph on research question 2.

Advantages associated with the role of the teacher, the third category in table 1 in the results section in this paper, have not been discussed in the literature reviewed (in the context of peer-assessment in inquiry-based education). However, in the literature on peer-assessment in general, the issue has been brought up several times (e.g. Black & Harrison, 2004).

Research question 2: Challenges of peer-assessment in inquiry-based learning

The challenges related to peer-assessment in the context of inquiry-based science education at Swiss primary school level as mentioned by the teachers all circle around the uncertainty that peer-assessment may not in all cases be valid. So, compared to the literature reviewed, both the difficulties with the skills needed to judge the performance of a peer (Topping et al., 2000) and also the skills needed to communicate that judgement (Black et al., 2003) were also mentioned by the Swiss teachers.

The teachers in Switzerland did not mention any challenge related to the processing of the feedback and deciding on the actions to be taken. This was expected from the literature (Sluijsmans, 2002). As already pointed out in the section on research question 1 above, a possible interpretation is that the students, who are not used to doing peer-assessment at primary school level, are so busy judging and communicating feedback that there is little capacity left to deal with the feedback received and to use it for further learning. A second interpretation is that students may be used to receiving and considering feedback from the teacher. So the innovative part of peer-assessment would be the students diagnosing and providing feedback whereas using the feedback would be normal and unproblematic from the perspective of the teachers.

Challenges associated with the role of the teacher, the third category in table 2 in the results section in this paper, have not been discussed in the literature reviewed. A possible interpretation is that formative assessment in general but also peer-assessment in particular has not been studied much from a teacher perspective.

What do these results signify for the uptake of more formative assessment activities as suggested in the Swiss curriculum? This question will be discussed in the next section.

Means of support to enhance the uptake of formative peer-assessment in the context of inquiry-based science education at primary school level

The primary school teachers identified a number of mechanisms through which they think the students learn in peer-assessment activities. The teachers also recognized learning gains in a number of transversal competences. Furthermore, the teachers saw some potential in the idea of handing the responsibility of assessment over to the students and having some more time for other activities themselves. These advantages could certainly be used when implementing formative peer-assessment.

For professional development programmes, the teachers' awareness of domain-specific competences should be raised. The teachers should also be sensitized for the difficulties in receiving and using peer-feedback. Additionally, the role of the teacher as a coach should be clarified so that the uncertainty associated to the loss of control would diminish.

In school books, the difficulties that are linked to providing peer-assessment could be addressed by criteria or assessment rubrics for students. It might also be helpful to have a focus on feedback rules in the students' books.

CONCLUSION

In this explorative study, the teacher perspective on formative peer-assessment in inquiry-based science education in Swiss primary school classrooms was investigated.

The study had a small number of participants. The sample is not representative for Swiss science teachers at primary school level. The study focuses on the perspective of Swiss primary school teachers. The perspective of students, of school management representatives, or other stakeholders has not been taken into consideration. The results have been triangulated with the researchers' observations during school visits and analysis of the teaching materials (such as worksheets, lesson plans), though.

Nevertheless, the results provide, on the one hand, first ideas about how to support the uptake of more formative assessment as expected in the guidelines of the new, nationwide curriculum. This will help to plan school books and teacher professional development programmes. On the other hand, the study brings up more research questions, particularly on the relation between formative assessment and self-regulated learning but also on the role of the teacher in peer-assessment activities.

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WEB-BASED PROFESSIONAL DEVELOPMENT TO IMPROVE TEXT DISCUSSIONS

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ABSTRACT

The goal of our project is to leverage web-based technologies to develop a scalable professional development program that increases the rigor and interactivity of classroom text discussions. Specifically, we are engaging in a series of iterative design cycles to develop an online workshop and remote coaching system. In the current mixed-methods study, we investigated the feasibility of the system, teachers' affective experience with the remote coach, and potential effects on teachers' practice. Key findings from the first design cycle include that teachers felt supported by the online workshop facilitator and coach and believed that they significantly benefited from reflecting on their videotaped lessons with the online coach. Our results also provide evidence that teachers implemented coach feedback to improve their lesson design and the rigor of their classroom text discussions.

INTRODUCTION

Research on professional development that affects students' learning and achievement provides evidence in support of several essential features of effective professional development programs (Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). That is, such interventions need to be based in the curricula to be taught, they need to explicitly build teachers' pedagogical knowledge base, and they need to provide in-classroom guidance to teachers to apply new knowledge in their practice. Professional learning programs with an instructional coaching component satisfy these criteria. Yet, decades of research show that such professional development programs, especially coaching, are very difficult to implement well (Duessen, Coskie, Robinson, & Autio, 2007). First, many local education agencies (LEAs) lack the human capital and resources necessary to develop high-quality professional development institutes and to train and supervise coaches (Matsumura, Garnier, & Resnick, 2010; Matsumura, Sartoris, Bickel, & Garnier, 2009). Second, coaching resources are often not used effectively in schools (Blamey, Meyer, & Walpole, 2008; Duessen et al., 2007; Matsumura, Garnier, & Spybrook, 2012). Duessen and colleagues (2007) found, for example, that only about 28% of coaches' time in schools was spent working with teachers. Coaches often perform a range of administrative tasks in schools that detract from their core duties to support teachers' instruction (Duessen et al., 2007; Matsumura & Wang, 2014). Finally, many LEAs simply cannot afford to support full-time coaches in schools.

Web-based technologies are a promising solution to addressing the problem of scaling effective teacher learning opportunities (Allen, Hafen, Gregory, Mikami, & Pianta, 2015; Dash, Magidin de Kramer, O'Dwyer, Masters, & Russell, 2012; Downer, Pianta, Fan, Hamre, Mashburn, & Justice, 2011; Powell, Diamond, Burchinal, & Koehler, 2010). Online workshops and coaching provided by a university or professional organization/institute could provide under-resourced schools access to human capital resources, including expert coaches who are qualified to serve as mentors of instruction. Remote coaching also could help ensure that professional development resources are focused exclusively on supporting teachers, as opposed to administrative tasks that could be performed by individuals without specialized knowledge of instruction.

The purpose of our present study is to develop a web-based professional development program that could serve these purposes. Specifically, we aim to develop an efficient way to bring high-quality learning opportunities focused on improving reading comprehension instruction to teachers in under-resourced LEAs.

BACKGROUND TO THE PRESENT STUDY

The design of our online program grows out of our prior study of an 'in-person' professional development program, specifically, the Content-Focused Coaching (CFC) program in literacy developed at the Institute for Learning (IFL) (Staub, West & Bickel, 2003). In our previous study, IFL fellows provided intensive training to coaches over multiple years to learn how to plan for and enact rigorous and interactive classroom text discussions – a high-leverage practice for increasing students' reading comprehension skills (Murphy, Wilkinson, Soter, Hennessey & Alexander, 2009). Specifically, the coaching intervention focused on applying Questioning the Author (Beck & McKeown, 2006) and Accountable Talk (Michaels, O'Connor, & Resnick, 2008) techniques. Questioning the Author (QtA) draws on cognitive science research that characterizes text comprehension as an active and inferential process of building a mental representation of a situation described by a text (e.g., Kintsch & van Dijk, 1978). Accountable Talk draws on sociocultural theory (Vygotsky, 1986) and research in the learning sciences (Bransford, Brown, and Cocking, 1999). This

approach emphasizes the importance of participants building on the ideas of others, making logical connections between ideas, drawing reasonable conclusions, and making explicit the evidence behind claims.

In turn, the coaches worked with teachers in designated schools in grade-level teams to study and plan lessons, as well as individually with teachers in their classrooms to model lessons and provide guidance to implement Questioning the Author and Accountable Talk techniques. Results from the 'in-person' version of CFC showed positive effects on text discussion quality and students' reading skills, especially for students who were English Language Learners (Matsumura, Garnier, & Spybrook, 2012; 2013).

While our research showed positive effects of CFC compared to traditional 'in-person' coaching and professional development offerings based in the LEA, we found that the CFC coaches' work in schools was also often hampered by factors such as lack of principal support, pressure to perform a range of administrative tasks, and lack of time in the school day to meet with teachers (Matsumura et al., 2009; 2012). Grade-level team meetings, for example, often dealt with tasks and issues unrelated to CFC. Moreover, we provided a great deal of training and support to CFC coaches. It is likely that many LEAs would not have the resources necessary to train and support coaches to the level of expertise needed to significantly increase the quality of instruction.

The impetus for our current research, therefore, was to translate the key components of the CFC program to an online environment. In so doing, we hoped to circumvent some of the implementation problems inherent in the delivery of 'in person' professional development as well as provide a way for LEAs to access high-quality professional development content and expert coaches. Here, in these proceedings, we present early findings from the first year of our project. Specifically, we describe teachers' response to our online workshop and remote coaching (a single cycle), as in their views of the usefulness of the program for increasing the quality of their instruction, the relative burden of the activities, and the degree of comfort in interacting with peers online and with the remote coach. We also examine the potential influence of the workshop and coaching interactions on the quality of classroom text discussions.

INTERVENTION DESIGN

The design of our online professional development program is guided by a situated view of learning (Brown, Collins, & Duguid, 1989; Collins, Brown, & Holum, 1991; Collins, Greeno, & Resnick, 1994). From this perspective, learning and cognition are embedded in activity. Learners develop expertise through guided participation in practices that are authentic for a particular discipline or profession. Guidance for participation is provided in the form of modeling and supports such as tools, protocols, templates, and feedback from more knowledgeable practitioners (e.g., a coach). Through repeated opportunities to apply new concepts and/or practices to diverse and increasingly complex problem solving contexts, learners internalize these supports (or scaffolds) and develop deeper, flexible, and nuanced concepts and skills. Articulating and reflecting on what is learned further supports learners to recognize salient features of expert enactment, and ultimately, apply this information to self-monitor their practice.

Online Workshop

Drawing from a situated view of learning, the learning activities in our eight-week online workshop center on planning for and enacting text discussions – practices that are authentic to the daily work of teachers. Teachers begin by studying the theory underlying interactive and rigorous text discussions and viewing models of expert discussions and lesson plans. This is important for ensuring that teachers have a coherent vision of the instructional model taught in the workshop prior to developing individual skills. Teachers then apply conceptual tools (i.e., scaffolds) such as checklists for identifying critical ‘talk moves’ on the part of teachers and students in discussions, and templates for lesson planning that foreground targeted features of a practice. The lesson planning template, for example, guides teachers to apply Questioning the Author techniques such as identifying places in texts that might pose difficulties for students and planning questions in advance that support students to construct a shared and coherent understanding of a text. Teachers then articulate their understanding of how to plan for and enact discussions, and reflect with peers in online discussion boards about their learning.

Class sets of both fiction and non-fiction texts appropriate to the upper elementary grades are provided to teachers as a basis for lesson planning to encourage teachers to apply the workshop content to their classroom context. Teachers begin by planning lessons based on a fiction text, *A Long Walk to Water* by Linda Sue Park, a novel that centers on children’s experience of war and water scarcity. The workshop leads off with fiction because elementary grade teachers in the United States tend to be more comfortable teaching fiction than non-fiction texts. In other words, fiction provides a more familiar instructional context to teachers in which to apply new concepts learned in the workshops. Teachers then move on to planning lessons based on a non-fiction text, a less familiar context for teachers, that also deals with water scarcity (*Not a Drop to Drink* published by National Geographic). We chose texts with a similar theme to encourage teachers to make connections across genres in their instruction.

Web-Based (Remote) Coaching

Upon completion of the online workshop, teachers engage in web-based coaching with a fellow from the University of Pittsburgh’s Institute for Learning. In the first year of the project (described here) teachers engaged in a single coaching cycle¹¹.

The coaching begins with teachers teaching one of the lessons they planned in the online workshop (for either the fiction or non-fiction texts). In subsequent cycles, teachers will move on to implementing the instructional model with the texts they normally use in their school. From the perspective of our theoretical framework, diversifying the contexts (i.e., texts) in which learned skills are applied is expected to support knowledge generalization and deepen teachers’ understanding of concepts taught in the workshop (e.g., how to pose an open-ended question, how to determine whether or not to stop and teach a particular vocabulary word) through continued opportunities to apply and receive feedback.

As described earlier, the purpose of the coaching phase of the program is to support teachers to implement what they learned in the workshop in their classroom practice. To aid in the implementation process, we developed a conceptual tool, termed the Framework for Teacher and Student Text Interactions, which encapsulates the instructional model that is the focus of our program (see Figure 1). Teachers receive the Framework at the end of the workshop and use it as a tool for reflecting on instruction throughout the coaching cycles. The Framework thus serves two purposes: First, it functions as a boundary object (Akkerman & Bakker, 2011; Star & Griesemer, 1989) that links the concepts introduced in the workshop to the coaching interactions and ultimately, to teachers’

¹¹ In the implementation of the full model (years 2 and 3 of the project), teachers will engage in 5-6 coaching cycles.

practice. Second, the Framework creates a focus for joint-productive engagement around particular dimensions of instruction. The descriptive language for a particular dimension (chosen in advance by the teacher and coach as a focus of coaching) is used as a lens through which to consider the extent to which the teacher and student ‘moves’ that characterize a dimension are evident in class discussions. The Framework thus creates a mutual goal to work toward, and a common language for looking at instruction.

Dimensions	Teacher Moves	Student Moves
Select a complex text with grist	Select a text with grist/ complexity that supports extended responses and meaning-making in discussion	Show interest in the topic Demonstrate motivation to persist and grapple with challenging content to make sense of text
Segment the text	Identify stopping points during reading that provide opportunities to unpack text difficulties Plan initial questions and potential follow-up questions	Engage in making sense along the way (i.e., during reading)
Pose questions to construct the gist	Ask open-ended questions that require students to respond in more elaborate ways to explain idea in the text Ask questions that surface students’ potential misunderstandings Ask questions in sequence that help students construct understanding of the key ideas in the text	Demonstrate understanding of key ideas in the text Respond using own words rather than repeating the text verbatim Respond in longer ways that connect ideas within the text
Pose cognitively demanding questions	Ask questions that link text ideas to broader issues in the discipline or world Ask questions that require text interpretation and analysis	Form generalizations, claims, and/or arguments about the text
Develop Accountability to Accurate Knowledge	Utilize Talk Moves that support Accountability to Accurate Knowledge: Marking Pressing for accuracy Building on prior knowledge	Demonstrate accurate knowledge of the ideas in the text Identify knowledge not yet available but needed to address an issue
Develop Accountability to Rigorous Thinking	Utilize Talk Moves that support Accountability to Rigorous Thinking: Challenging students Pressing for reasoning Expanding reasoning Modeling Recapping	Synthesize several sources of info Construct explanations Test understanding of concepts Formulate conjectures and hypotheses Employ generally accepted standards of reasoning Employ standards of evidence appropriate to the subject matter Challenge the quality of each others’ evidence and reasoning
Develop Accountability to Community	Utilize Talk Moves that support Accountability to Community: Keeping the channels open Keeping everyone together Linking contributions Verifying and Clarifying Invites everyone’s participation	Engage in active participation in classroom talk • Listen attentively to one another • Elaborate and build on each other’s ideas • Work to clarify or expand a proposition

Figure 1. Framework¹² for Teacher and Student Text Interactions to improve reading comprehension Coaching Cycle

Each coaching cycle is comprised of three phases: a pre-lesson conference to determine instructional goals for the coaching cycle, written reflection on practice, and post-conference joint-reflection on the videotaped lesson segments.

¹² In addition to addressing text discussions, our full framework includes an extension to writing, which is omitted here in the interest of space.

Pre-lesson coaching conference to determine instructional goals

A coaching cycle begins with teachers e-mailing the coach a lesson plan (beginning with the lesson plan from they developed in the course). During individual pre-lesson phone conferences (approximately 30 minutes long), the coach responds to the lesson plan with questions or comments and determines with the teacher the dimensions of the Framework that are to be the focus of the coaching cycle. The coach sends a summary e-mail to teachers to document the pre-lesson conference and reiterate the goals of the upcoming videotaped lesson.

Written reflection on instruction

Subsequently, teachers videotape themselves enacting the planned lesson and upload the videos (approximately 30 minutes long) onto a secure server. The coach then views and edits teachers' videotaped lesson using QuickTime Pro in order to identify three short segments (two to three minutes in length) that highlight specific and valued events in the instruction. The coach uploads the video clips to the Online Coaching Interface (OCI) developed at the University of Virginia's Center for Advanced Study of Teaching and Learning (CASTL-OCI). The coach then writes comments and reflective questions for each lesson segment that draws attention to particular teacher and student interactions in the discussion.

The teacher is notified that the clips have been uploaded and is invited to generate a short written response to the coach's comments. The goal of the written feedback is to provide an opportunity for the teacher to gather their questions and ideas prior to the post-lesson conference. The teachers' written response serves a similar function for the coach; that is, it provides the coach with insight into the teachers' instruction and intentions that the coach can then use to better tailor their comments to teachers in the post-conference conducted over the phone.

Post-lesson conference: Joint reflection on the videotaped lesson

A coaching cycle ends with individual post-lesson phone conferences (approximately 45 minutes long) in which the coach and teacher watch and reflect on the lesson segments together guided by the Framework (teacher and student talk moves that characterize a particular dimension). The coach and teacher also determine 'next steps', which includes identifying the dimensions from the Framework that are to be the focus of the next coaching cycle.

Technology Support

Prior to beginning the professional development program, we provided an in-person orientation/training session to participating teachers. During the session, we presented teachers with the video camera and tripod they would be using and briefly demonstrated how to use it. Teachers received a packet of support materials (e.g., condensed version of camera instruction manual, steps for uploading videos, etc.). In addition, we provided teachers a link to the project website, where they could view short demonstration videos that lead teachers through the steps of using and placing the video cameras, and uploading their videotaped lessons to the server. Finally, throughout the study, teachers had access to continued support from our project manager via email or phone.

RESEARCH METHODS

Participants

Our participants consisted of seven teachers from three schools in a large urban school district in the mid-Atlantic region of the U.S. The district served 25,000 students from kindergarten to 12th grade (PPS, 2013). Approximately 60% of these students are Hispanic, 30% are African-American, and 9% are of Caucasian, Middle Eastern, or Asian descent. More than 90% of the students were considered to be from low-income families. About 15% of students receive special education services, and about 13% are identified as English Language Learners (ELL).

All of the teachers in the study are female. Five are Caucasian, one is African-American, and one identifies as biracial. Six of the teachers hold a Bachelor degree, while one holds a Master degree. All hold a regular teaching certification. Four are relatively new teachers (with 2-3 years of experience), while three are seasoned, with 9, 10, and 20 years of experience. Of the seven teachers, three taught 4th grade and four taught 5th grade. The teachers were considered to be strong practitioners by their principals. They were desirable as first-year participants/collaborators in our study because we did not want to burden struggling teachers by having them take on an additional professional commitment. Although we believed the program could benefit such teachers ultimately, this being the first year, the intervention was still under significant development. We regarded the teachers we did recruit as partners in the development of the intervention, and we looked to them to provide continuous feedback about our program. Teachers were compensated for their time and participation.

Data Collection

Teachers videotaped their classroom text discussions at baseline, prior to the workshop, and again at the end of the workshop and first coaching cycle ($N=3$ observations). Teachers also completed a survey at the end of the workshop and completed logs (brief surveys) each time they interacted with the University of Virginia's Center for Advancing the Study of Teaching and learning (CASTL) online coaching platform. Finally, teachers were interviewed at the end of the intervention to gain further insight regarding their experience in the intervention. Questions included their response to the web-based professional development program as a whole (e.g., strengths and weaknesses), perceived changes in their instruction, and level of comfort interacting in the online environment and with the remote coach.

Data Analysis

We used descriptive statistics to analyze all survey data. Qualitative analyses of interview transcripts were conducted using NVivo 10 (QSR International, 2012). Data were analyzed thematically through a process which included the following steps: affixing codes to transcripts; sorting coded material to identify patterns, themes, and relationships; looking for confirming and/or disconfirming evidence during subsequent data collection; and gradually elaborating a set of generalizations that were consistent with the patterns discerned within the data set (Miles & Huberman, 1994). Codes were arrayed on matrices organized by teacher to facilitate across case comparisons and identification of trends and patterns.

To address the question of the effectiveness of our intervention on classroom text discussion quality, we analyzed the full-length video-recorded lessons using Studiocode software (Vigital, 1997-2015). All recordings (one baseline and two additional videos, per teacher) were de-identified, and the order in which they were analyzed was randomized. Each videotaped lesson was analyzed using the Instructional Quality Assessment (IQA). The IQA assesses the percent of students who contribute to

the text discussion and the extent to which (a) teachers and students build on each others' ideas, (b) teachers press students to support their assertions, (c) students use text-based evidence to support their answers, (d) teachers provide wait-time to students to generate a response, (e) the rigor of the questions teachers pose to students during the discussion, and (f) the rigor of the text used as the basis for the discussion. Each dimension is rated on a four-point scale (1=poor to 4=excellent). IQA ratings of observed text discussions (alphas ranging from .77 to .86) are associated with differences in students' reading achievement (Matsumura, Garnier, Slater, & Boston, 2008; Matsumura et al., 2013). Additional codes specifically aligned with Questioning the Author (Segmenting the Text and Constructing the Gist of a text) also were developed. ANOVA was performed to test for significance between the baseline ratings and the ratings after the workshop (i.e., pre-coaching) and after the first coaching cycle.

RESULTS

Teachers' Response to the Program

Usefulness for improving teaching quality and burden

To elicit teachers' views of the workshop activities, we asked teachers to rate each activity, videotape, and reading in the workshop and overall impression of each of the eight sessions on two dimensions – helpfulness for improving practice and burden. We also asked open-ended questions assessing teachers' views of the most important thing they learned from that session, suggestions for improvement, and degree to which the online community provided a supportive environment for their learning. Teachers were overall positive about the amount that they learned from the workshop and usefulness of what they learned for improving their practice. They also reported that they felt comfortable in the online environment, and supported by their teacher peers in the discussion board. Some teachers also reported, however, that the workshop was burdensome and that the activities, while useful, also took more hours to complete than anticipated (e.g., two teachers reported that they spent upwards of five hours a week completing workshop activities).

Teachers were likewise very positive about the remote coaching. In surveys (logs) they completed in the online coaching system, all teachers either agreed or strongly agreed that the written comments they received from the coach focused on issues that were relevant to their practice, were easy to understand, was worth the time it took to read and respond to the comments, and that the experience increased their confidence in their teaching. Teachers also all agreed or strongly agreed that the conferences with the coach conducted over the phone were beneficial for improving their practice. Specifically, they reported that the conferences were productive, helped them gain a better understanding of the program's instructional model (Framework), and helped them improve their teaching and identify strategies that they could use in their classroom. In contrast to the online workshop, teachers did not report that the coaching was burdensome.

Aligned with the survey responses, teachers in the summary interviews conducted at the end of the project likewise reported that the program was beneficial for improving their teaching. One teacher, for example, summarized her experience as "Awesome. [The program] was awesome... This program made you look at the way that you were teaching, made you look at instruction, and made you look at the questions that you were asking, and made you look at student engagement, and if they're really learning." Another teacher reported, "Even though [the program] was a lot of work, it definitely has helped me become a better teacher. And the way I looked at comprehension is so totally different than I did stepping into the classroom in September."

Comfort interacting with a remote coach

We wondered if teachers would feel comfortable interacting with the remote coach – a person with whom they had no prior relationship. Our results from teacher interviews indicated that teachers trusted and felt emotionally supported by the coach, despite not meeting face-to-face. One teachers said, “I always felt like... something would be more beneficial for me if I had that interaction with the person face to face, but this [experience] made me think a little bit differently because...even though I wasn’t face to face with [the coach], I feel like we always stayed in contact, and if I needed anything, I knew I could come to her.” Likewise, another teacher said, “I felt very connected with [the coach] online...I felt like I was supported and I got to know her...I actually would have liked to work with her a little bit longer because she had really good suggestions.” A third teacher remarked, “When I was on the phone with [the coach]... she actually took the time to go through the chapter with me....So to me, it didn’t matter if she was sitting there or I was on the phone with her because she still did the same thing, or maybe even more than someone would do if they were sitting with me...She was wonderful.”

Interestingly, teachers reported that they received better attention from the online coach than from their school-based coach. The general refrain was that the remote coach was more available and made the experience more customized and substantive. One teacher said, “I don’t see my [district’s] literacy coach that often, and we don’t have in-depth conversations like with the online coach.” Another teacher noted that her interactions with her school-based coach are not as personal as with the on-line coaching: “The online coaching focuses specifically on you. And...I have the opportunity to ask her questions...and if I don’t understand something...I can get my answers right then and there...As far as the literacy supervisor, it’s more of a pop in, pop out, if you need to reach me, just email me and I’ll get back to you...when I have time type of thing... I feel like the on-line coaching, I had more access to [the coach] as opposed to the literacy coach that I have in school.”

One other participant noted, “This year we had a new [district coach], and she’s very nice, but she’s been in my classroom twice. And the first time was to pop in to do something, maybe say hello, and the second time was...to do a walkthrough, because I’m sure that she needed to get her quota in.”

Influence on Text Discussion Quality

As noted earlier, teachers chose the dimensions of the Framework they wanted to focus on in their coaching. Interestingly, all teachers chose to focus on ‘Constructing the Gist’ as their instructional goal. For three of the seven teachers, this was their only focus, meaning that all of the coach’s comments in the online CASTL interface (and the general emphasis of the coaching conversation) were keyed to this dimension. Two other teachers received two-thirds of the coaching on ‘Constructing the Gist’ and also received coaching on the closely related concept of ‘Segmenting the Text’. Finally, the remaining two teachers received coaching suggestions related to increasing the rigor of the discussion in addition to helping students to construct the gist. Commensurate with this, at the end of the first coaching cycle, compared to baseline, teachers were more inclined to segment the text during discussion and pose questions that guide students toward constructing a coherent representation of the text. Furthermore, there was an increase in the extent to which teachers showed how students’ ideas related to one another in the discussion (see Table 1). These are all aspects of teaching that are related to social construction of knowledge.

Promising trends are also evident for the general rigor of the discussion, which includes teachers posing more cognitively demanding questions, as well as for students linking contributions, providing more extended explanations, and providing text-based evidence to support their responses. These

aspects were not the direct focus of any coaching sessions, although they were featured in the online workshop. Finally, we note that the increase in the quality of the text selection likely reflected the fact that, as part of the intervention, we provided a novel with grist to teachers to plan and enact lessons with. The novel, *A Long Walk to Water* by Linda Sue Park (2011), is based on the true conflicts related to a lack of clean water in South Sudan. The increase in the rating then suggests that our text represents a more complex text than those that teachers might typically use in the classrooms (e.g., short sections of non-fiction text, texts with simple storylines and little nuance).

Table 1
Classroom Text Discussion Quality

Framework Dimension	Dimensions of Text Discussion Quality	Baseline Pre-Workshop (n=8)	Post-Workshop (n=7)	Following 1st Coaching Cycle (n=7)
Select a Text with Grist	1. Rigor of Text (3-point scale)	2.25	2.86	3.00
Segment the Text	2. Segmenting the Text	1.75	4.00***	4.00***
Qs to Construct the Gist	3. Guidance Toward Constructing the Gist	1.88	3.43	3.83***
Q to Gain Higher Level Understanding	4. Rigor of Discussion	2.38	2.86	3.17
Accountability to Accurate Knowledge	5. Providing Text-Based Evidence (Students)	3.25	3.43	3.50
Accountability to Rigorous Thinking	6. Teacher Linking Student Contributions	1.13	1.43	2.50**
	7. Asking/ Press (Teachers)	3.88	3.43	3.67
	8. Providing Explanation (Students)	2.75	3.29	3.33
Accountability to Community	9. Student Participation	3.75	4.00	3.83
	10. Student Linking Contributions	2.63	2.71	3.67

Notes: Discussion ratings are on 4-point scale for all dimensions, except where noted; Significant differences from baseline instruction are denoted as follows: * means significant at $p < 0.05$; ** means significant at $p < 0.01$; *** means significant at $p < 0.001$

DISCUSSION

In sum, commensurate with a growing body of research on online professional development, evidence from our project so far suggests that web-based literacy coaching approach has potential for increasing teachers' access to high-quality professional development and increasing teaching quality. Teachers responded very favorably to the workshop and coaching overall, and were able to implement the coaching suggestions in their practice. Notably, this was the case even though teachers participated in an abbreviated form of our model (i.e., the effects of only a single coaching cycle were studied). Moreover, our results are preliminary and based on a very small sample of schools and teachers. In our future work, we will be looking at multiple coaching cycles and charting the relationship between coaching interactions and practice with larger samples of teachers. This will enable us to better understand the ways in which our work is, or is not, effective for increasing different aspects of classroom discussions, as well as how coaching interactions might change over time as a result of

teachers' increasing familiarity with the concepts represented in our instructional model and expertise at applying these concepts in their practice.

On a more practical note, while our intervention showed potential for improving classroom text discussion quality, teachers also reported that the workshop was overly time-consuming. Given that our sample of teachers were highly experienced, knew their curricula well, and had strong classroom management skills (i.e., were considered to be strong practitioners in their school), this finding is of particular concern to us as we would expect this population of teachers to be more able to 'handle' the workload. In order to scale our intervention, we need to ensure that it is feasible for less experienced teachers to participate as well. In our second design cycle, we are working with teachers to streamline the workshop activities to improve the feasibility of implementing our online professional development program 'at scale.'

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RESEARCHING INTO PRACTICE: DELIVERING INTERCULTURAL COMMUNICATION IN A DISTANCE LANGUAGE LEARNING PROGRAMME. THE ROLE OF TUTORS IN LANGUAGES AT THE OPEN UNIVERSITY, THEIR BACKGROUNDS, ATTITUDES, VALUES AND BELIEFS

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ABSTRACT

The Open University's teaching model is based around the provision of distance learning materials for independent study. The Languages programme at the Open University has traditionally not only taught the four skills of reading, writing, speaking and listening but also included in an integrated way area studies and intercultural communication. It states in its aims and learning outcomes the explicit development of intercultural communicative competence (Byram, 1997) for global citizenship (Byram, 2008, Byram and Parmentier, 2012) where the student becomes a mediator between cultures and languages. A second key component in the distance learning model of the Open University is the large number of part-time teaching staff ('Associate Lecturers') who play a crucial role as the first and main contact for the students, in delivering tutorials, marking assignments and providing individualised feedback to the students. Despite playing an important role in the teaching strategy there has been a lack of research into the part-time colleagues who deliver the direct contact. This practice-based scholarship project was the first of its kind in the faculty.

The aims of the project were to investigate the personal backgrounds and experiences of the Associate Lecturers, their professional experience and practice within the institution and outside the Open University, their ideas and understanding of the concept of intercultural communicative competence, their attitudes, values and beliefs which form the basis of intercultural communicative competence and their practice with regard to teaching intercultural awareness and intercultural communicative competence. The study, undertaken by several colleagues in the Department of Languages, used a mixed methods approach, combining an online survey (n=292) with semi-structured interviews. The online survey was especially designed for this purpose and the interviews were designed in part around the Autobiography of Intercultural Encounters (Council of Europe, 2009). This paper will present the main findings of this scholarship project, its impact on practice, staff development and the curriculum.

INTRODUCTION

The article presents the finding of a project with Associate Lecturers (ALs) in the Department of Languages at the Open University, UK which aimed to investigate the identities, values, beliefs and professional practice of these part-time lecturers.

A brief background and rationale for the study will be provided, the methodology used will be described and then the findings will be presented and discussed. The paper finishes with the possible implications for the practice of these important members of staff and wider implications for curriculum design.

BACKGROUND AND RATIONALE FOR THE STUDY

The Open University in the United Kingdom (OUUK) is the largest provider of part-time study opportunities in Great Britain, attracting around 190,000 students in the academic year 2015/16. It is offering an open access policy to its undergraduate programmes which means that students can study with the institution without prior qualifications, such as the British A-levels. Language Studies has been part of the institution's curriculum since 1995. All study in the Language Studies programme takes place in modules which contain 300 or 600 hours of study.

In line with all OUUK qualifications, The BA (Honours) Language Studies contains a clear set of learning outcomes. One of the learning outcomes for the BA and its nested qualifications is the development of intercultural communicative competence (ICC). The category 'knowledge and understanding' states that students should be able to

show intercultural communicative competence, including a reasoned awareness and critical understanding of the cultures and societies associated with each language and the ability to describe, analyse and evaluate the similarities and dissimilarities between cultures and societies' with the students' own.

As a distance education institution, the teaching strategy is embedded in the materials that students use to study their unit of studies. For this reason and in response to the institution's recent focus on qualifications rather than modules, colleagues in the Department of Languages embarked on a project to devise a new, structured qualification-based approach to the Languages curriculum which clearly expressed the development of intercultural knowledge, skills and attitudes which is underpinned by research and scholarship in the Department of Languages (see, for example, Aguerre, Alder & Beaven, 2013; Rossade, 2013; Beaven, 2012; Stickler & Emke, 2011).

The increasing emphasis on teaching intercultural communicative competence in language modules created the need to try and bring together 1) ICC in our curriculum, 2) our knowledge about our students (see for example Álvarez & Kan, 2012; Baumann, 2010, Baumann, 2007) and 3) how the tuition element of study is actually delivered by the Associate Lecturers. This project aimed to find out more about the third element and investigates current tutoring practice, and the values and beliefs that the ALs hold.

METHODOLOGICAL APPROACH

The study used the conceptual framework of intercultural communicative competence by Michael Byram and his collaborators (Byram, 1997; Byram, 2003; Alred, Byram & Fleming, 2003). Within a European context, Byram's work has been the benchmark for ICC since the late 1990s, reflected in the adoption of his and his collaborators' work in the Common European Framework of Reference for Languages (Council of Europe, 2001; Byram, 2003; Byram & Parmentier, 2012).

Intercultural communicative competence, as defined by Byram, consists of: 'knowledge, skills and attitudes, complemented by the values one holds because of one's belonging to a number of social groups, values which are part of one's belonging to a given society' (Byram, Nichols & Stevens, 2001: 5). The following model summarises the five component parts of ICC which are expressed as '*savoirs*' or 'ways of knowing'. They form the basis for the tools used in this project.

	Skills Interpret and relate (<i>savoir comprendre</i>)	
Knowledge Of self and other; Of interaction: individual and societal (<i>savoirs</i>)	Education Political education Critical cultural awareness (<i>savoir s'engager</i>)	Attitudes Relativising self Valuing others (<i>savoir être</i>)
	Skills Discover and/or interact (<i>savoir apprendre/faire</i>)	

Figure 1 Model of Intercultural Communicative Competence (Byram, 1997: 34)

The project uses a mixed method research methodology (Creswell, 2009), consisting of the collection of quantitative data through questionnaires and qualitative data through interviews. The online questionnaire was designed from scratch, it included 25 questions and was administered through SurveyMonkey. ALs were asked in the questionnaire whether they would be willing to participate in a follow-up interview. Semi-structured interviews (Gilham, 2005) were used to collect interview data. The interview design followed the approach taken in the 'autobiography of intercultural encounters' (Council of Europe, 2009), a resource to be used as a complementary tool 'to encourage students to exercise independent critical faculties including to reflect on their own responses and attitudes to experiences of other cultures' (Council of Europe, 2009: 2). Ethics approval was granted for both parts of the project. Participation was voluntary.

All Associate Lecturers in the Department of Languages received the questionnaire electronically (n=292). The response rate for the questionnaire was 40% (n=112). All ALs were asked whether they would be willing to participate in a follow-up interview to which 37 agreed. All potential interviewees were contacted, 28 ALs were interviewed by eight interviewers. The interviews were conducted via the online conferencing tool Elluminate and recorded. Five recordings failed, 23 recordings were transcribed and verified by project members and then coded using N-Vivo for data analysis, following a content analysis approach. The procedures to anonymise data from the participants followed standard BERA guidelines.

FINDINGS

Background and demographics of the tutors

The majority of the ALs were female (76%:24%), born outside the UK (63%:37%) and of those born outside the UK most (84%) were born in EU countries (Austria, Belgium, France, Germany, Italy, Spain) while 16% were born in non-EU countries (Argentina, Australia, Canada, China, Colombia, Congo, Costa Rica and USA). 47 % had British nationality and 55% had a nationality other than British¹³, 47% had lived in the UK for 20 or more years and a further 35% had lived in the UK for between 11 and 19 years. The interviewed ALs in their overall majority had also lived in the UK for a long time (between 10 and 35 years). Over 80 per cent had at least ten years of teaching experience whereas only a small percentage (4.5%) was relatively new to teaching (up to five years). About a third of the ALs had worked for more than ten years for the Open University, a third had gained between five and ten years of experience and a further third had taught between one and five years at the OU. Around 70% worked in other institutions as well.

The responses (n=110) on what module they had taught or were currently teaching with the OUUK covered the full range of the language modules at the Open University (20 modules in Chinese, English for Academic Purposes, French, German, Italian, Spanish and Welsh at the time). The highest percentage of respondents (in total 36.4%) taught on French modules with the remaining respondents spread across other languages. Each module was represented by at least one AL. They spoke a variety of different languages apart from English and the language they taught (if not English), including Albanian, Arabic, Breton, Catalan, Chinese, Dutch, French, Galician, German, Greek, Italian, Japanese, Polish, Portuguese, Russian, Swedish, Spanish, Turkish and Welsh. The interviews revealed that the majority of these tutors were quite well travelled around most of the globe (Europe, Asia, the Americas, Australia, Africa and the Middle East) whilst a minority had less travel experience or perceived themselves to have travelled less ('I haven't been travelling much, [...] but I have been to Italy, France, Belgium, Austria, Germany, Sweden and Japan').

Tutorials and intercultural communicative practice

The ALs firmly believed that 'language and culture are inseparable and therefore should always be taught together' and about half agreed with the statement: 'I think the teaching of culture is essential to language teaching'. They were asked about intercultural competence in their tutorial practice. Here they considered to develop attitudes of openness and tolerance towards other people and cultures as most important, followed by promoting reflection on cultural differences and promoting the ability to handle intercultural contact situations successfully.

One tutor said that they tended to concentrate:

"on the language teaching rather than the intercultural aspects of the language. So much of intercultural understanding can be learnt only by spending time in another country or exchanging information with people from another culture. Also, there has to be an initial interest in learning about the country because people can live in another country without understanding, or even being interested in, the underlying culture."

Another AL thought that distance language students had fewer opportunities to practise the language in real life contexts and thus intercultural awareness is more difficult to raise:

¹³ This amounts to more than 100% as four ALs had dual nationality

"One of the aspects relating to intercultural language learning is that students have less opportunities to use the language in created contexts and real life contexts than students in conventional settings doing intensive language programmes. Therefore, lacking intercultural communication (and interpersonal communication) hinders, to a large degree, the development of an intercultural awareness whilst learning the language."

The remaining replies can be grouped into several categories: Intercultural awareness was defined by some as a context to the language and connected with communicative competence:

"Use of the language related to the culture (e.g. tu vs. vous)"

"An awareness of the social norms and values of other cultures leading to communicative competence."

Other responses defined intercultural awareness by focussing on cultural differences:

"Knowing about how different cultures vary"

"The understanding that people from different cultures see things and think about things in a different way"

A third group of responses emphasized the comparison of one's own culture with another culture, in some cases stressing the need to be sensitive to them:

"To be aware that the culture you happen to grow up in is only one of many cultural systems, to be aware of other cultures' beliefs and perceptions of the world, to understand and respect other cultures' approach to life"

"Capacity to understand the differences between own and other cultures"

"Appreciating and understanding that people's cultures are different and being able to put oneself in other people's shoes; appreciate/identify cultural differences"

A fourth group of responses suggested definitions that focused on comparison, empathy, constant change in knowledge and the fluidity of culture as a construct:

"Being able to see difference without fear but with empathy while also using comparison as a critical tool to enhance awareness through constantly changing knowledge. Intercultural awareness must include flexibility and the possibility of change otherwise other cultures will be seen in monolithic essentialist terms."

"It refers to an understanding that culture is a fluid, dynamic and changing construct that neither his/her own culture (individual or collective) nor another culture (individual or collective) has a fixed boundary and the process of communication between different cultures is constructed and negotiated."

Several ALs mentioned comparing one's own culture with another culture:

"Greetings, numbers, terms of address (tu/vous), daily routines of adults and children, food and drink, work and annual leave. I would start with a simple comparison: according to the course materials/tutor's materials, how is it done in France and how is it done in your country (England/Scotland/Wales)"

"Direct comparison of similarities/differences between "home" country and target countries; this can be made more fun by methods such as role plays."

"At tutorials, some activities involve comparing between French and other cultures, for example on the topics of cinema, housing, health system, work/leisure/holiday times and activities etc."

They defined intercultural awareness in various ways:

- 'the ability to understand the context of the language',
- 'an awareness of the social norms and values of other cultures leading to communicative competence' or stressing cultural differences: 'be aware of cultural differences',
- 'the understanding that people from different cultures see things and think about things in a different way' and 'comparing one's own culture with another one'. Awareness of and respect for other cultures' beliefs and perceptions of the world and demonstrating empathy ('being able to see difference without fear but with empathy'), flexibility and change featured as well.

One tutor said that they tended to concentrate 'on the language teaching rather than the intercultural aspects of the language. So much of intercultural understanding can be learnt only by spending time in another country or exchanging information with people from another culture.'

Some however had experienced differences of viewpoint and stereotyping:

"Some students come with misconceptions about French culture and I have to dispel some myths. Usually, I try to develop some cultural awareness by comparing stereotypes about Scotland or England (regional differences between North, South, East or West, today and 50 or 100 years ago) and students realise that cultures are not uniform and static. I also use non-British students' knowledge if I have some in my groups."

All of the interviewed ALs had personal experiences of other cultures, as they had lived in other countries or migrated to the United Kingdom. In addition, their attitudes towards people from other cultures were also shaped by their professional experiences as teachers of English and Modern Languages:

"through teaching there is no doubt that one becomes extremely aware of cultural differences and sensitivities [...] we learn [this] as part of our professional development [...] one is very aware [...] and being quite receptive to different views [...] or not to offending anyone or balancing different aspect[s]"

At the same time, exposure to another country and culture also impacted on how they regard their own country and culture.

"Living in a foreign country or a different country makes your outlook on your own country different, just stepping back a bit and looking at things from a distance makes you perhaps more aware of what's going on in your own country [when living abroad] you change without realising [it] [...] so in a way you are almost hovering above two countries, not quite feeling where now you belong."

They also mentioned the question of identity and belonging: 'I feel it is ok for me to be different'. The importance of tolerance towards people from other countries and cultures is exemplified by the following extract: '[the experience of living abroad] has made me more empathetic towards people from different cultures.' Their ability to speak more than one language was also cited as an important aspect of shaping their attitudes towards people from different cultures. This also influenced their view of monolingual people, as exemplified in this excerpt:

"I feel I have an easiness in other places, in new situations that I have been given by having this sort of life [...] I look at people who only speak one language who've never lived in a country other than the one they were born in and I [...] genuinely feel sorry for them"

The vast majority of ALs (about 85%) considered ‘developing students’ speaking skills’ as most important in their teaching, followed by ‘developing students’ interactive skills’ and ‘developing students’ listening skills’. The emphasis on speaking skills is also reflected in the amount of time they reported developing the students’ speaking skills (about 45%) and what they regarded as the most important goal in their tutorial practice: ‘I want to improve their ability to speak more fluently’ (57%). This clearly highlights that the tutorials focus very much on speaking practice.

Learning languages and learning about other cultures

Several ALs articulated the benefits of learning a language. Learning a language opens horizons and changes the way other cultures are being experienced.

"Learning a foreign language, regardless of what it is will automatically give you so much more than just speaking a language, or so much more, as well, than understanding the local culture, it will [...] equip you with certain tools to deal with the unexpected, to deal with differences, [...] and I don't think this is something that you realise when you learn the language, when you are in the thick of it, it is later that when you, when you, you transfer that."

"We are aware that cross cultural communication is never perfect, you know, we are aware that there are some times when, because we are from different cultural backgrounds, we will not understand each other and we know that and accept it. So it makes it possible to avoid, some interpersonal conflict".

"To be quite sensitive and receptive to other people's cultures and [...] understand that not everyone sees the world through the same logic [...] and also to, well, to be aware of one's own is very important, the language one is using"

A sense of interculturality, gained through life experiences, was reflected in the responses of the participants, as shown here:

"It's probably just things I have learned from my life experiences because I have moved across country a few years ago to the UK"

The intercultural experience may have been enhanced by their professional practice as language teachers (‘being a tutor is also being a mediator between two cultures’). Another AL however reflected on the tension between being seen as an ‘ambassador of the country’ and a reference point for the notion of native speaker (‘what you do and say etc. represent for the students what a native person is’) and the fact that such notions are rarely applicable to tutors who ‘tend to be quite multi-cultural’.

DISCUSSION

This project which was the first of its kind undertaken by staff in the Department of Languages at the OUUK established that the group of Languages tutors are diverse with a wide variety of experiences and backgrounds. They have in-depth knowledge of the culture(s) in their country of birth and of British culture(s) by having lived amongst British people. Most of these colleagues have experienced other cultures through, in some cases, extensive travel or residence abroad and many of them have also experienced migration, mostly into the UK. The vast majority of these members of staff are bi- or pluricultural and also plurilingual: in addition to English and the language they teach, most speak at least one other language.

The majority of them are experienced practitioners and their personal and professional experiences as language teachers have had an impact on how they see the world, their attitudes, values and beliefs. It

has changed the outlook on their own country of origin, allowing them to become observers of different cultures and accept differences.

ALs have also articulated clearly an understanding of the concepts of intercultural awareness and competence. As knowledge of oneself and others, of interaction (individual and societal), openness, curiosity and the relativizing of oneself and valuing others are key components of the ICC framework, it can be said that these ALs come equipped with a level of intercultural communicative competence. This should enable them to support students in gaining greater intercultural communicative competence in their tutorials.

However, the data also show clearly that their tutorial practice at the OU is not primarily conducive to the development of ICC among the students. The focus in tutorials lies on developing oral and interaction skills, as these skills are a particular challenge in distance language learning. As tutorial and study time is a limited resource, there is clearly a tension between these statements, and the conviction by over 80% of ALs that language and culture should be taught together. These findings are in line with the findings of an international study into the theory and practice of foreign language teachers and the teaching of intercultural competence in seven countries (Sercu, 2005) which found that teachers did not teach the acquisition of intercultural communicative competence for time reasons. One particular outcome of the project has been the initiation of a discussion what the overall focus of tutorials should be. The group recommended the inclusion of activities that foster intercultural communicative competence at every level of study, even if some of these activities are not conducted in the target language. The recently developed overall curriculum plan for the Language Studies degree at the Open University offers opportunities to address the overall balance of the different components involved in language learning in tutorials, especially as intercultural communicative competence is systematized in this plan and taught from beginners' to advanced levels throughout the study journey of the students. The study has also revealed areas that merit further work and discussion.

Four out of five ALs maintain that language and culture belong and need to be taught together. In their professional practice, however, when asked about what they teach when they teach culture, they focus on a wide definition of culture, on lived and performed traditions and celebrations. Within this wider definition, they focused on lived and performed traditions and celebrations, for example major events in the cultural and religious calendar or daily life and routines. Several ALs also mention different conventions for greeting and addressing each other. Thus their focus is to some extent limited to the surface and immediate visibility of culture. Such an approach to culture teaching bears the danger that culture is then reduced to the folkloristic and essentialist without enabling students to gain a deeper and more differentiated understanding of the cultures of the societies in the target languages they study. The examples of intercultural experiences and encounters the ALs have told us about contain many more hidden cultural practices and conventions which ALs had to learn or adapt to. It is not clear if and how these enter the actual teaching. On the basis of their responses it might be beneficial to establish a more explicit and more differentiated understanding of what is meant by 'culture' whilst acknowledging that this is a difficult, contested and controversial concept.

The absence of socio-economic, geographic and demographic factors (class, gender, age, urban vs. local or rural) in defining culture is also noticeable. Most contributions stay at the level of national culture and this needs further reflection and discussion. In order to enhance the student experience it might be beneficial to be more explicit to ALs in how the teaching of ICC is integrated in the new curriculum through some staff development. The findings of this study suggest that it might be worth exploring further how the rich personal experiences that ALs report in this project could be integrated more systematically into their tutorial delivery and more generally within the teaching strategy so that tutors feel enabled to become mediators between cultures, which is the overarching goal of Byram's concept. This should allow them to work together with their students and their students' experience of

other cultures to critically reflect on the students' own and the other cultures. This might necessitate for the Language Studies programme to partially redefine the role of the tutors in respect of their tutorial practice and extend their merit beyond the practising of interactive speaking in the tutorials. Since the survey and the interviews were conducted, the Department of Languages launched a new introductory module (L161 *Exploring languages and cultures*) which extends the curriculum in the various language modules by more in-depth reflection and discussion about what culture actually means and how it becomes operational when people from different 'cultures' meet.

Overall the project has led to a set of internal recommendations that are gradually being addressed through the programme's strategy of curriculum renewal, including the development of a new strategy for tutorials which allows for the integration of ICC into tutorial practice, thus demonstrating how a practice-based research project can have an impact on teaching practice.

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PROMOTING TEACHERS' SCAFFOLDING OF STUDENTS' MATHEMATICAL LANGUAGE IN A PROFESSIONAL DEVELOPMENT PROGRAMME

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ABSTRACT

To promote students' acquisition of language required for mathematical learning, the employment of language-supporting scaffolding strategies (Smit, 2013) has proven to be effective. So far, little is known about how this teaching approach can be upscaled in educational practice. This study investigates the features of a professional development programme focused on teachers' scaffolding of students' mathematical language. In design-based implementation research seven professional development sessions for two professional learning communities in different parts of the Netherlands (consisting of 5 and 10 teachers) were shaped and enacted by four researchers-educators. Over time, all participants (researchers, educator, and teachers) collaboratively identified both process and product features of the professional development programme. Besides insights into these features, this study also yielded professionalized language-oriented primary teachers and a course programme that these teachers and others can employ to further upscale the language-oriented approach in primary mathematics classrooms.

INTRODUCTION

Primary school students' mathematical proficiency is considered an important key for success in education and, more generally, in 21st century society (Keijzer, 2013). Being or becoming mathematically proficient includes learning the language of mathematics and the language of participating in mathematical discourse (Moschkovich, 2010). An example from one of the Dutch mathematics textbooks (figure 1) shows the language students need to participate in mathematics lessons.

8 **blok 4** **les 6**

1 **How do you do your calculation?**
 Lex saves money for a mountain bike.
 Last year he saved €216.
 This year he saves another €183.
 Lex thinks he has enough money.
 His brother thinks he hasn't.
 What do you think?
 This is how Lex did his calculation:

$216 + 183 =$
 $200 + 100 = 300$
 $10 + 80 = 90$
 $6 + 3 = 9$
 $300 + 90 + 9 = 399$

€449

Figure 1: Example from the textbook series 'Alles Telt' book 5B (translation by authors)

When doing the problem in figure 1 proficiency in everyday language is required. For example a student should know what saving money is, what a year is, what a brother is and that the picture depicts the mountain bike in the problem. Academic language is language that is typically used in school. We find this in the problem in sentences like 'This is how Lex did his calculation' and even more prominently in 'How do you do your calculation?' Subject-specific language, which is the language typical for mathematics, is found in the calculation shown below the text. However, there is more language in the problem that is specific for the subject of mathematics. The problem encourages students to formulate how Lex solved the problem. In adding the two numbers he splits the numbers in hundreds, tens and ones. In tackling the problem students need to know how to use words like 'splitting numbers' and 'hundreds', 'tens' and 'ones'. Moreover, they do not only need to know the words, but also how these are used in particular formulations.

Language is omnipresent in mathematics teaching (Morgan, 2007). This is not only the case in mathematics teaching where contexts are used to teach students, like realistic mathematics education (Treffers, 1987; Freudenthal, 1991; Gravemeijer, 1994). It is therefore needed that teachers learn to support students in learning mathematical language.

BACKGROUND

The research presented here builds on Smit (2013). Drawing on sociocultural and content-based language instruction theories, the main question of this thesis was how teachers in primary classrooms can scaffold students' language required for mathematical learning (Vygotsky, 1962; Brinton, Snow, & Wesche, 2003; Janzen, 2003). Scaffolding refers to responsive help based on a diagnosis (Smit, Van Eerde, & Bakker, 2013), in this study directed at students' gradual acquisition of mathematical language. To this end, a repertoire of scaffolding strategies was developed, employed and evaluated (e.g., reformulating, asking students to formulate more precisely; see Table 1).

Table 1
Strategies for Scaffolding Language and Examples for Each Strategy

1	Reformulate pupils' utterances (spoken or written) into more academic wording	[In response to the graph goes higher and higher up:] <i>Indeed, the graph rises steeply.</i>
2	Ask pupils to be more precise in spoken language or to improve their spoken language	<i>What do you mean by 'it'?</i>
3	Repeat correct pupil utterances	<i>The graph descends slowly indeed.</i>
4	Refer to features of the text type (e.g., interpretative description of a line graph)	<i>Into how many segments can we split the graph?</i>
5	Use gestures or drawings to support verbal reasoning	E.g., gesturing a horizontal axis when discussing this concept
6	Remind pupils (by gesturing or verbally) to use a designed scaffold (i.e. word list or writing plan) as a supporting material	<i>Look, the word you are looking for is written down for you here.</i>
7	Ask pupils how written text can be produced or improved	<i>How can we rewrite this in more mathematical wording?</i>

The language to be scaffolded was specified in terms of a curriculum genre, for example the academic and subject-specific language students need for reasoning about line graphs. Each genre can be captured in terms of particular structure and linguistic features. Genre pedagogy (Gibbons, 2009) was employed, as it explicitly focuses on the development of academic and subject-specific language needed for participating in different school subjects. The development of such language is of particular importance for language-weak and second language learners, as they cannot build on the same foundations as their native peers. Although genre pedagogy has been successfully implemented in particular areas of the curriculum, its possibilities for mathematics education have been hardly investigated (an exception is Mousley & Marks (1991)). Smit (2013) showed how genre pedagogy could be made productive for mathematics education (in the case of line graphs). In the research described here, teachers were encouraged to identify genres for different mathematical domains themselves as a preparation for language-scaffolded, interactive mathematics teaching.

The professional development course central to the current study originates from the scientifically grounded insights into how language-oriented mathematics education can be designed, enacted and evaluated as yielded by Smit (2013). Moreover, this current study originates from leading questions amongst primary teachers in the participating schools. They formulated the problematic nature of language in mathematics lessons in several questions, namely:

- How can I promote classroom interaction instead of merely focusing on the textbooks?
- How do I prevent students from increasingly failing to participate in mathematical discussions?

- How can I consider the role of language in problem solving, and what are suitable ways of identifying the required language and centralizing it in maths lessons?

RESEARCH QUESTION

Many students in classrooms worldwide face the challenge of participating in subject-specific (mathematical) discourse, in which in some cases the language of instruction is not their first language. Teachers have shown to insufficiently meet this challenge (e.g., PISA studies). Furthermore, reform efforts in mathematics education have stressed the importance of ample classroom discussion in which mathematical concepts can be shared and investigated (e.g., NCTM, 2000). Despite reform efforts, many mathematics classrooms still hold a traditional and teacher-dominant nature in which there is a lack of student contributions and little room for language development (Van Eerde, Hajer, & Prenger, 2008).

Both problems are addressed in the current study. Moreover, insights into how teachers can be professionalised in the realisation of language-oriented, interactive mathematics lessons are developed. The question central to this study is: *What are features of a professional development programme that realises interactive, language-scaffolded mathematics education by the participating teachers?*

METHOD

The research method applied was design-based implementation research (Penuel, Fishman, Cheng, & Sabelli, 2011). Its starting point is collaboratively formulated goals (by teachers, educators, and researchers). It has an iterative nature and aims for both theory development and sustainable change (concerning, in our case, the 15 teachers and their colleagues). The design of the professional development course was initiated and carried out by four researchers-educators, based on frequent discussions with and feedback from three of the participating teachers.

During the professional development course, we capitalized on four learning activities that were found to be effective for developing teacher expertise: learning by experimenting (e.g., trying out lessons), learning in interaction with others (teachers, researchers), using external sources (e.g., publications, exemplary materials), and reflection (Bakkenes, Vermunt, & Wubbels, 2010). We aimed at teachers' increasing independence (according to the idea of scaffolding), and draw on the textbooks and approaches used in teachers' schools. Scaffolding language was thus explored on two interconnected levels. On the one hand we discussed several aspects of scaffolding student language in mathematics lessons in the course. On the other hand we used scaffolding strategies to support participating teachers. Doing so facilitated teacher educators' modelling scaffolding for these teachers.

To answer the main research question concerning features of the programme, we analysed questionnaires, teacher logs filled out after each session, video recordings (transcribed verbatim), as well as our own researcher logs, which were based on the design-based research instrument of a hypothetical learning trajectory (HLT) (Simon, 1995) which was used to formulate learning goals, teaching activities and testable conjectures about teacher learning. Questionnaires focus on the teachers' starting position. The HLTs initially were developed from researcher logs. Teacher logs were used to develop or adapt HLTs. We used teacher logs and the video recordings also to find out how teacher skills in scaffolding language developed. Details about the data analysis procedure can be found in Mackay (2015).

RESULTS

During the first meetings of the professional development course the notion of language scaffolding is introduced and teachers and teacher educators discuss genres for specific domains. As a consequence of this introduction the teachers become aware of the importance of language in mathematics lessons. They also gradually start thinking through students' thinking. Moreover, they experience that mathematics textbooks hardly focus on language. One of the teachers in this initial stage writes in her log about how she changed working with the textbook: 'I noticed that I select words from the textbook and discuss them before I start the actual lesson.' In thinking through problems from the textbook teachers find that every problem in a sense provided a genre on its own.

Following these initial experiences with language in mathematics lessons, expert teachers start experimenting with scaffolding strategies for scaffolding students' language provided in the course. The teachers are eager to exchange experiences of their scaffolding enactment by sharing and discussing video fragments from their lessons. This proves helpful for enacting these strategies in their classrooms. Therefore researchers-educators decide to centralize video watching in the professional development sessions. After three months one of the teachers writes in her log where her development led her. She shows how she now is able to use scaffolding strategies like repeating and emphasizing correct use of mathematical language: 'When a student uses the right language, I repeat what he or she said and tell the child he or she formulated a beautiful sentence. I thus hope that students come to see the importance of reasoning about mathematical problems, rather than merely focusing on the answer itself.' When the teachers become proficient in the enactment of scaffolding strategies in their own mathematics lessons, a new perspective opens up.

The teachers' participation in the course was not only aimed at improving their own teaching. It also was meant as a means to improve practice throughout the school. After about half a year, team development therefore becomes a key issue during course meetings. Participating teachers discuss during the professional development sessions how they shared their knowledge and newly developed skills with their colleagues. They did this by discussing the subject with peers in informal meetings, discussing language in mathematics lessons in a specific groups, and/or put it on the agenda for the whole team. Some of their strategies included:

- sharing videos from their own mathematics lessons,
- discussing language in mathematics textbooks,
- sharing language scaffolding strategies.

In doing so the professional development course provided a model for in-school activities. As such, the scaffolding role that at first the researchers-educators had during professional development sessions, was now transferred to the participating teachers in their own schools.

In the end all participating primary teachers developed proficiency in realising interactive, language-scaffolded mathematics lessons. They improved their preparation of lessons in terms of language learning goals, increasingly enacted language-supporting scaffolding strategies, and became more aware of language use by students and language required to learn mathematics. The participating teachers formulated a dissemination plan for professionalising their own colleagues and took first steps in this direction.

The design-based implementation approach in professional learning communities, combined with the focus on the aforementioned learning activities, as well as shaping the course according to the idea of scaffolding, thus proved a successful way of professionalising teachers in realising language-oriented mathematics lessons. In particular, teachers stressed the importance of designing and preparing language-oriented lessons for a specific mathematical domain (e.g. percentages), discussing each

other's video fragments, being exposed to examples of good practice, and interacting with each other and the researchers-educators.

DEVELOPING PRACTICE

This study shows how mathematics education in primary schools can be improved by joint investments by participating teachers, researchers and educators. It shows the field of educational practice how professionalising teachers on this relevant topic can be a source of inspiration for others, and can thus form a germ for future development of students, teachers and educators. Participating teachers can benefit from this study in several ways. Firstly, they developed knowledge and skills that they can directly apply in their classrooms. Secondly, they received materials and insights as to how their colleagues can be professionalised. Thirdly, the established professional learning communities can help them to support the dissemination of interactive, language-scaffolded mathematics teaching in their own schools.

One of the materials used in the schools was developed during the course as a coproduction of teachers, teacher educators and researchers. The 'mathematical language guide' (figure 2) was made to provide a means that would help teachers realize language scaffolding in mathematics lessons. In short this guide shows steps participating teachers undertook every time they adapted a problem from the mathematics textbook. As such it developed from discussing various genres needed in a variety of mathematics domains. The guide suggest taking four steps in preparing a language informed mathematics lesson. Participating teachers hope these steps in the end become a habit preparing each mathematics lesson.

mathematical language guide

mathematical aim
Determine the mathematical aim of the problem

think through students' thinking
Consider the thinking that is needed, related to:

- the context
- modelling
- formal mathematics

language
Consider the language needed and distinguish between:

- everyday language
- academic language
- subject-specific language
- focus on particular formulations

scaffolding
Support this language using *scaffolding* strategies, like:

- reformulate pupils' utterances (spoken or written) into more academic wording
- refer to students' thinking that is needed
- refer to features of the text type
- ask pupils to be more precise in spoken language or to improve their spoken language
- repeat correct pupil utterances
- appoint the quality of correct pupil utterances
- ask pupils how text can be produced or improved

This mathematical language guide is a yields of the TRAP-project, conducted by Hogeschool Pabo, Hogeschool Saxion, Universiteit Utrecht, Stichting Sarkon and Stichting OPDO, and commissioned by the NRO

Figure 2: Mathematical language guide

CONCLUSION

This study aimed to identify features of a professional development programme that helped participating teachers to realise interactive, language-scaffolded mathematics education. Analysis of the professional development programme yielded the following features:

- there is an analogy between the support participating teachers receive, the support that teachers' colleagues receive, and the support that is intended for students (scaffolding),
- the professional development course is highly adaptive and a result of a shared responsibility of researchers, teacher educators and teachers,
- in the professional development course the teachers, teacher educators and researchers function as a professional learning community,
- video is used to share experiences and to learn from other course participants,
- teacher development follows the following stages: awareness of mathematical language and the importance of centralizing this language in mathematics lessons, scaffolding mathematical language in classroom interaction, sharing knowledge and skills in supporting (scaffolding) colleagues in the participating teachers' schools.

This study thus showed that it is possible to upscale insights into how primary teachers can realise scaffolding of language in interactive mathematics lessons. The results show that all teachers became substantially more aware of the role of language for mathematical learning, and that they also grew capable of realising meaningful classroom interaction in which they scaffolded students' language. Crucial features for shaping the professional development include the aforementioned four learning activities four: learning by experimenting (e.g., trying out lessons), learning in interaction with others (teachers, researchers), using external sources (e.g., publications, exemplary materials), and reflection (cf. Bakkenes et al., 2010), the idea of scaffolding underlying the programme, and the professional learning communities in which teachers could increasingly become more independent and more knowledgeable.

DISCUSSION

Adequate use of language in mathematic lessons is not an aim in itself. However mathematical language is needed to gain proficiency in mathematics (Sfard, 2008). We here note that teachers were able to improve language in their mathematics lessons, as they learned using language scaffolding strategies (Mackay, 2015). One therefore might expect that the result of the professional development course analysed here would for example lead to higher scores on standardised mathematics tests. Studying this, however, was not possible within the scope of this research. This can be a subject for future research, but one can wonder how to value the results of such a study. Namely, the adaptivity of the professional development trajectory makes that a new group of teachers will adapt the course to one of its own. In a sense the next group improves the results of the first one, by taking the next cycle in designing the course. This is in the nature of design research whereof also the professional development course described here is a result (cf. Penuel, Fishman, Cheng, & Sabelli, 2011).

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TEACHING COSMOPOLITANISM THROUGH TRANSNATIONAL ENGLISH LITERATURE

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ABSTRACT

*Increasing global mobility calls for a fresh view on the competences students need to acquire in the English Foreign Language classroom. To address these new challenges the construct **cosmopolitan communicative competence (ccc)** was developed for the study. CCC models the competences needed to communicate across those lines of difference that are relevant for the individual and social identity of communicative partners. In the model identities are understood as situated by different factors of belonging. The negotiation of **intersituatedness** is considered a central competence in the communication of different speakers in the global language English.*

*The teaching approach applied in the study is based on the use of the biographic resources of students in culturally diverse classrooms. These experiences which represent the discourse sphere of the students' lifeworld (Wolfgang Hallet) are made accessible by creating life-writing texts. These texts are juxtaposed to the representation of identity development and **intersituated** communication in transnational English literature. The model of first and second order differences developed by Mary Kalantzis and Bill Cope is used as an analytical tool in order to compare student texts and literary texts.*

The central research question is what this life-writing approach contributes to advancing students' cosmopolitan communicative competence. In the pilot phase the approach was tested in two classes of twenty-five students each. The teaching approach was then refined and the sample reduced to seventeen students to allow for an in-depth qualitative analysis. The data were coded on the basis of a system of categories that mirror ccc.

THE COSMOPOLITAN CHALLENGE

Cosmopolitanism and Education

The social changes initiated by increasing mobility and global interconnection in the areas of communication, economics and cultural exchange call for educating students as world citizens. As adults they will increasingly need to take a cosmopolitan perspective in order to be competent citizens in diverse societies, to be enabled to communicate with partners from different cultural and linguistic backgrounds and to address political issues that cannot be solved locally. The following part of this article will sketch briefly the understanding of cosmopolitanism that forms the theoretical basis of my study.

Immanuel Kant promoted the idea of ensuring the peaceful co-existence of nation-states that are governed by the rule of law. He saw this as an important achievement of civilizing social interaction – in contrast to the need of “savages” to protect their rights by waging wars (see discussion of Kant in Stevenson 2011, 144). Cultural historians and postcolonial scholars have criticized Kant’s cosmopolitanism as being embedded in the Eurocentrism and racism of Enlightenment thinking, however (see e.g. Stevenson 2011, 146; Bhabha 2011, 315-317). Kant, for example, assumed the division of human beings into the four races White, Negro, Mongol and Hindu. This division was associated with appearance, intelligence and potential for human development (Stevenson 2011, 146). Gayatri Spivak questions Kant because for him civility – which forms the foundation of his idea of cosmopolitanism – is learnt through culture. This racist division of the potential for human development limits the access to civilization for non-European people. Thus there is a tendency in Kant’s cosmopolitanism – in spite of claiming the opposite – to reinforce the imperialist division between master and native rather than granting equal and universal rights to all human beings (Stevenson 2011, 146).

Other critics state that some approaches to cosmopolitanism only consider global élites like academics and businesspeople who move in the transnational spaces inhabited by their community. This group of people characterized by an “excess of belonging” in Werner Delanoy’s terms, have nothing in common with, for example, refugees or migrant workers who are characterized by an “excess of non-belonging” (see Delanoy 2013, 159 ; Gikandi 2010, 22-23). A third line of argument criticizes the frequent reduction of cosmopolitanism to a superficial and tokenistic celebration of global foods and fashions. Both aspects – the celebration of elitist life-styles and the tokenistic appraisal of diversity – are symptoms of *global cosmopolitanism* for Homi Bhabha. This type of cosmopolitanism is linked to prosperity and privilege, promotes neoliberal ideas of progress and favours free market forces and competition. From Bhabha’s point of view global cosmopolitanism welcomes multiculturalism and multinationalism only if this promises success and prosperity (Bhabha 2004, XIV). Since education should aim at enabling students to take true responsibility as world citizens Eurocentric and elitist approaches must be abandoned. Instead *vernacular cosmopolitanism* as understood by Homi Bhabha provides a suitable basis. Bhabha claims that:

"A just measure of global progress requires that we first evaluate how globalizing nations deal with 'the difference within' – the problems of diversity and redistribution at the local level, and the rights and representations of minorities in the regional domain."

Bhabha, Homi (2004); *The Location of Culture*; London and New York; p. XV

From this perspective a cosmopolitan approach must first provide strategies that enable the successful interaction of citizens of different social and cultural belonging in diverse societies. People must be given adequate options to represent and negotiate individual and group interests. These interests are

linked to different factors that shape individual and group identity. The term *situatedness* is used to encompass the array of factors that shape and individual's or a group's identity and social position.

Advancing cosmopolitan competence in terms of the desired outcomes of educational processes thus means that students need to achieve the ability to understand the various factors that shape their own individual and group identity as well as that of their partners in communication. Furthermore students need to be enabled to engage in practices of negotiating these differences- a process which will be addressed as *negotiating intersituatedness* in this article.

As I will show in the following two chapters a cosmopolitan approach in the EFL-classroom has two dimensions – a general pedagogic dimension that is closely linked to the teaching context – and an EFL-specific dimension that is connected to the role of English as a global language.

Teaching Context: Cosmopolitan Classrooms in Germany

Cultural diversity is ubiquitous in German classrooms – about a third of the student population has a migrant background.¹⁴ Many students with a migrant background or with a migrant family history are part of historically marginalized groups like e.g. the descendants of former “Gastarbeiter” (“guest workers”) or “Spätaussiedler” (“late migrants”) from the former Eastern Bloc (Bade 2011, 160). The recent immigration of refugees from Syria, Afghanistan and other troubled regions increases the relevance of living up to the cosmopolitan challenge in German classrooms.

In the past, there was often a negative bias against students with a migrant background. The most prominent expression of this is the deficit-oriented perspective on these students (Woellert 2009, 13). As Arnetha Ball has shown in different national contexts low teacher expectations are an important factor that inhibits students' academic achievement (Ball 2006). The situation for children with a migrant background was further aggravated by the fact that social status is an important predictor for academic success in the German educational system (see e.g. results of PISA). Paul Mecheril sees the (lack) of congruence between school context and family habitus as one of the most relevant factors that fuels this problematic correlation (see Mecheril 2010 on disposition-context incompatibility). Thus students from immigrant families with a low social status are at a strong disadvantage. These observations of educational scientists explain that students with a migrant background rank lower in large-scale assessments like the PISA study and that they are overrepresented in schools offering low qualification levels (see e.g. Budde et al 2009).

Consequently multilingualism and migrant experiences – two factors that are potentially valuable resources in a globalized world – frequently hinder educational success instead of advancing it. It is a plausible hypothesis that negative perceptions of students with a migrant background are strongly linked to factors of social stratification, yet the acknowledgement of this dangerous linkage may also lead to teachers' well-meant misappropriations concerning the factor of cultural belonging and its significance. A pedagogic approach that enhances these students' chances of academic achievement and successful personal development needs to take a resource-oriented approach towards diversity. Following Homi Bhabha's understanding of vernacular cosmopolitanism these students need to be given a voice in order to enable successful representation in the “regional domain” (see quotation Bhabha above). As I will show at a later point, a life-writing approach is especially promising to achieve this goal because it focusses on individual experiences that are also related to group belonging. Thereby stereotypical perceptions of group identity can be avoided - while the significance of group belonging in shaping experience and social interaction is also shown.

¹⁴ Students who are either migrants themselves or who have at least one parent who is a migrant are considered as having a migrant background, these students may or may not have German citizenship.

A Cosmopolitan Perspective on English as a Global Language

A cosmopolitan perspective on teaching processes in the English Foreign Language classroom calls for reconceptualization on two levels. On the **linguistic level** the privileged position of the native speaker needs to be reconsidered. Braj Kachru's three-circle typology is a prominent example of privileging English as spoken in the so-called "core countries" (US, GB) as the norm-giving ideal (see e.g. Gnutzmann/Intemann 2008, 13-14). A more egalitarian approach that considers the increasing importance of communication between non-native speakers (e.g. Gnutzmann/Intemann 2008, 13-14) is present in Marko Modiano's model. According to Modiano, speakers of all varieties have access to the common core of English as an international language. Kachru's distinction between norm-giving, norm-developing and norm-dependent speakers is abandoned. From a cosmopolitan perspective this model is preferable, especially since the critical reflection of intergroup attitudes is a central objective on the level of **cultural learning**.

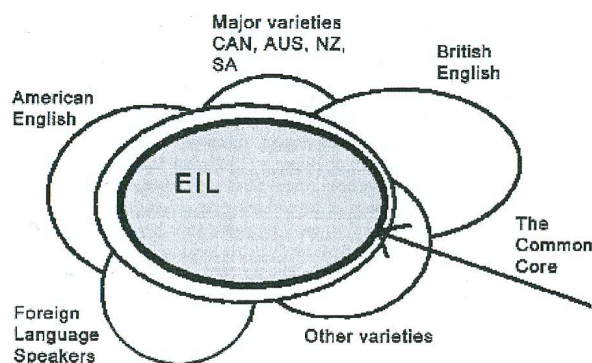


Figure 1: Modiano's (1999: 10) model of English as an International Language (EIL)

Figure 1: used as in Decke-Cornill 2008, 162

From a cosmopolitan perspective the role of English can be described as ambivalent; on the one hand it is a communicative vehicle that facilitates global communication - but, on the other, the spread of English is also linked to oppression (e.g. British imperialism, transatlantic slave trade) and domination (US cultural dominance after WWII) (see e.g. Gnutzmann/Intemann 2008, 10-11). A critical reflection of the role of English for speakers of different cultural descent must be part of a cosmopolitan approach to teaching in the EFL-classroom.

Cultural Learning in the EFL-classroom

In the last three decades, EFL-didactics have seen a lively debate over suitable concepts of cultural learning in the EFL-classroom. Proponents of *intercultural learning* like Claire Kramsch see the communication of interlocutors from different cultural and linguistic backgrounds as a process in which a "third place" is created that transcends the systems of meaning making of both partners in communication (Kramsch 1993). According to Kramsch language is closely intertwined with the mental constructs that are relevant in a certain cultural setting (Sapir-Whorf hypothesis). Due to the fact that language and thought are interconnected very closely any process of language learning also goes along with first an insight into the mental constructions of a different linguistic community and then, possibly, with a modification of one's own constructions. This process often goes along with some problems in communication that need to be negotiated e.g. when so called "critical incidents" occur. This means that not only the speaker of the foreign language needs to adapt his or her personal system of meaning making, but that the native speaker also needs to transcend his or her own

concepts. This insight leads to abandoning the ideal of the native speaker in favour of the *intercultural speaker* (see e.g. Kramsch 1993, Byram 1997). Michael Byram has used Kramsch's ideas to establish the construct of *intercultural communicative competence* in order to model the knowledge, skills and attitudes which are relevant in communicating successfully with speakers of a different language (Byram 1997).

Since the turn of the millennium concepts of intercultural learning have been criticized for focusing on "culture" as the only significant line of difference in the communication of speakers of different cultural and linguistic backgrounds. Concepts of intercultural learning have been blamed to promote an idea of culture that implies a static, homogenous system (e.g. Fäcke 2006, Volkmann 2010, Delanoy 2013).

Wolfgang Welsch's often cited essay "The Puzzling Forms of Culture Today" supplies a philosophical basis for *transcultural* approaches. In these approaches culture is understood as an internally diverse, flexible system which is in a constant process of change and re-negotiation (Welsch 1999). Culture is understood as an open system that is internally differentiated and thus hybrid. Even if Welsch's ideas have found wide recognition in the didactic community the debate over the relation of inter- and transcultural learning and the didactic consequences of following one or the other concept is ongoing (e.g. Fäcke 2006, Volkmann 2010, Delanoy 2013).

Transcultural approaches share some important ideas with postcolonial and diaspora studies. Homi Bhabha, one of the most prominent postcolonial scholars, promotes the idea of *situatedness* – a concept that is congruent with Welsch's understanding of culture as *internally diverse*. The notion of *hybridity* on both the individual and the social level is central to Bhabha's works (e.g. Bhabha 2004) and Welsch also sees cultures as hybrid due to global interconnectedness (Welsch 1999).

The transcultural approach turns away from seeing cultures as clearly separate. The same holds true for the notion of hybridity that reveals binary group oppositions distinguishing between "us" and "them" as reductionist and dysfunctional. One of Bhabha's central objectives is overcoming processes of binary group distinction that frequently go along with negative associations concerning a different group – referred to as "othering" in postcolonial studies (Bhabha 2004). For Wolfgang Welsch this kind of distinction simply does not mirror social realities in highly differentiated societies (Welsch 1999).

The aspect of intracultural diversity is specified in Avtar Brah's model of diaspora space (Brah 2005, 91). She sees culture as encompassing the spectrum of experiences, modes of thinking, feeling and behaving as well as the values, norms and traditions of the social group(s) to which people belong. Culture is a symbolic construction of the array of a group's experiences. According to Brah it is:

- an embodiment and chronicle of the group's history
- always linked to material conditions
- marked by socio-economic conditions
- evolving through history and a mirror of power-relations

Consequently, different groups in society have different cultures, whereas similarities can be found under common socio- economic conditions (e.g. workers from different Commonwealth countries in Great Britain). Brah stresses the importance of class and its intersectionality with other factors such as gender and religion within cultures in her approach. Brah adds a procedural aspect to her concept of culture. She understands cultural reproduction as cultural transformation through processes of selecting, modifying and transforming (Brah 2005, 91). Thus Brah's notion of diaspora space is congruent with Welsch's understanding of culture as being internally diverse and in a constant process of change. The didactic consequences of these ideas will be discussed in the next section.

Cosmopolitanism and Cultural Learning in the EFL-classroom

Reframing the goals of cultural learning in the EFL- classroom from a cosmopolitan perspective calls for locating the underlying understanding of culture in the debate around inter-and transcultural learning. The model of cosmopolitan communicative competence takes up the idea of intercultural learning that a communicative “third place” is necessary in the communication of interlocutors – especially those from different linguistic and cultural backgrounds. At the same time ccc understands cultures as internally diverse and subject to change rather than as stable entities that are clearly separable. The construct applies an intersectional approach to understanding individual and social identity as suggested by Avtar Brah. Moreover, the construct uses Delanoy’s dialogic approach which also encompasses elements from inter-and transcultural learning (Delanoy 2008, 178-180). According to Delanoy partners in a dialogue need the general insight that all human viewpoints are shaped by a socio-cultural context and that they are thus always limited. Like Bhabha he applies the term *situatedness* to describe socio-cultural embeddedness (Delanoy 2008, 178).

In spite of the limitation of individual perspectives because of their *situatedness* Delanoy sees human beings as capable of widening their understanding by (self-) critically turning to other viewpoints (Delanoy 2008, 178; also see discussion on subject-context relation in Fäcke 2006). According to Delanoy an ideal dialogue is characterized by the equality of interlocutors, if this is not the case the gradual elimination of hierarchies is a central goal. Dialogue is seen as an open and continuing process – a creative act in which disparate elements need to be related to each other in order to construct new meaning/understanding. –To achieve this aim the dialogue has to be kept alive by participants who have the ability to critically distance themselves from their own position. Irritation and contradiction should be seen as possibilities to develop their scope of action and reflection. The partners in communication attempt to co-construct a new and shared culture (Delanoy 2008, 178).

Cosmopolitanism and Life-Writing: Merging pedagogic and EFL-specific goals

A life-writing approach that combines students’ autobiographic texts and transnational English literature offers rich didactic potential to achieve general pedagogic goals and EFL-specific goals of promoting cosmopolitan communicative competence. Life-writing assignments in which students share information on their linguistic disposition, their places of belonging and their personal experiences with migration and mobility offer a representation of the students’ lifeworld. The learning community is offered insights into diversity in their own classroom by representing students’ own experiences in creative texts. The experience-based assessment of diversity in the local sphere can be used as a basis for comparison with perspectives in literary texts that represent the discourse sphere of the target- language (for the model of discourse spheres see Hallet 2002). The model of first and second order differences developed by Mary Kalantzis and Bill Cope offers a basis for establishing categories that are relevant in shaping students’ experiences as well as those of literary characters.

In promoting cosmopolitan communicative competence **transnational English literature** can be considered especially valuable. In my study the term transnational English literature is understood to refer to literary texts written in English whose scope of objectives expands the nation state as a frame of reference. It can be seen as literature of the “contact zone”, as it has been introduced by Mary Louise Pratt in the context of postcolonial studies. She understands the contact zone as “the space of colonial encounters, the space in which people geographically and historically separated came into contact with each other and established ongoing relations usually involving conditions of coercion, radical inequality and intractable conflict” (Pratt 1992, 6 qtd. in Eckstein 2007, 14). Literary scholar Lars Eckstein has argued that the use of this metaphor can be extended to an understanding that “includes all kinds of cultural encounters from colonial days to the ubiquitous exchanges in today’s

globalised world” (Eckstein 2007, 14) and in this wider sense it can also be applied to literature. Transnational English Literature, as it is understood in my study, is frequently written by authors who are immigrants to English-speaking countries, or live in former British colonies. The authors of transnational English literature are often highly mobile individuals who move back and forth between different English-speaking and non-English speaking countries. Those writers who live in the diaspora – like many writers of Indian descent - “focus particularly on issues relating to (multiple) identity, transculturality and the difficulties of belonging”(Dengel-Janic in Eckstein 2007, p. 147). The role of English is frequently reflected from a postcolonial perspective in these works. Despite its high degree of diversity transnational English literature is a category united and distinct from other kinds of literature by the use of English as a shared language and its association with English-speaking countries.

Central Aspects of Cosmopolitan Communicative Competence

Even if the model of Cosmopolitan Communicative Competence is more comprehensive I will focus on three essential competences concerning situatedness in this article. These are ***assessing situatedness***, ***negotiating situatedness*** and ***negotiating intersituatedness***. To assess the situatedness of a person or a literary character means to gain an in-depth insight into the most important factors characterizing his or her individual and social belonging. In order to make this abstract concept accessible for students the model of first and second order differences developed by Mary Kalantzis and Bill Cope is used in my study. Mary Kalantzis and Bill Cope distinguish two sets of categories that are important for understanding peoples’ identities. These are “first order differences” (or “lifeworld attributes”) and “second order differences” (or “gross demographics”). First order differences should help to understand an interlocutor as “the person they have become through the influence of their family, their local community, their friends, their peers and the particular slices of domestic or popular culture with which they identify” (Kalantzis & Cope 2009, p. 21). According to this model, first order differences can be subdivided into three categories: “life narratives” (experiences, places of belonging, networks), “personae” (affinities, attachments, interests, values, worldviews, dispositions) and “styles” (learning, discursive or interpersonal styles).

Second order differences are those lines of difference that place individuals in social groups. According to Kalantzis and Cope second order differences can be subdivided into three categories: “material” (class, locale, family); “corporeal” (age, race, sex, sexuality, physical and mental abilities) and “symbolic” (culture, language, gender, identity, group affiliation) (Kalantzis & Cope 2009, p. 15). This model is applied as a tool to assess the situatedness of literary characters. Students use the model as a basis for analyzing literary characters and as a guideline for creating the characters of their own fictional texts. Thereby the ability to negotiate situatedness is practiced in the safe space of fiction. Students can learn how different perspectives and experiences influence the development of a character by modeling characters and stories based on scenarios provided by the teacher. In the main study this competence was assessed by analyzing students’ creative writing assignments. The main study was conducted in an English honors class of eleventh grade students. One assignment was to write a fictitious dialogue of a British-Pakistani character with her psychologist. The character is a young woman named Miriam from Qaisra Sharaz’ short story “A pair of jeans”. Miriam has been hiking with her university friends and returns home in her hiking clothes which do not cover her midriff. Her future in-laws – who are scheduled for a visit – arrive early and see Miriam in these clothes. Miriam and her mother are ashamed and worried that this type of clothing is not acceptable for the in-laws. At the same time the protagonist becomes angry when her mother sends her to her room to change because she feels uncomfortable rejecting part of her personal identity. It was the students’ task to create a dialogue in which the psychologist explains some of the conflicts that arise at

this point in the protagonist's development and to give her advice on a potential strategy for dealing with the situation.

The negotiation of intersituatedness is also practiced in the form of a fictitious scenario. In the main study students were asked to use the model of first and second order differences to assess the situatedness of Amitava Kumar – as presented in an excerpt from his autobiography “Bombay-London-New York”. This analysis was then used as a basis for creating the first character for the students' story. Then the students created another character that could mirror aspects of their own identity. The two characters were to meet in a medium-sized town in the state of New York and fall in love with each other. Students established some guidelines that are significant for writing a short story and created their texts. The didactic concept behind this approach was to create a fictitious scenario in which the use of English as a global language becomes relevant for both characters and in which different aspects of belonging have to be negotiated in order to reach a common understanding. Engaging in a relationship is of course a very intimate situation that may reveal many conflicts as well as options for reaching common ground. Thus a love story was chosen as a basis for the assignment.

Findings

In the pilot phase of the study the teaching approach was used in two classes of twenty-five students each in a teaching unit encompassing 15 English lessons. These students were eleventh graders at a German *Berufskolleg* (vocational school) aiming to achieve a *Fachabitur* (qualification that allows entry to universities of applied sciences) in the field of health/social services. At this point in time students' life-writing assignments were used along with the film version of Jhumpa Lahiri's transnational English novel “The Namesake”. The representations of student experiences in the life-writing assignments were used as a basis for comparison to those of the characters in the film. The model of first and second order differences was not yet part of the teaching approach. The results were evaluated on the basis of teacher observations and lesson protocols. In the course of the teaching unit enhanced student activity and an increase in achievement could be shown for many of the students with a migrant background. Some students reported that their motivation improved, they showed an increase in classroom participation. A lot of those students for whom migrant experience was significant showed improved motivation and better achievement in the written test while many of the students without migrant experiences could not profit equally.

In the main study, the method was changed to accommodate the findings of the pilot study. The model of first and second order differences was added to provide an analytical tool helping students to assess their own situatedness and that of literary characters. Furthermore the sample was reduced to only one group of seventeen students to allow for an in-depth qualitative analysis of the different students' products and the development of cosmopolitan communicative competence. The teaching unit was conducted in an English honors class in grade 11. The class of 17 students was taught over a time-span of six weeks and twenty-five lessons. Different written products and transcripts of classroom discussions are currently analyzed on the basis of a coding system which mirrors different aspects of cosmopolitan communicative competence.

MAXQDA 12 is used as supporting software. Interrater- reliability could be improved from 68-75% to 91-98% by holding a coding conference in which central coding rules were discussed and specified. Since no fixed segments were established in advance coincidental congruence is estimated to be zero (see MAXQDA 12 Referenzhandbuch, 150) so that no further calculation of a Cohen's Kappa value is necessary.

In the coding system each relevant category is divided into a scale of three attainable levels of competence. The coding manual consists of twelve categories that cover the areas of knowledge, skills and attitudes. Those competences that are related to the areas of knowledge and skills are measured in the student products and transcripts of audio data. The underlying attitudes can only be reconstructed by scrutinizing the level of competence expressed in the area of skills. The coding rules for the category “assessing situatedness” are presented below in order to grant an insight into the system of categories and its structure:

Assessing Situatedness	Application of the Model of First and Second Order Differences
ability to assess situatedness : basic	applied if character’s situatedness is assessed on the basis of two first or second order differences
ability to assess situatedness: good	applied if character’s situatedness is assessed on the basis of two first or second order differences and/or a differentiated assessment of the significance of certain categories for understanding the character’s situatedness is given
ability to assess situatedness: advanced	applied if character’s situatedness is assessed in a differentiated manner that balances the different factors of relevance and includes a comparison with the situatedness of a different character or the perception of other characters on the basis of that character’s situatedness is explained

First results show that there is a relation between students’ ability to assess situatedness and their ability to negotiate situatedness and intersituatedness. While a good to advanced competence in assessing situatedness is an essential precondition for achieving a high level of competence in negotiating situatedness and intersituatedness (in a fictional text). Yet, a highly developed competence in assessing situatedness does not result in a good or excellent ability to negotiate situatedness or intersituatedness in all cases.

One hypothesis to explain these findings is related to the field of attitudes. In comparison to the *analytic assessment* of situatedness the (fictional) *negotiation* of situatedness and intersituatedness calls for a greater willingness to accept the limitations of perspective that go along with situatedness. What is even more, the negotiation of situatedness and intersituatedness calls for an attitude that accepts the relevance of potentially conflicting points of view (see e.g. Frederking 2008).

These first ideas on the findings of the study require further in-depth investigation. This will be provided by an aggregation of the collected and coded data. Codings will be summarized using Philipp Mayring’s approach of qualitative content analysis. Mayring’s approach was adapted as suggested by Steigleder (Aguado/ Heine 2013) to accommodate the needs of research in the EFL-classroom. The summaries will form the basis of nine case studies selected from the initial sample of seventeen students. The most relevant criterion for the choice of cases is a complete set of products because the study aims to chart the development of cosmopolitan communicative competence of each student. A complete set of products is highly relevant to accomplish this detailed study of individual development of ccc. Comparing the development of ccc in the different cases will hopefully serve to show mechanisms that enhance or inhibit the development of cosmopolitan communicative competence.

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REGIONAL COLLABORATION IN FALL PREVENTION – HEALTH CARE STUDENTS’ PILOT STUDY

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ABSTRACT

Research on fall prevention has been made plenty in Finland, but in health care education the issue has not been brought out enough. This paper describes the theoretical background and the research methods of this ongoing pilot study AKESO. The purpose of this pilot study is to investigate health care students’ learning experiences and knowledge of fall prevention and evaluate how the theoretical knowledge can be integrated into the practical knowledge during the clinical practices period. This students’ pilot study at Savonia University of Applied Sciences (Savonia UAS, Kuopio, Finland) is a part of the Regional Fall Prevention Network’s (RFPNetwork) operation. The data of this pilot study will be collected in three phases. The first data collection is at the beginning of the theoretical course, the second during and after the simulations and the third after the clinical practice. The results will contain about 30 health care students’ learning experiences from the fall prevention education. This pilot study produces new information for the educational development work in fall prevention to ensure that already during education students are given enough evidence-based knowledge and practical experiences about how to prevent falls.

INTRODUCTION

In health care fall prevention work is an essential part of the patient-evidence based care (Pearson, Wiechula, Court, & Lockwood, 2005). Falls are an important cause of harm in care in Finland (National Institute for Health and Welfare, 2016). In health care education fall prevention has not been brought out enough. Health care workers and students, who will come to work in this field, are key persons of fall prevention work. This means that they have to gain enough understanding about the fall related risk factors, knowledge of the methods and tools used in avoiding fall prevention, and experience in guiding and counselling the clients.

In health care teaching has been developed more to the direction where theoretical knowledge and practical skills are integrated in authentic learning environments. This pedagogy can be based on the philosophy of integrative learning and connective training (Griffiths, & Guile, 2003; Tynjälä, 2008). The integration between theoretical knowledge and practice can be promoted by using simulation learning, which is an authentic learning situation for health care students. Simulation based teaching in fall prevention has not been studied broadly yet.

This paper describes the theoretical background and research methods of this ongoing pilot study AKESO, the purpose of which is to develop more effective ways to teach and motivate health care students in patients fall prevention. The aim of the study is to promote and deepen students' knowledge of health promotion, fall prevention and foster application of the knowledge to work. Long term clinical implication in the future will be safer patient care and effective fall prevention in all patient and customer care situations.

INTEGRATIVE PEDAGOGY

The pedagogy of the AKESO pilot study is based on the philosophy of integrative learning and connective training (Griffiths & Guile 2003; Tynjälä, 2008). Integrative pedagogy is a teaching principle that connects the basic elements of expertise. On an individual level, these elements are theoretical knowledge, practical expertise, self-regulation skills development and socio-cultural information, which are manifested on a wider scale in the workplace. (Tynjälä, 2008.) This philosophy has previously been used in development work related to practical training situations in health care among health care students (Koskinen, & Äijö, 2012; Äijö & Sirviö, 2013).

Integrative pedagogy integrates theory and practice (Tynjälä, 2008). Theoretical knowledge includes information and facts about fall prevention, and the learning methods used are traditional, such as teaching using lessons, books and research articles. It is the responsibility of health care professionals to put this theoretical knowledge into action in their own workplaces. Among students, integrative simulation situations at universities and authentic learning experiences from clinical practice placements or inter-professional fall prevention campaigns combine theoretical, practical and reflective elements of learning. Combining practical and theoretical information requires that students and health care professionals have self-regulation information. Self-regulation information includes a person's own learning habits, awareness of competence needs, and one's own operational models with patients or customers, for example how to recognize and discuss the risk of falling and fear of falling with customers in different kinds of situations and environments. Socio-cultural knowledge consists of the unwritten rules of the work placement, as well as the tools and equipment used. (Tynjälä, 2008.) The Figure 1 illustrates the pedagogical model of AKESO pilot study.

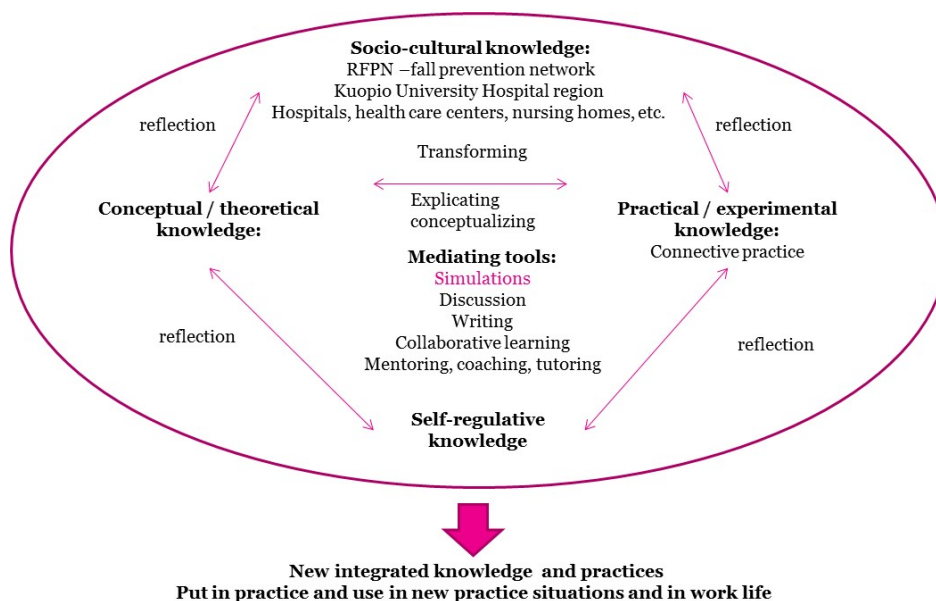


Figure 1: Pedagogical model of AKESO pilot study (adapted and modified by Tynjälä, 2008)

SIMULATION

Simulation as a comprehensive learning method

Simulation is an artificial representation of a real-world process to achieve educational goals (Seropian, 2003). It is both an experiential learning method and a technique which amplifies guided experiences that evoke or replicate aspects of the real world in a fully interactive manner (Gaba, 2007). In health care education simulations allow participants to practice and learn principles in a controlled environment that will prepare them for the safe administration of real health care to patients (Saunders, 1997).

The base of simulation pedagogy is on socio-constructivism and experiential learning; it enhances learning and helps to construct competence on the basis of the previous knowledge. Therefore simulation particularly suits to professional learning, where integration of discipline theory and practice need to be combined. (Dieckmann, Gaba, & Rall, 2007.) Practice simulations are useful for learning e.g. the most important or rare events of the profession and generally communication management. It is well applicable e.g. in gerontology nursing education, because it improves technical-, communication and problem solving skills, fosters overall confidence and helps to participate in multi-professional teamwork fluently. Moreover, it improves safety or quality of the given care and thus gives an opportunity to replace experience that are too dangerous or too difficult to do for real (Dieckmann, Gaba, & Rall, 2007).

There are plenty of different models for simulation e.g. virtual simulation, role play, skills practice and full scale simulation. Full scale simulations are comprehensive exercises which create all elements of a situation that are perceptible to the participant. Pedagogically the simulations should proceed gradually from easy to more difficult, focus on relevant issues and weed out the excessive elements of learning situations, as opposed to the many actual situations. Simulations also should make sense to the participant and convince that the experience is applicable in real life. In full scale simulation all

the steps are planned, the scenario is standardized and it always contains debriefing. Table 1 showed the planning main contains.

Table 1.

Planning of a full scale simulation scenario

The phase of planning	The content of planning
Setting learning objectives for the simulation	<ul style="list-style-type: none"> - 2-3 clear learning objectives (or outcomes) - the objectives show what learners are able to do after the exercise
Choosing the subject/topic for the simulation scenario	<ul style="list-style-type: none"> - the subject/topic supports the achievement of the objectives - is relevant for the level of students' competence: the students are prepared for themselves beforehand for the simulation with e.g. reading, test or questions
Practical solutions of the scenario	<ul style="list-style-type: none"> - the customer case; preliminary information and background of the customer/patient - the authentic environment, equipment, furniture etc. - choosing the simulator or coaching the standardized patient - step-by-step plan how the scenario proceeds - closing criteria
Planning for debriefing	<ul style="list-style-type: none"> - proceeding of debriefing - having a list for the questions to guide debriefing - adhering to the objectives

Practical flow of a simulation

Simulation exercise proceeds from the orientation and description of the situation (briefing) through the implementation of an exercise to the learning discussion (debriefing). During briefing the scenario is presented, the patient case introduced and the environment and equipment are showed. Briefing can also include a short mini-lecture of the key training issues.

For the simulations an authentic environment and atmosphere, e.g. a real customer situation, equipment and clothing, are important. Thus they can be carried out in a real environment, such as a gerontological care unit, or a simulation center, which is staged to fit a suitable caring environment. AV technology is essential for a full-scale simulation because it allows the facilitator in the cabin and other participants in the debriefing facilities to see the simulation from many perspectives, and the participants to act in peace without any interference. The technique also provides the participants with a video feedback of the simulation. The simulations can be carried out using patient simulators or standardized patients (SP). A highly sophisticated simulator or SP and actual equipment enhances patient contact and gives the participants a wider understanding of the particular case.

The duration of the simulation is usually about 10 to 15 minutes. During the simulation the facilitator encourages participants with convincing visual and auditory cues and clues and thus cognitively helps the participants that they do not have to manage everything by themselves. Even though simulation aims to create authenticity as perfect as possible, the perfect reality is not always desirable. Instead various kind of unreality can be used to promote learning. Participants can concentrate on learning a

few things, while the facilitator limits the details and stimuli, which certainly would not be the case in real situations.

A number of models exist incorporating the debriefing. Conducting a formal debriefing the reflective process focuses on discussion in organized and nonthreatening way. Debriefing stimulates learning and helps identifying the elements that possess educational value and are relevant to the learning objectives of the simulation scenario. Therefore the participants are able to evaluate the situation and learn from their self-analysis as well as from the discussion with others. (Fanning, & Gaba, 2007.) The often busy clinical area rarely allows time for such discussions.

According to studies, simulations are more effective than traditional teaching. They allow combining the theory and practice (e.g. Bambini, Washburn, & Perkins, 2009; Mould, White, & Gallagher, 2011), promote the acquisition of skills (e.g. Reilly. & Spratt, 2007), and self-confidence (Baillie. & Curzio. 2009; Blum, Borglund, & Parcells, 2010). They will also improve decision-making (e.g. Cant, & Cooper, 2010, Kaddoura, 2010), as well as interaction and cooperation skills (Baker, Pulling, McGraw, Dagnone, Hopkins-Rosseel, & Medves, 2008; Fruscione, & Hyland, 2010). It should also be noted that the possibility of making mistakes in safe conditions reduces errors in the treatment of real patients (Cant, & Cooper, 2010).

METHODS

Study part of the Regional Fall Prevention Network

The AKESO pilot study is part of the Regional Fall Prevention Network's (RFPNetwork) operation (Nursing Research Foundation, 2015). The network began its operation in May 2012. RFPNetwork operates in the region of Kuopio University Hospital (KUH) district. KUH is responsible for specialized medical care for almost one million people in Eastern and Central Finland and the RFPNetwork covered most of the KUH region at the end of 2015. The network has grown since 2012 to comprise 30 members from 11 organizations or groups of organizations. RFPNetwork member organizations represent different kinds of hospitals, health centers, nursing homes, homecare or educational organizations in the area (Tervo-Heikkinen, Holopainen, Haatainen, & Miettinen, 2014).

The objective of RFPNetwork is to bring together professionals whose activities can have the greatest influence on fall prevention. The RFPNetwork is a multi-professional group with the aim of promoting prevention of falls and fall-related accidents in the whole area. Network members represent many professions, such as physicians, nutrition therapists, lecturers, researchers, physiotherapists, patient safety managers, registered nurses, osteoporosis nurses, nursing managers, pharmacists, clinical nurse specialists, emergency field directors and development managers. Some of the members have joined the network because of their own interest to improve patient safety. Others have been invited because they have valuable expertise on the topic.

The aim of the network is to support evidence-based work by searching and producing consistent practices and guidelines. The main objective is that the number of falls and fall-related accidents will not increase in the area. An important part of the network is to organize training courses for the staff in their region and do collaboration with the educational organizations. This collaboration supports in health care education evidence-based teaching in fall prevention. Also designing and developing simulations demands continuous co-operation with experts from the education and health care organization. Savonia University of Applied Sciences (SUAS) actively co-operates with the Kuopio University Hospital (KUH) with the development of gerontological care education.

Participants and data collection

The participants of this study will be 30 health care students from Savonia University of Applied Sciences, who participate in a gerontological nursing course in spring 2016. The data for this study will be collected in three phases. The data of the study's phase 1 will be collected from the students' small group thematic discussions at the beginning of the gerontological nursing course (Denzin & Lincoln, 2000). The students are asked to discuss their previous understanding about environmental and personal factors related to falls and fall prevention. The data of the phase 2 will be collected by observation of the simulations and by using a thematic analysis of the educational debriefing (Denzin & Lincoln, 2000). The phase 3 data will be collected by using an electronic diary where the students reflect on their experiences about fall prevention after the clinical practice (Östlund, Kidd, Wengström, & Rowa-Dewar, 2011).

The permission to conduct the pilot study was obtained from the Savonia University of Applied Sciences. Informed written consent will be taken from all participants after full explanation of the nature, purpose, and procedures used in the study. The participants will be informed that individuals' names will not be used in any documents of the study and they are free to withdraw from the study anytime. The data of pilot study will be collected and analyzed during the spring 2016. The results of the pilot study will be published in national and international journals.

CONCLUSIONS

The integrative pedagogy model offers a theoretical framework for this AKESO pilot study. Simulations, as a teaching method, will be a critical factor which supports integration between the theoretical knowledge and practical skills among health care students. This pilot study will produce new information to the educational development work in fall prevention to ensure that already during education students are given enough evidence-based knowledge and practical experiences about how to prevent falls. Also new teaching methods will motivate students to study fall prevention among old people.

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EEG MIND READER 1.0 AS A PART OF COMPLEX MEASURING METHOD (CMM) FOR EDUCATION

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ABSTRACT

In the Complex Measuring Method (CMM) two devices are used together simultaneously: Neurosky MindWave and TOBII T120 connected together with the Health Science and Health Promotion Research Group (HSHP-RG) - MindReader 1.0 application running on a Microsoft Windows 7 based personal computer, thus the recorded data of both devices get the timer stamps from the same source, therefore the received data (TOBII & EEG) can be compared easily and exactly. Studies based on TOBII eye-tracking device, researchers still cannot answer one of the most important question: when the eye is on a fixation point for a long time, the subject is thinking (concentrating), or just relaxing for a while? Using CMM, we can answer this question, following up the appearance of fatigue and differentiate the required concentration levels for the same exercise for different pupils.

INTRODUCING CMM

The Complex Measuring Method (CMM) is a methodological tool for education, developed by our research group: Health Science and Health Promotion Research Group (HSHP-RG) working at College of Kecskemet. The basic idea was to connect the existing eye-tracker tools with a portable, easy-to-use EEG device. The CMM makes possible to record the eye movement and the EEG-signals in real time, therefore researchers can describe the connection between the recorded eye movements and its neurological backgrounds (Devosa, Maródi, Grósz, Buzás, & Steklács, 2015). Why is this so important for a pedagogical researcher? CMM can answer important questions about the reading process, including one of the most important one: when the reader fixated for a long time on an area (word, picture etc.), it happened because of trying to understand the meaning, or it was just for stop for relaxation (Maródi et al., 2015). Therefore the CMM could help summarising the real problematic and difficult parts of textbooks (Maródi & Devosa, 2015), which should be important part of assessments and evaluation of future textbooks (Devosa, 2014).

PARTS OF CMM

The CMM contains four essential parts:

- NeuroSky MindWave
- TOBBI T120
- HSHP-RG MindReader 1.0
- Personal Computer running Microsoft Windows 7

Details of NeuroSky MindWave

NeuroSky MINDWAVE: is a simplified EEG machine based on a personal computer running any of the following operating systems: Windows: XP, Vista, Windows 7, Windows 8, Windows 8.1, or MacOS : 10.7.5, 10.8.x, 10.9.x, 10.10, 10.11. With the bundled softwares this tool of brainwave technology is mostly used for playing, and the educational researchers use to record attention levels during the math, memory and pattern recognition exercises. Lots of softwares (games, educational softwares etc.) can be downloaded from the official site of the device: <http://store.neurosky.com/>

On figure 1 a pattern registration sample exercise can be seen. During the solution process, the subject is wearing the EEG device therefore the data is being recorded continuously.

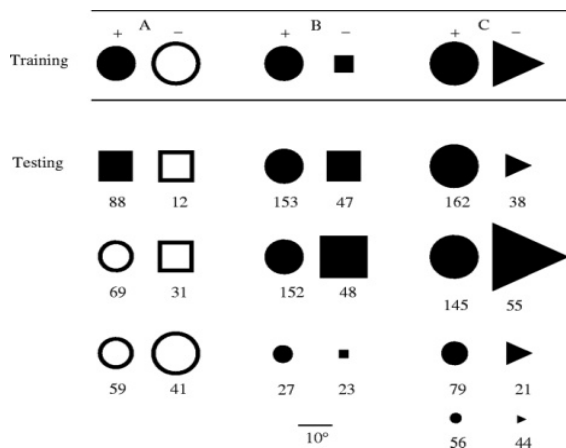


Figure 1: Pattern recognition sample

The device itself is ideal for researches working with young pupils, because: easy to carry and handle, light, children like how it looks, easy to buy and cheap to replace, if something happens with the device in the classrooms.

Sensors can be found on the arm of the device (figure 2):

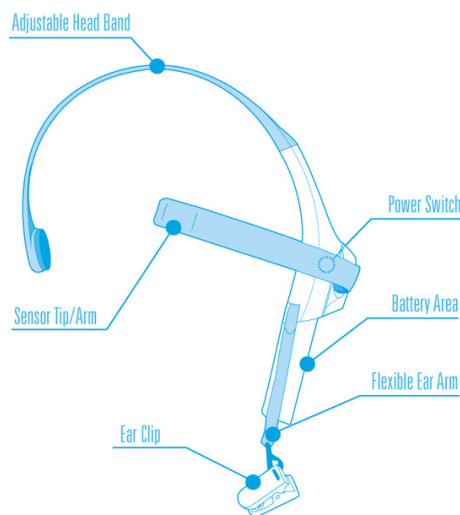


Figure 2: Sematic look of MindWave

The device has two sensors which are connected to forehead and ear clip. These sensors can gain strong enough power to detect raw EEG signals (Alpha, Beta, Gamma, Delta waves). For researchers the attention, meditation levels, blink time – which are calculated data – are the most important (Sałabun, 2014).

The list of record-available signals are below:

- Alpha, Beta, Gamma, Delta waves
- eSense meter for Attention
- eSense meter for Meditation
- on-head detection
- eSense Blink Detection
- blink detection (which can be a reference point to TOBII data - described later).

Specifications

- Weighs 90g
- Sensor arm up: Height: 225mm x Width:155mm x Depth: 92mm
- Sensor Arm down: height: 225mm x width:155mm x depth:165mm
- 30mW rate power; 50mW max power
 - - 2.471GHz RF frequency
- 6dBm RF max power
- 250kbit/s RF data rate
- 10m RF range
- 5% packet loss of bytes via wireless
- UART Baudrate: 57,600 Baud
- 1mV pk-pk EEG maximum signal input range

- 3Hz – 100Hz hardware filter range
- 12 bits ADC resolution
- 512Hz sampling rate
- 1Hz eSense calculation rate (NeuroSky, 2011)

Details of TOBII T120

TOBII T120 is a market leader brand in eye-tracking. The device is very popular among the educational and reading researchers (Steklács, 2015) because it makes quite precise assessment, and easy to setup. The TOBII T120 uses the technique called pupil centre corneal reflection (PCCR). The PCCR uses highly visible reflections caused by a light source to illuminate the eye (Senzio-Savino, Alsharif, Gutierrez, & Yamashita, 2011). An image of the eye showing these reflections are captured by a camera, which is then used to identify the reflection of the light source on the cornea (glint) and in the pupil. The gaze direction is calculated by the direction of vector formed by the angle between the cornea and pupil reflections combined with other geometrical features of the reflections. (See figure 3.)



Figure 3: TOBII device T120

TOBII T120 uses near-infrared illumination to create the reflection patterns on the cornea and pupil of the eye. Images of the eyes and the reflection patterns are captured by image sensors. Physiological 3D model of the eye with advanced image-processing algorithms are used to estimate the position of the

eye in space and the point of gaze with high accuracy (TOBII Library, 2015). (See figure 4.)

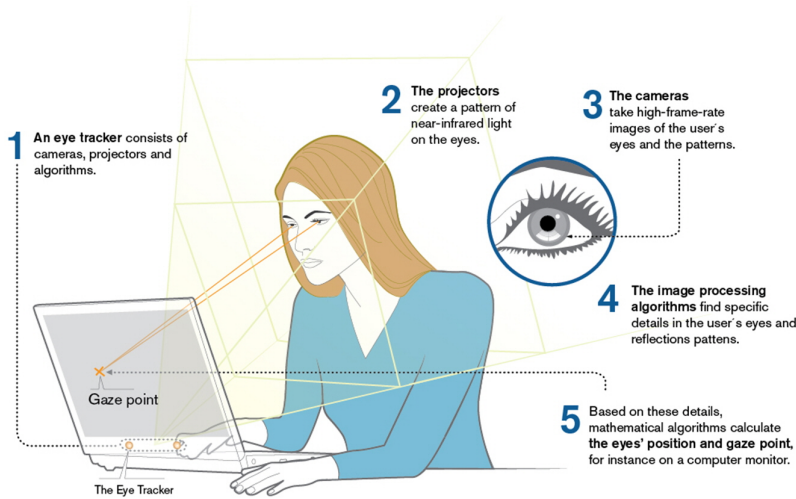


Figure 4: Working method of TOBII T120 (TOBIIpro Library, 2015)

Gaze plots and heat map

Gaze plot and heat map outputs generated by the TOBII T120 device (see figure 5) (Maródi et al., 2015), where dots represents the fixations graphically, where chubby dots specify a longer fixation period, and lines among fixations are marks the saccades. “Gaze plot” means all the fixations the subject completed on a particular illustration or webpage shown by screen shot markings (see figure 5).



Figure 5: Gaze Plot or Scanpath image.(Maródi et al., 2015)

Gaze Plots illustrates the total eye tracking gathering or numerous subjects in a tiny period. “Heat map” (Maródi et al., 2015) also visualize eye tracking information. (see figure 6)



Figure 6: Heat map image(Maródi et al., 2015)

A heat map demonstrates the quantity, and period of fixations by altered colours which subjects completed within certain areas. Green typically indicates the smallest amount of quantity of fixations or the shortest time, with altering levels in between green and red. If the subjects did not fixate in the region at all, a colourless area signifies it on a heat map. The colourless area could mean it may have been in their peripheral vision of the subjects (Maródi & Devosa, 2015).

Details of MindReader 1.0

MindReader 1.0 is programmed in C# language (uses .NET 4.5) by Health Science and Health Promotion Research Group, College of Kecskemét. This software is essential in our studies, because this application connects the EEG data and TOBII data together. Meanwhile many EEG + eye-reading studies are in progress, according to the read literature we could not find any, where scientist could solve the problems of easy caring devices, and the precise sample timing (Bensalem-Owen, Chau, Sardam, & Fahy, 2011). The basis of our idea was to have the both devices driven from the same timing source. Therefore we decided to use devices in our studies that can be driven from one PC together and quite easy to use. (Devosa et al., 2015), because in many cases the researchers visit the school, not the subjects the lab: it is much better for the pupils to stay in well-known environment during the experimental process. Therefore have had found the MindWave device, which has stream data format as output. Our MindReader runs on the same PC receiving the data, and marking it with time stamps, form the same source: the timer of the PC, hence researcher can compare the EEG and TOBII data easily and precisely (see figure 7).



Figure 7: Our idea: Complex Measuring Method (CMM)(Devosa et al., 2015)

The Mind Reader application has two important tasks to do:

1. receive the signals form MindWave tool, and displays it as a function therefore the researcher can immediately and obviously see the results;
2. write the values into a Microsoft Excel workbook for further analysis.

Inside MindReader 10

As all modern software development, the design – develop - test processes were done within an up-to-date software developing environment. Our group decided to use C#, as a programming language, hence the Visual Studio 2012 has been used to write the code (see figure 8).

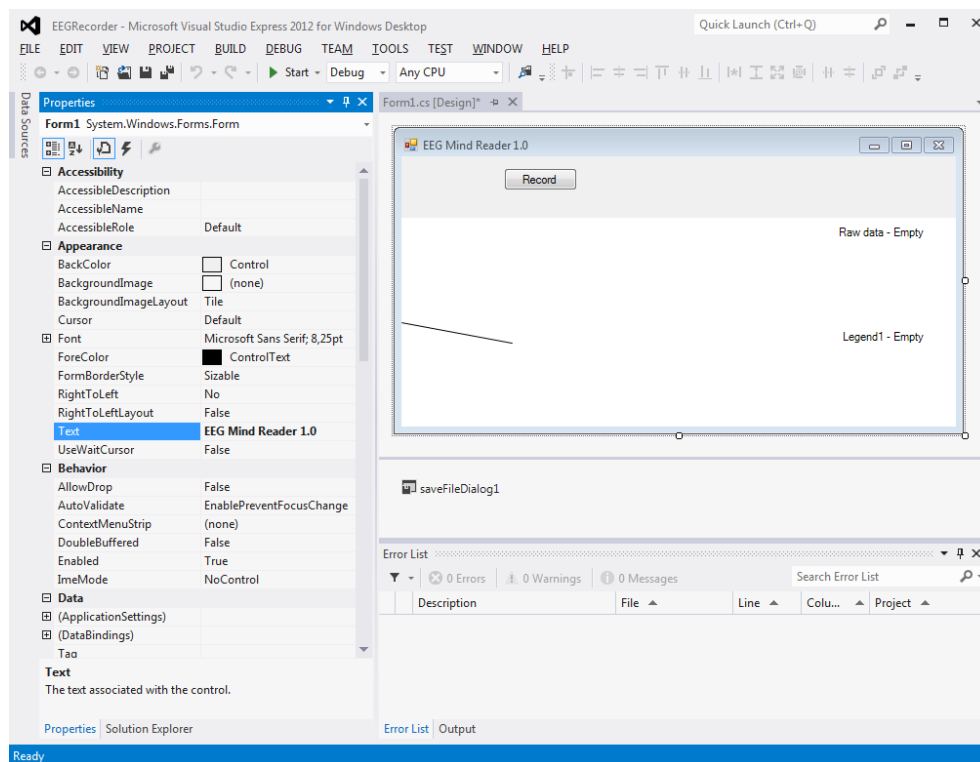


Figure 8: The developing phase of Mind Reader 1.0's GUI in Visual Studio

The software has a clear and simple GUI, to make the data recording process as simple as possible. One button implemented the GUI, which function changes according to the actual circumstances: record => save as => start => stop.

The software's displaying method uses the C# source code shown on figure 9. The software updates the displayed chart if any new signal received from attention or meditation data.

```

private void chartUpdate()
{
    while (!_shouldStop)
    {
        if (eegDataHandler != null)
        {
            object[] attention = eegDataHandler.attentionData.ToArray();
            object[] meditation = eegDataHandler.meditationData.ToArray();
            object[] raw = eegDataHandler.rawData.ToArray();
            if (attention.Length > 0 && meditation.Length > 0 && raw.Length > 0)
            {
                attentionMeditationChart.Invoke((Action)delegate()
                {
                    attentionMeditationChart.Series["Attention"].Points.Clear();
                    attentionMeditationChart.Series["Meditation"].Points.Clear();

                    for (int i = 0; i < attention.Length - 1; i++)
                    {
                        attentionMeditationChart.Series["Attention"].Points.AddY(attention[i]);
                    }
                    for (int i = 0; i < meditation.Length - 1; i++)
                    {
                        attentionMeditationChart.Series["Meditation"].Points.AddY(meditation[i]);
                    }
                });
                rawChart.Invoke((Action)delegate()
                {
                    rawChart.Series["Raw"].Points.Clear();
                    for (int i = 0; i < raw.Length - 1; i++)
                    {
                        rawChart.Series["Raw"].Points.AddY(raw[i]);
                    }
                });
                System.Threading.Thread.Sleep(50);
            }
        }
    }
}

```

Figure 9: Source code of displaying method of Mind Reader 1.0 in Visual Studio

The structure of the source code makes easy to develop our software in the future for the new requisites.

EXAMPLE RESULTS FROM PRE-TESTS OF CMM

During 2015 pre-test experiences were carried out using CMM. On figure 10, it is possible to see - at the lower left corner - MindWave 1.0 working in progress during a CMM experience held in a Kecskemét primary school.

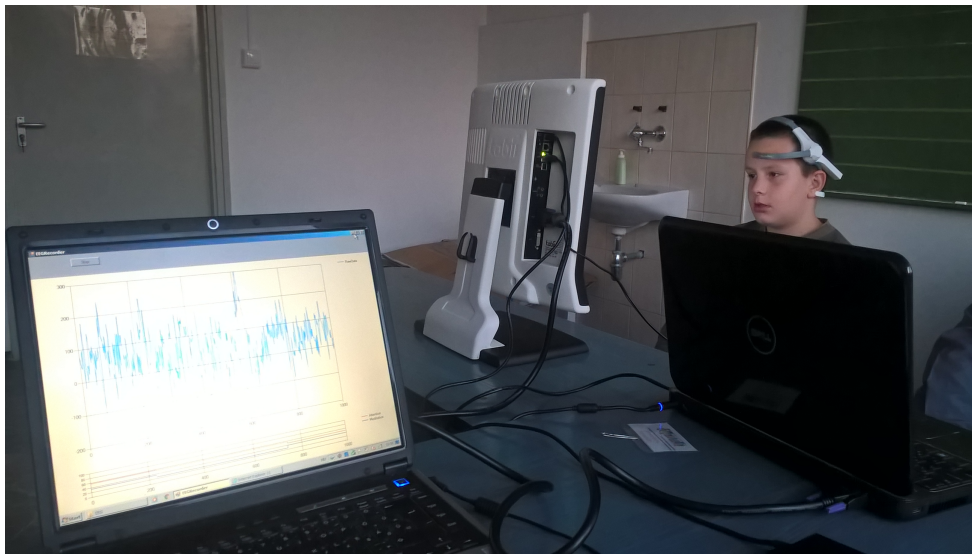


Figure 10: MindReader 1.0 in working in a CMM experience

The exercises were getting more and more difficult, in this paper two exercises are described and shown with MindReader 1.0. In the exercises the 10 years-old pupils had to find the correct route on the display of TOBII, according to the description and legend.

On figure 11 (exercise 1) a smoothed attention level record can be seen. We received quite noisy signals because of high sampling rate, that is why the smoothing. At „break downs” we believe the student changed among the exercise’s parts: the legend and the picture.

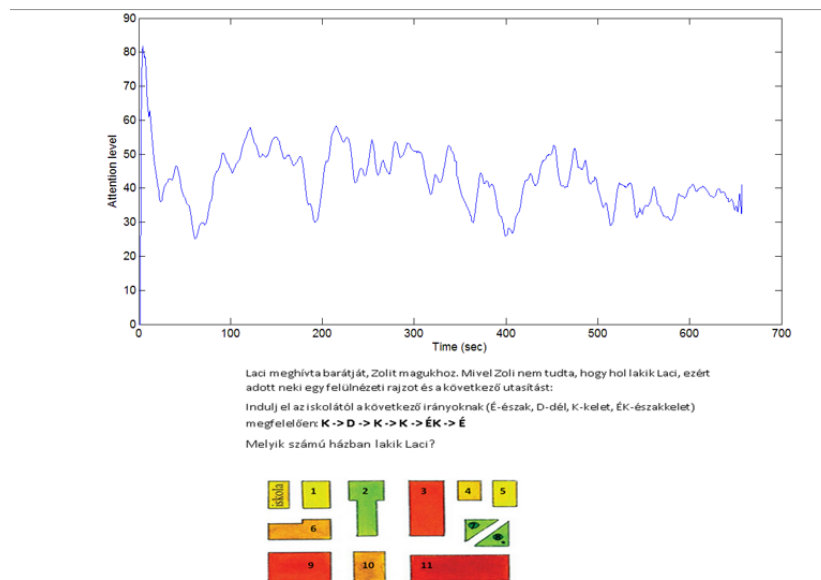


Figure 11: Exercise 1.

On figure 12 (exercise 2.) The pupil has to solve a same type exercise like the previous one. The researchers were interested in fatigue, which can be exactly recognized from the signals.

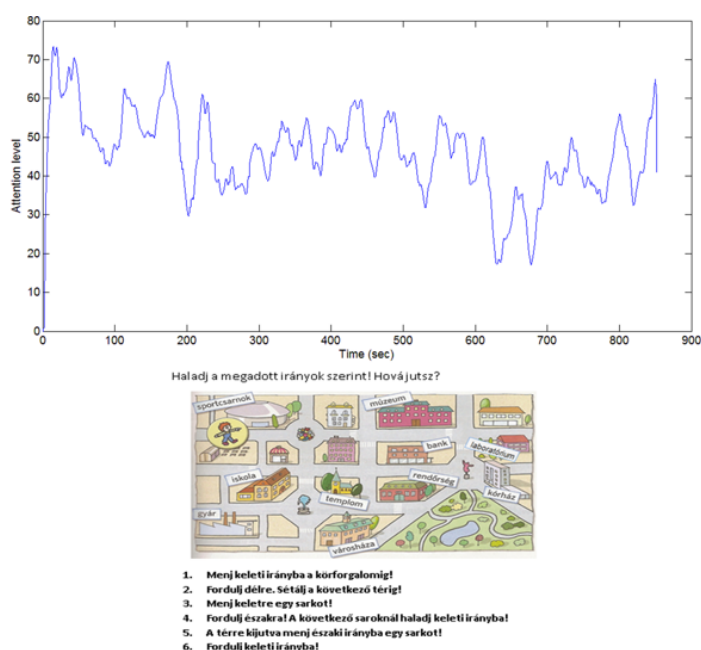


Figure 12: Exercise 2

The results of the preliminary experiences fairly shows that CMM methodological tool works as the designers planted it to work. According to the plans of Health Science and Health Promotion Research Group (HSHP-RG) the regular experiences will start in February of 2016, and by 2017 the CMM tool will be ready for assessment and evaluate the new teaching materials before they will be used in everyday education.

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COLLABORATIVE REFLECTION AND TUTOR'S ASSISTANCE IN TEACHER EDUCATION. TWO CASE STUDIES ON CASE-BASED REFLECTION SETTINGS

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ABSTRACT

This paper studies the functioning of collaborative reflection in a case-based reflection setting integrated in the teacher education Practicum. We carried out two case studies in which reflection was conducted collaboratively by 15 student teachers and one tutor. In each reflection process, we investigate the phases and the sequence of collaborative reflection and the assistance offered by the tutor in the different phases of the process. We identify consistent sequences and phases, with each phase being characterized by different types of tutor assistance. However, these sequences and phases differed clearly in the two cases studied, and the purposes that the tutors pursue through reflection were also different. Moreover, the sequences found did not conform to the patterns that some authors considered to be characteristic of good reflection. Our findings provide support to the idea posited by previous authors that there is no single specific sequence that defines good reflection, and that good reflection can take many different forms and have many different purposes.

REFLECTION IN TEACHER EDUCATION

Reflection is considered central in teaching and in teacher education programs today. Its incorporation within teacher education and the development of reflective skills are currently the focus of a great deal of research in this field, and many possibilities have been proposed (Buschor & Kamm, 2015; Kim et al., 2013). One setting that is becoming increasingly popular, especially when integrated in student teachers' practicums, is *case-based reflection*. Typically, this setting consists of presenting a real practice situation, on which a tutor and several student teachers conduct collaborative reflection (McCullagh, 2012; Tigelaar et al., 2008; Mauri et al., 2015). The general structure of this setting is well established, with several ways of presenting the situation for reflection (e.g., video recordings, written critical events, and direct observation), but it is far less clear how the process of collaborative reflection should be conducted in terms of the interaction of the participants and tutors' assistance (Gelfuso & Dennis, 2014). There are two main reasons for this lack of definition. First, the question of the exact nature and purpose of reflection remains controversial; and second, there is no consensus on how collaborative reflection should work, and how it should be assisted by the tutor.

Regarding the nature of reflection, for example, there is an ongoing discussion about whether successful reflection is defined by a unique sequence of phases (Korthagen, 2001; Gelfuso & Dennis, 2014) or, on the other hand, whether it can take many different forms without a pre-established sequence (Clarà, 2015; Tessema, 2008). Among those who defend the existence of a characteristic sequence, the most popular candidates are Korthagen's ALACT sequence (Action-Looking Back-Awareness-Creating-Trial) and a sequence strongly based on Dewey's (1933) writings termed Suggestion-Intellectualization-Idea-Elaboration-Testing (e.g. Gelfuso & Dennis, 2014). Nor is there a consensus on the intended purpose of reflection. Among the different positions are the Deliberative Approach, according to which reflection should contrast the situation of practice with academic knowledge (Theory with a big "T"); the Realistic Approach, which aims to generate personal theory (theory with a small "t") from reflection on practice; the Personal Approach, in which reflection is oriented to making hidden personal beliefs explicit and conscious; and the Critical Approach, oriented towards morally or ideologically eliciting and considering social, political and ethical issues through reflection. (Mansvelder-Longayroux, Beijaard, & Verloop, 2007; Korthagen, 2001). It has been argued that this disparity in the conceptions of the purpose of reflection is due to the pedagogical views underlying its orientation, which, fortunately and inevitably, are very plural (Korthagen, 2001).

The functioning of collaborative reflection has been approached from two main viewpoints. Most analyses have focused on ways of assisting individual reflection within a collaborative setting. For example, Korthagen (2001) studied the tutor's scaffolds which can assist each phase of the individual ALACT sequence, Harford & MacRuaric (2008) studied how to prompt and structure dialogue among peers in such a way that their collaboration fosters reflection, and Wopereis, Sloep, & Poortman (2010) studied how certain tools (in their case, blogs, but other researchers have studied portfolios, simulation tools, etc.) can be used to promote individual reflection within a collaborative setting. In parallel, a smaller body of research has built up around the study of reflection as a collaborative process – that is, collaborative reflection as a reflection process in itself, and not only as a collaborative setting that supports individual reflection. This approach takes participants' joint activity as a unit of analysis. From this perspective, for example, Tigelaar et al., (2008) studied and identified different *interaction types* in processes of collaborative reflection: e.g. Clarifying, Interpreting, Judging, Explaining, etc. Korthagen (2001) also explored this kind of approach, and proposed a sequence of collaborative phases in reflection: Experience – Structuring – Focusing – theory (note that theory is written with a small "t").

In this paper we study collaborative reflection in case-based reflection settings, starting from three premises: 1) reflection is approached as a collaborative process – that is, we aim to study collaborative reflection as a reflection process in itself, by adopting social units of analysis; 2) successful reflection may have many different purposes; 3) successful reflection may take many different forms and sequences.

The study pursues two research objectives: first, to understand how processes of collaborative reflection are structured and evolve, and second, to understand the tutor's role within these collaborative processes

METHOD

Design, setting, participants and data

In view of these premises and objectives, we adopted a multiple case study design. Since we were open to (and interested in) a diversity of forms and purposes of reflection, we studied eight cases in which the reflection was guided by eight different tutors, at three universities in culturally different areas in Spain (Andalusia, Basque Country, and Catalonia). In all instances a similar case-based reflection setting was used, but no indications were given to tutors regarding the guidance they should give (except that they should offer opportunities to students to participate and talk).

In all three settings, the case-based reflections were carried out at the university during the students' practicum period. The situations to be reflected upon were real events experienced by the participants in their practicum. Each student selected one situation or event during her practicum that she wanted to discuss in the collaborative reflection; she wrote a description of it, and read it out loud in the case-based reflection setting. After this, the collaborative reflection process began. In the eight cases, between 10 and 15 student teachers and one or two tutors took part. There was a minimum of five consecutive sessions lasting approximately 90 minutes each. One, two, or sometimes three situations were reflected upon in each session.

We videotaped the first five sessions of all cases. These videotapes constitute the main data for analysis, but we also interviewed the tutors before and after the five sessions in order to gather data on the purpose they were pursuing when guiding collaborative reflection.

Analysis

We applied two analytical techniques to the videotaped data: Interactivity Analysis and Content Analysis. Interactivity Analysis (Coll, Onrubia & Mauri, 2008) is a technique for the analysis of joint activity in educational settings, strongly based on the idea of participation structures (Erickson & Schulz, 1997), which uses social units of analysis. The aim of applying this analysis to our data was to characterize and understand the phases of collaborative reflection occurring in each process of collaborative reflection. In short, this analysis involved three steps. First, we identified *chunks* of interaction which functioned as units; second, we coded each of these units of interaction by means of inductively created categories which described "what the participants are doing together"; third, we described each of these units of interaction according to the structure of turn-taking among the participants.

Content Analysis is a technique which permits reliable coding of large amounts of qualitative data, so that the data are in some sense simplified and can be more easily processed and managed (Krippendorff, 1980; Clarà & Mauri, 2010). We applied this technique to identify the different forms

of assistance offered by the tutor at the various phases of the reflection process. The unit we used to apply the codes was the turn. The system of categories was inductively created from the data themselves (Gerbic & Stacey, 2005), and inter-rater procedures were successfully conducted to establish the reliability of the system (for all the dimensions, in the last version of the system, the rate of agreement was above 75% in independent coding of 30% of the data). The system of categories included three dimensions of assistance: 1) Assistance with the dialogic nature of conversation (seven categories); 2) Assistance with the interpretation of the situation (10 categories); 3) Assistance with linking theory and practice (six categories).

RESULTS

In this paper we present the results of two cases, which we will call Case 1 and Case 2.

Case 1

In Case 1, 15 student teachers and one tutor participated in the reflection. In the interview, the tutor described the aim while guiding the reflection process as to encourage the students to identify internal contradictions or dilemmas which may explain why the situation took place in the way it did. In the five sessions analysed, the participants reflected on eight different situations (two in the first session, two in the second, one in the third, one in the fourth, and two in the fifth).

In the global consideration of the five sessions, Interactivity Analysis makes it possible to identify a general pattern of collaborative reflection composed by four phases: Clarification-Exploration-Focalization-Interpretation (Table 1).

Table 1
General structure of collaborative reflection (Case 1)

Structure:	Clarification	Exploration	Focalization	Interpretation
Interaction:	Sr-S-Sr-S	T-S-S-S-S	T-S-T-S	T
Total time in the five sessions (eight situations):	27 m.	59 m.	125 m.	34 m.
% of total time (weight):	11%	24%	51%	14%

The *Clarification* phase is devoted to clarifying aspects of the situation presented for reflection. In this phase the interaction is typically centred on the student who has presented the situation, to whom the other students direct their questions one after the other; thus, the turn-taking structure can be represented as Ss-S-Ss-S (where Ss is the student who presented the situation, and S are other students). The *Exploration* phase is devoted to exploring different, independently considered, aspects or problems of the situation under reflection. Typically, these aspects are considered one after the other. For example, in a situation describing a conflict between teachers about how to situate students in a classroom (one teacher, in one subject, wanted to situate them in pairs, while another teacher, in a different subject, wanted to situate them in groups of four), one aspect was “the problems that the

continuous re-organization of the classroom may cause for children's learning", and another aspect was "the difficulty some teachers find in using collaborative methodology", etc. The turn-taking structure in this phase was open, and typically no participant became the centre of the conversation. The turn-taking structure can be represented as T-S-S-S (where T is the tutor and S are different students). The *Focalization* phase focuses on internal tensions or dilemmas which may be underlying the situation, creating tension between aspects usually explored in the previous phase. For example, in the situation mentioned above, a tension exists "between methodological stability in the class and teachers' autonomy". In this phase, the turn-taking structure is typically centred on the tutor and can be represented as T-S-T-S... (where T is the tutor and S are different students). Finally, the *Interpretation* phase is devoted to establishing a plausible interpretation of the situation, based on the clarification of the main dilemma or internal tension which explains it. Typically this is done by means of a monologue by the tutor, with little intervention from the students. Taking the five sessions together, the phase which was given most time was *Focalization*, with 125 minutes (51% of the total collaborative reflection time). Just under a quarter of the time was given to *Exploration* (59 minutes, 24%), 14% to *Interpretation* (34 minutes), and the 11% to *Clarification* (27 minutes). If we look at the different collaborative reflection processes separately, we find that the general structure presented above is quite consistent over the five sessions and eight situations reflected upon in Case 1 (Table 2). The sequential order of the different phases was consistent in all the reflection processes. The full sequence was found in four instances; in two others one phase was missing (situation 5 lacked Clarification and situation 7 lacked Exploration); the remaining two instances lacked two phases (Clarification and Interpretation, in 1 and 2). In all instances, the phase with the most time was Focalization, although in 2 and 3, Exploration and Focalization were given the same amount of time.

Table 2
Phases of collaborative reflection in each situation (Case 1)

	Clarification	Exploration	Focalization	Interpretation
Situation (session)	% total time	% total time	% total time	% total time
1 (1)	--	31%	68%	--
2 (1)	--	50%	50%	--
3 (2)	11%	31%	31%	27%
4 (2)	33%	14%	33%	19%
5 (3)	--	14%	67%	19%
6 (4)	18%	21%	43%	18%
7 (5)	38%	--	48%	14%
8 (5)	16%	26%	31%	26%

Content Analysis identified certain types of assistance which were characteristic of some of the phases of collaborative reflection in Case 1 (Table 3). In the Clarification phase, the tutor offered no

assistance at all; however, he offered assistance in the Exploration phase. The most frequent forms of assistance in this phase were: Opening up the conversation to others, to encourage the participation of more students in the conversation; and Reminding students of the interpretative character of reflection, to avoid evaluative and judgemental attitudes. In the Focalization phase, the most frequent forms of assistance were: once again, Opening up the conversation to others; Considering students' contributions when the tutor contributes to the conversation – for example, highlighting what one student has said; and Fostering students' identification of dilemmas, usually by means of provocative questions or interventions. In the Interpretation phase, the most frequent forms of assistance were: Considering students' contributions and Identifying explanatory dilemmas in the situation, in which the tutor himself highlighted, identified or explained these dilemmas or internal tensions.

Table 3
Typical forms of tutor's assistance in each phase (Case 1)

	Clarification	Exploration	Focalization	Interpretation
Typical assistance on Dialogic Conversation		Opening the conversation to others	Opening the conversation to others Considering students' contributions	Considering students' contributions
Typical assistance on Interpretation		Reminding participants of the interpretative character of reflection	Fostering students' identification of dilemmas	Identifying explanatory dilemmas in the situation
Typical assistance on linking Theory and Practice				

Case 2

In Case 2, as in Case 1, 15 student teachers and one tutor participated in the reflection. In the interview, the tutor identified the purpose in guiding the reflection process as to generate academic knowledge by approaching the practical situation being reflected upon from the perspective of Theory. In the five sessions, participants reflected upon five different situations.

In the global assessment of the five sessions analysed, as in Case 1, Interactivity Analysis identified a general pattern of collaborative reflection composed by four phases, although these phases were clearly different from the ones found in Case 1. The phases identified in Case 2 were: Clarification-Exploration-Theoretical Discussion-Synthesis (Table 3).

Table 4
General structure of collaborative reflection (Case 2)

Structure:	Clarification	Exploration	Theoretical Discussion	Synthesis
Interaction:	Ss-S-Ss-S	T-S-S-T	T-S-S-S-T	T
Total time in five sessions (five situations):	10 m.	237 m.	60 m.	8 m.
% of total time (weight):	3%	75%	19%	3%

As in Case 1, the sequence of collaborative reflection in Case 2 began with the phase of *Clarification*, followed by *Exploration*. However, in Case 2, the turn-taking structure of the Exploration phase was slightly different; in this case the conversation was more centred on the Tutor, though not excessively so. Typically, the tutor's intervention was followed by interventions from several (though not many) students; then the tutor summarized or considered what these few students had said and restarted the conversation. Thus, the conversation was organized as a succession of short pieces of open conversation between students, which were marked and controlled by tutor's interventions at the beginning and end of each short piece. This can be represented as T-S-S-T... (where T is the tutor and S are different students). The *Theoretical Discussion* phase was devoted to working out theoretical knowledge, previously learnt by the students in other subjects, by using the situation to exemplify and examine Theory. The turn-taking structure was similar to that of the previous phase, that is, T-S-S-T... Finally, the *Synthesis* phase was aimed to provide an integrated and coherent view of what had been said and established in the previous phases. The turn-taking structure typically comprised a monologue by the tutor, with little intervention by the students.

Taking the five sessions together, the phase which was given the most time was, by a long way, *Exploration*, with 237 minutes, or 75% of the total collaborative reflection time. *Theoretical Discussion* was given 19% of the total time (60 minutes), and *Clarification* and *Synthesis* only 3% each (10 and 8 minutes respectively).

Table 5
Phases of collaborative reflection in each situation (Case 2)

	Clarification	Exploration	Theoretical Discussion	Synthesis
Situation (session)	% total time	% total time	% total time	% total time
1 (1)	----	58%	42%	----
2 (2)	5%	95%	-----	----
3 (3)	----	57%	33%	10%
4 (4)	----	100%	----	----
5 (5)	11%	69%	15%	5%

Looking at each reflection process separately, we find that the order in which the four phases appeared was quite consistent, but that they did not always appear (Table 4). In fact, the four phases only appeared all together in one instance (5); in one instance there was only one phase (Exploration in 4), and in two other instances there were only two (Exploration and Theoretical discussion in 1, and Clarification and Exploration in 2). However, in all instances the emphasis (in terms of time) was clearly placed on the phase of Exploration, which was the only phase that appeared in all the reflection processes in this case.

Regarding tutor's assistance, we identified some characteristic types in each of the four phases in Case 2. The most typical form of assistance in the *Clarification* phase was Considering students' contributions when the tutor contributed to the conversation. The most typical forms of assistance in the *Exploration* phase were Considering students' contributions (once again); Opening the conversation to others in order to foster the participation of more students; Reminding participants of the interpretative character of reflection; Identifying new aspects of the situation, in which the tutor highlighted or proposed a new aspect and asked the students to consider it in their reflection; Fostering the students' identification of new aspects of the situation, in which, instead of proposing the new aspect directly, the tutor gave clues, suggestions, or questions so that the students themselves identified new aspects to be incorporated in the reflection; Identifying links with other situations, in which the tutor established similarities or comparisons between the situation under reflection and other situations; and Identifying links with academic knowledge, in which the tutor pointed to relationships between the situation and aspects of Theory. The most typical assistances offered in the *Theoretical Discussion* phase were: Considering students' contributions; Opening the conversation to others; Requesting clarification from a student about her opinions or views; Identifying new aspects of the situation; and Fostering the students' identification of links with academic knowledge, in which, instead of the tutor identifying these links (as she typically did in the previous phase), the tutor now gave clues or questions to encourage the students themselves to identify new links with their academic knowledge. Finally, the most typical forms of assistance that the tutor offered in the *Synthesis* phase were: Considering students' contributions; Reminding participants of the interpretative character of reflection; Identifying new aspects of the situation; Reminding participants of the interpretative

framework of reference, in which the tutor emphasized theoretical frameworks or ideas that the students had worked on in other subjects; and Identifying links with academic knowledge.

Table 6

Typical forms of tutor's assistance in each phase (Case 2)

	Clarification	Exploration	Theoretical Discussion	Synthesis
Typical assistance in Dialogic Conversation	Considering students' contributions	Considering students' contributions Opening the conversation to others	Considering students' contributions Opening the conversation to others Requesting clarification from a student	Considering students' contributions
Typical assistance on Interpretation		Reminding participants of the interpretative character of reflection Identifying new aspects of the situation Fostering the students' identification of new aspects of the situation	Identifying new aspects of the situation	Reminding participants of the interpretative character of reflection Identifying new aspects of the situation Reminding participants of the interpretative framework of reference (e.g. constructivism)
Typical assistance on linking Theory and Practice		Identifying links with other situations Identifying links with academic knowledge	Fostering the students' identification of links with academic knowledge	Identifying links with academic knowledge

DISCUSSION

In this paper we have presented two different case scenarios where collaborative reflection was conducted in a case-based reflection setting in teacher education. Our analysis has allowed a qualitative description of each case, in terms of: 1) the purpose of collaborative reflection; 2) the phases and sequences of reflection; and 3) the forms of assistance that each tutor typically offers at each phase of the collaborative reflection process. In Case 1, the purpose of reflection was to identify the internal contradictions or dilemmas which explain the situation under reflection. Collaborative reflection in this case consistently followed a sequence of Clarification, Exploration, Focalization and Interpretation. The Focalization phase was the one with the greatest weight in this sequence, at least in terms of time. No assistance was offered by the tutor in the Clarification phase, and in the other phases the assistance was typically devoted to encouraging students' participation of and including them in the conversation, maintaining the interpretative (not evaluative) focus, and promoting the identification of dilemmas and internal contradictions in the situation. In Case 2, the purpose of reflection was to generate a better understanding of Theory by means of the reflection on practice. In this case, collaborative reflection followed a sequence of Clarification, Exploration, Theoretical Discussion, and Synthesis. However, although the order of these phases was followed consistently in Case 2, they rarely appeared all together in one and the same collaborative reflection process. Of these four phases, the one which appeared most and for longest was the Exploration phase. In Case 2, assistance focused mainly on including and considering students in the conversation, keeping an interpretative focus, promoting the identification of a multiplicity of important aspects in the situation under reflection, and promoting the identification of links between the situation under reflection and academic knowledge and other practice situations.

In the study of both cases, therefore, we found clear and consistent sequences of phases of collaborative reflection, characterized by specific and different types of assistance. The sequences of phases found in these two cases clearly differed from one another, and were also different from the ALACT sequence, the Suggestion-Intellectualization-Idea-Elaboration-Testing sequence, and the Experience-Structuring-Focusing-theory sequence (Korthagen, 2001; Gelfuso & Dennis, 2014). In our two cases, the tutors pursued clearly different purposes in their approach to the reflection. Thus, these findings support the idea that there is no single "normative" way to conduct collaborative reflection, and that it can take many forms in terms of both sequence and purpose. Moreover, these two cases also suggest that the specific sequence of collaborative reflection may be quite strongly influenced by the purposes of participants, especially in the case of those who have the responsibility and the authority to guide the process – in our cases, the tutors. Thus, although Clarification and Exploration were found to be the first two phases in both cases, the other two phases seemed to respond very closely to each tutor's declared purpose for reflection: in Case 1, Focalization was clearly defined by looking for internal tensions and dilemmas, and in Case 2, Theoretical Discussion was very strongly defined by working out theoretical knowledge. All this highlights the challenge of finding new ways of defining what good reflection is without relying on normative sequences and purposes, and underlines the need to find both new ways of studying reflection processes and new criteria to assess their quality.

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PRACTICE-BASED RDI COOPERATION IN HEALTHCARE LOGISTICS

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ABSTRACT

This paper is a description of the Healthcare Logistician project (2012-2013) funded by TEKES – the Finnish Agency for Technology and Innovation. It is part of their Innovations in Social and Healthcare Services programme, which aims to renew healthcare and social services and increase business opportunities. The project was implemented in cooperation with a private supplier of transport and logistics services, two regional hospital districts and Lahti University of Applied Sciences. The specific aim of the project was to define solutions for improving productivity in hospital logistics operations. The essential idea behind the concept of healthcare logistician was to free traditional healthcare personnel of the need to conduct logistics operations, enabling them to have more time for patients. As a result, the project created a new healthcare logistician service concept, defined the job description of healthcare logistician and set competence requirements for the new profession while simultaneously developing education for healthcare logisticians. The developed model was piloted in the operating room department of two specialised medical care hospitals during the project's lifetime. Since the project, the healthcare logistician concept has been implemented in several Finnish hospitals and the first group of healthcare logisticians has graduated.

HEALTHCARE LOGISTICIAN PROJECT

The need for healthcare services in Finland is increasing due to an ageing population. At the same time, financial resources are decreasing. A great deal of change in the structure of tasks is occurring within organisations. Many traditional, and even recent professions, are about to disappear or change, leading to an increased need to develop and update the adult population's professional skills. (Työelämä 2020.) This means that healthcare services also need to be developed and healthcare organisations have to find new and more efficient operating models. Healthcare logistics would enable that by strengthening logistical operations and allowing nurses to concentrate on nursing. Eskelinen (2006) has estimated that approximately 25 % of a nurse's tasks are purely support-service based tasks, including many logistics tasks. Additionally, Graban (2012) has pointed out that nurses' time cannot be wasted by having them do logistics tasks. Recognising the need to rebalance their tasks – to move nurses away from support services and to improve the productivity and efficiency of healthcare logistics operations – the Healthcare Logistician project was implemented. The aim of the project was to create a new healthcare logistician (HL) service concept, a new profession, define a job description and set competence requirements for it as well as develop education for healthcare logisticians. The essential idea behind the project was to free traditional healthcare personnel from the need to conduct logistics operations, enabling them to have more time for patients.

The Healthcare Logistician Project (2012-2013) was funded by TEKES, the Finnish Funding Agency for Technology and Innovation, as part of their Innovations in Social and Healthcare Services programme, which aimed to renew health and social services and increase business opportunities. The project was implemented in cooperation with a private supplier of transport and logistics services, Uudenmaan Pikakuljetus Oy, two hospital districts and Lahti University of Applied Sciences (Lahti UAS). Uudenmaan Pikakuljetus Oy is the market leader in healthcare deliveries in Finland. During the HL project, it was a part of the global DSV group. Since the beginning of September 2015 it has been owned by PostNord, which is the leading supplier of communications and logistics solutions to, from and within the Nordic region. Despite the acquisition, DSV Healthcare Solutions is continuing the development of the HL operating model as part of their healthcare logistics service concept. The main role of the logistics suppliers was to define the HL service concept and develop their own healthcare sector services.

The partner hospital districts of the project were the Päijät-Häme Social and Healthcare Group (PHSOTEY), especially the Päijät-Häme Central Hospital in Lahti, and the Healthcare District of Southwest Finland, especially Turku University Hospital. The hospital districts and the healthcare practitioners' contribution to the whole project idea and the implementation of the project was essential. Their contribution was especially focused on the definition and description of the new profession and their role was extremely important, particularly in empirical data collection and analysis, defining the role and tasks of healthcare logisticians, and piloting the HL model in the operating rooms of the hospitals. The operating room departments of specialised medical care hospitals, which accept emergency operations, represented the most challenging environment for testing the model.

The development work done by healthcare organisations and the healthcare distributor was supported by Lahti UAS. Lahti UAS is a multidisciplinary higher education institution. One of its goals is to develop the region's working life and promote regional competitiveness in close cooperation with private and public sector organisations. As a higher education institution, the role of Lahti UAS was to define the competence requirements of the new HL profession and to create its education.

NEED FOR THE PROJECT

The background for the development of the HL concept was based on the generally identified need to develop public sector healthcare in Finland as well as in Europe. The development of professionally executed logistics services is seen as one possibility for ensuring the availability of needed resources and high quality healthcare services in a cost-efficient way. In Finland, there is no possibility to use 25% (€1.7 billion) of the €6.8 billion total annual nursing costs to support these services. The needs of the project are considered from the perspectives of: 1) healthcare organisations, 2) healthcare service providers, and 3) higher education organisations.

From the healthcare organisations' perspective, there was a market need for a HL model. The essential idea behind the concept of healthcare logistics was to free nurses from having to concentrate on logistics tasks – distributing medical supplies, operation control, purchasing and supply chain management – and allow them to be nurses. In addition, there is a need to enable nurses to spend more time with the patients while performing medical duties, plus healthcare organisations are under pressure to reduce costs and save time. For example, in large Finnish hospitals the annual costs of logistics services are about €20,000 per hospital bed and about €11,000 to €12,000 in regional hospitals (Javanainen 2014). In a Canadian study (Bendavid, Boeck & Philippe 2010), it has also been estimated that many common sources of inefficiencies in the healthcare sector, such as the hospital over procurement of medical supplies, storage location multiplicity, losses due to outdated products and nursing staff spending valuable time on non-value-added activities, have pressured hospital administrators into looking for SCM solutions.

The HL concept was based on a study by Keskinä (2007), an anaesthesia nurse with long experience of working in operating room logistics at Päijät-Häme Central Hospital. His findings were that the organisation of logistics functions and the descriptions of those functions are insufficient for the specialised, modern healthcare industry. In essence, the education of personnel conducting healthcare logistics is inadequate, and full-time employees who are educated in logistics are sorely lacking in knowledge about healthcare. Thus, the HL concept seeks to guarantee an unbroken flow in the care process, free up staff to undertake other duties, and also enhance the management of stock and the supply chain. In addition to healthcare organisations, *healthcare service providers*, such as logistics and ICT service providers, need to develop their business and service concepts as well as to look for innovation opportunities. For private companies, project-based public-private partnerships offer possibilities for increasing the awareness of healthcare organisations, for creating competitive advantage through a deep knowledge of healthcare operations and for participating in the development of the healthcare sector. Due to the reform of the financing model of the *universities of applied sciences (UASs)*, and the growing competition between higher education institutions, the Finnish UASs have been forced to focus on the development of study programmes; research, development and innovation (RDI) activities; as well as the deepening of their cooperation with commerce and working life. Consequently, UASs need to promote regional development by educating professionals and by carrying out applied research that not only answers the needs of regional stakeholders but also serves to develop the UAS's education programmes.

RESULTS OF THE PROJECT

The project created a new healthcare logistician service concept and operating model, defining a healthcare logistician's job description and setting competence requirements for this new profession as well as developing education for it.

Healthcare logistician service concept/operating model

The aim of the HL concept is to free nursing staff from logistics tasks, minimise logistics work in healthcare organisations and to develop logistics solutions that ensure the service quality and flexibility of logistics services. In the HL service concept, the tasks of department logistics are given over to HLs who are educated for the purpose, but who also understand the special characteristics of a demanding healthcare environment (Fig. 1).

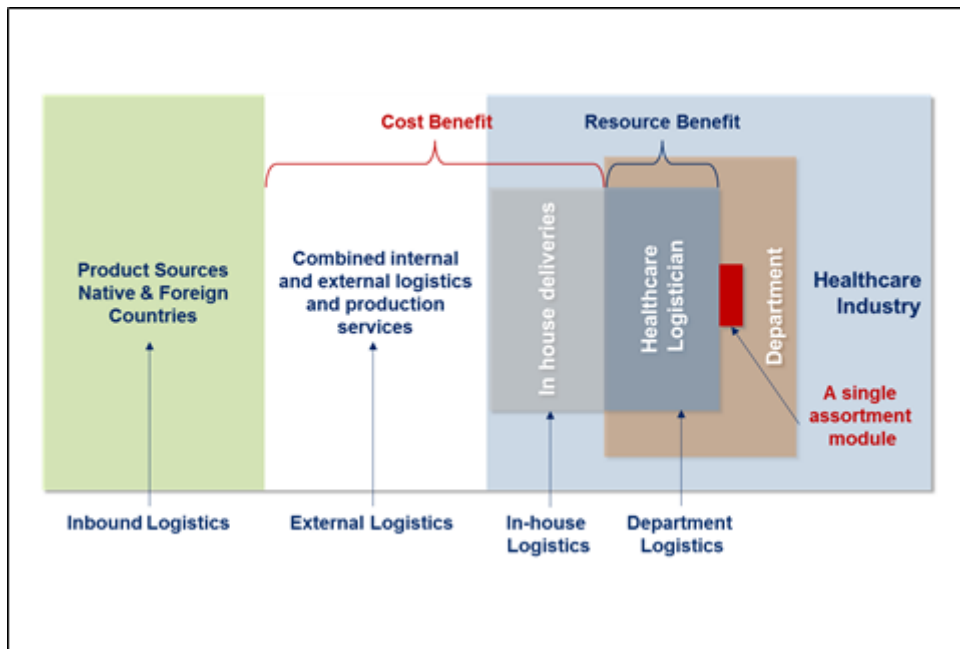


Figure 1. Healthcare logistician as a part of the logistics of healthcare organisations (Niiranen 2015).

In this service concept, healthcare logisticians support the work of healthcare professionals by taking care of the whole variety of supplies needed to perform patient care safely, so that all the supplies are in the right place at the right time, although they do not participate in nursing.

A HL service can be implemented in a variety of healthcare organisations and their units, and the level of implementation differs between organisations. Basically, the HL service concept can be implemented on three different service levels. At the lowest service level (shelving service), a HL orders the supplies from a central warehouse and from the suppliers, and takes care to ensure an adequate amount of supplies are stored on wards. Healthcare personnel fill in the second, minute and hourly availability of the items in the storage department of the operating room, and conduct the case picking for operations when required. On the next level (double-bin replenishment service), a HL takes care of the time critical availability items, but the healthcare personnel take care of the case picking for operations. A double-bin replenishment service is a support service used, for example, in operating rooms. On the highest service level (case picking service), the HL takes care of all picking and inventory maintenance on their wards – according to agreed guidelines, thus healthcare personnel can concentrate on taking care of patients. (Healthcare logistician project 2013.) In addition to availability and situational logistics tasks, HLs also cooperate closely with the in-house and external logistics operations of other healthcare organisations when planning order-delivery processes and creating the preparedness of the components and stock buffering, etc.

A new profession

Healthcare logisticians are logistical experts who are educated in the processes and practices of the healthcare industry. They understand nursing and speak the same professional language as nursing staff and logisticians. They understand the basics of risk management as well as the demands of aseptic activities and patient safety; they are able to effectively liaise with other specialists, guarantee that the necessary medical supplies are available at the right time, and promote the functionality and quality of the service chains. A HL is also a developer, a person who critically analyses logistics processes and functions and develops them.

The healthcare organisations need highly knowledgeable and qualified human resources to guarantee the quality of performance and patient care (Khobreh, Ansari, Dornhöfer & Fathi 2013). Working in the demanding healthcare environment, while supporting healthcare professionals in their work, requires a new type of combination of logistics and healthcare competencies and skills, which are based on the concepts of job-related (Cheetman & Chivers 1996 and 1998; Boyatzis 2008; Winther & Achtenhagen 2009; Bartlett et al. 2000) and professional competencies (e.g. Torr 2008). Due to professional competencies being context-dependent (e.g. Deewr 2007; Le Diest & Winterton 2005; Guthrie 2009; Mulder et al. 2007; Calhoun et al. 2002), their requirements differ not only between individuals but also between organisations. Thus the competence requirements create collective understanding and agreement on the professional requirements for the profession of healthcare logistician.

A competent HL masters his/her work processes by means of the methods, tools and materials available and while observing occupational safety. The competence requirements of a HL consist of 11 task-related competence areas: 1. Can plan and manage warehouse operations; 2. Can carry out orders; 3. Is familiar with duties connected to the delivery of supplies and shelving services; 4. Is familiar with duties connected to the collection of supplies and shipment processes; 5. Can establish a shelving service; 6. Is able to carry out stock management tasks; 7. Can ensure a safe working environment by storing and handling hazardous materials and chemicals safely; 8. Understands infection prevention and control as part of everyday practice and is able to work in accordance with best practices, an organisation's quality system, instructions and legislation; 9. Is able to plan and develop healthcare logistics and understand the role of healthcare logistics as part of the overall care process; 10. Has knowledge of acts, decrees, regulations and guidelines governing his/her work practices; 11. Can maintain and enhance customer and stakeholder relations. In addition to occupational skills, a HL needs interpersonal and personal skills, such as general working life skills, personal skills, language skills, and technology and information technology skills.

The above description of competence requirements is not a set of minimum competency requirements for all HLs in all healthcare organisations. It is more of a collection of abilities in order to perform tasks and duties in different situations. Such a large number of competence areas indicates the challenging content of the HL profession.

New education

One of the main challenges for implementing the HL service concept is the need to build trust between nursing staff and HLs. In general, formal education is seen as a guarantee of required knowledge and skills. Due to the particularly demanding work environments, existing logistics or healthcare education do not meet the high standards and requirements of healthcare logistics. Thus a special competency based HL education programme that combines logistics and healthcare education was developed during the project.

As a result of the project, Lahti UAS has piloted bachelor's degree level further education. The curriculum consists of six modules. The first module focuses on the HL service concept, the HL profession and competence identification. The second module analyses the role of a HL from the healthcare perspective. The third module examines the logistics opportunities that can improve an organisation's profitability, presenting a variety of methods to achieve the objectives. The fourth module deepens team and networking skills. The last two modules focus on workplace development in practice.

From the healthcare point of view, students should, for example, be familiar with healthcare legislation and be able to work in the field of legal requirements, regulations and guidelines, be able to reduce the risks of logistics activities that affect patient safety, be familiar with the principles of infection control and also know and identify their organisation's major products and categories.

From a logistics point of view, students should: understand logistics supply chain management and opportunities to influence the finances of their organisation through logistics; be able to plan and control warehouse operations; be able to monitor the consumption of products and take economic efficiency into account; understand public procurement regulatory objectives, guiding principles and their practical significance; understand LEAN thinking; be able to analyse logistics functions from the process point of view; and be able to identify future development areas. The advantage of bringing together different skills, knowledge and values helps educated HLs understand their role within a logistics' service chain and the care process. They should also be able to design, develop and evaluate healthcare logistics services and apply their expertise in practical projects.

IMPACTS OF THE PROJECT

In the following, the impacts of the project are analysed from four perspectives:

1. healthcare organisations,
2. healthcare service providers,
3. higher education organisations (Lahti UAS),
4. healthcare logistician students.

The biggest beneficiary of the project is the Finnish *healthcare sector*, especially the participating hospital districts. The biggest benefit of the HL service concept for hospitals is the ability to perform more operations in the same amount of time with fewer personnel. According to Katri Niiranen, Business Development Director, Healthcare at DSV Solutions, (DSV Healthcare Solutions 2015) the operating room department of Päijät-Häme central hospital was able to reallocate 10% of its staff elsewhere by implementing the HL operating model. At the same time, the new operating model improved productivity and generated cost savings by decreasing the time used to clean up and replenish the products used in the operating rooms. The HL service concept created cost savings by moving logistics activities away from expensive operating rooms, thereby freeing room capacity for more productive use. It is calculated that the potential savings at Päijät-Häme Central Hospital Operating Department were about €1.5 million a year (about 27 % of the total logistics costs). The benefits of the HL concept also standardises the use of supplies, reduces travel and search times, improves supply flows, increases efficient team working, clearly defines process ownerships, balances workloads, and results in better spatial use solutions, thereby improving quality and patient safety. In addition to the improved working methods and cost savings, the project offers important information to hospital districts regarding future development and the outsourcing of their logistics operations.

Since the project, several other Finnish regional hospital districts have started their own development projects for implementing the HL operating model or they are planning implementation activities. The ideas of the HL operating model have been implemented, for example, at the biggest hospital district

in Finland, The Hospital District of Helsinki and Uusimaa, where changes in the amount of stock resulted in annual savings of €3 million. (Javanainen 2014).

The hospital districts have also actively sent their staff members to the HL education courses organised by Lahti UAS. From the healthcare organisation's point of view, the education serves not only the staff members' personal goals, but also the needs of healthcare organisations by providing new perspectives on the development of their logistics operations and thus supports the implementation of the HL concept. It also offers possibilities for benchmarking. In fact, over 15 healthcare districts shared their best practices during the first two HL education programmes.

For logistics service providers the project created competitive advantage through the deep knowledge gained about hospital in-house logistics, the increased possibility to act as an interface between suppliers and hospitals and the opportunity to develop their own healthcare logistics solutions and services, such as the pre-packaging of medical supplies, for hospitals. It also created the possibility to build a strong working relationship with the pilot hospitals. On a national level, the project increased the healthcare customers' awareness of DSV. It also opened DSV's possibilities to participating in several new hospital planning projects. The project was also financially important to Uudenmaan Pikakuljetus Oy and the DSV Group as the total of new business created in 2014 was between €3 and €4 million. Now the HL service concept is offered as a part of the DSV Group's healthcare sector services in Finland and also in other European countries.

From Lahti UAS's point of view, the project offered the possibility to create the required further education skills and deepen cooperation with healthcare organisations, logistics suppliers, researchers and healthcare logistics practitioners. For example, HL education is carried out in close cooperation with the project partners. The project partners, DSV and Päijät-Häme Healthcare District, play important roles as visiting lecturers in the education programme. The project has led to other cooperation projects as well: Päijät-Häme Healthcare District participated in "Well-being in Logistics Centers" (2014-2015) implemented by Lahti UAS and Techvilla Ltd. and funded by the European Social Fund. At Päijät-Häme Central Hospital, the Well-being Project evaluated HL's well-being, provided suggestions on how to improve well-being at work, illustrated how the management level can improve their role, and proposed tools and models that simplify the evaluation of well-being at work.

For the researchers, the HL project offered a great opportunity to use multidisciplinary research and find new contacts and broaden their multi-professional network. The project also increased researchers' and teachers' understanding of healthcare logistics, and produced new teaching materials as well as offering research themes for researchers, not only at Lahti UAS but also at other universities and universities of applied sciences.

The first HL study group started in November 2013 with 14 students representing the regional healthcare districts and municipal healthcare organisations. They completed their education and graduated in November 2014. The second study group with 21 students started in March 2015 and the third group will start in autumn 2016. The HL education is especially aimed at nursing auxiliaries, practical nurses, warehouse employees, warehouse maintenance and instrument technicians interested in developing their careers. **For adult students**, HL education is a possibility if they would like to improve their competencies based on market requirements. It also offers the opportunity to change occupation and/or organisation, become more skilled and move to a higher position within an organisation. For university degree students, a HL education programme offers new bachelor level studies that can be taken at both universities and universities of applied sciences.

During the project's lifetime, several theses and student development projects have been completed at Päijät-Häme Hospital District (e.g. Höök 2013; Lahtero 2013) and in other hospital districts. The development project topics are decided on with the employer, i.e. the hospital district, based on its current needs. The development projects have mainly concentrated on developing in-house and department logistics operations, focusing on the different levels (shelving services, double-bin replenishment services and case picking services) of the support services that a healthcare logistician offers.

Development projects have included, for example, the expansion of an existing shelving service to other departments, an internal customer satisfaction survey of the shelving service, the implementation of a double-bin service for anaesthesia tables in operating rooms, and the harmonisation of ophthalmological patient operations guidelines.

DISCUSSION AND FUTURE DEVELOPMENT

The project was an excellent example of a new type of cooperation between private and public sector organisations in the demanding healthcare environment. The project was innovative with respect to the solutions proposed for practices and at the same time it expanded educational opportunities. It also created a new culture of sharing and multi-disciplinary cooperation. The Healthcare Logistician project was awarded the Finnish Association of Purchasing and Logistics (LOGY) Logistics Award in 2014. The award is presented annually for the development of extraordinary in-house logistics processes. The project and its results have been presented nationally and internationally at conferences and seminars as well as on the pages of professional and academic journals (e.g. Kotonen, Tuominen, & Kuusisto 2013; Kotonen & Tuominen 2014; Kotonen et al. 2014; Kotonen, Tuominen & Maksimainen 2015; Kotonen, Tuominen, Maksimainen, & Kuusisto 2015). The project was also noticed by Finland's national public broadcasting company, YLE, in 2014, when the first healthcare logisticians graduated.

Despite all the information gathered and the experiences gained and shared, the HL concept remains very new. Finland's hospital districts are still taking their first steps towards realising the potential of the HL model. According to Niiranen the Finnish hospital districts understand the potential of the HL concept but changes in a complicated healthcare environment take time (DSV Healthcare Solutions 2015). In addition to the pilot hospitals, at least seven other hospital districts are implementing the HL operating model and several other hospitals are planning its implementation. In the most progressive organisations, several healthcare logisticians are already working, whereas others are only considering the implementation of the model.

The importance of HL education has been identified by healthcare organisations because defined competence requirements and HL education decrease uncertainty, reduce resistance and increase confidence in the profession. By improving the professional levels of the participants, the goal of sustaining and guaranteeing a high quality of performance has been achieved. The achieved benefits thus influence the effectiveness of the processes and deliver excellence.

Although the HL concept has been tested and proven in Finnish hospitals, its efficiency has yet to be tested in other European healthcare environments in order to ensure its ability to create added value for patients outside Finland. Thus, the next step for the HL concept and education is to scale up to the European healthcare sector.

Improving healthcare logistics is a challenge for all partners. This new method for holding down costs and improving the quality of care needs to be recognised at the management level of healthcare organisations. This means understanding healthcare logistics as part of the strategic perspective of

organisational development and also focusing on the utilisation of the existing supply chain data. As Johnson (2015) has argued, healthcare organisations should understand the relationship between clinical and supply chain data and analyse that data to make smarter, faster, better decisions that result in predictive demand signals, quality patient care and positive outcomes.

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FLIPPED CLASSROOM APPROACH IN TEACHING MEDICATION CALCULATIONS: AN ACTION STUDY

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ABSTRACT

Nurses' ability to perform correct medication calculations is a basic qualification for every nurse and can be seen as a vital part of patient care and safety. However, both cognitive and affective mathematical challenges are evident internationally among nurses and nursing students. Satakunta University of Applied Sciences and Helsinki Metropolia University of Applied Sciences have co-produced Clinical Calculations online course (1 ECTS credit) for global needs. In this study, we used the online material of the course to conduct a flipped classroom approach for teaching medication calculations for beginning nursing students ($N_e=60$). Students felt that teacher's help and the online material were essential for their learning. The students in experimental group performed as well as the control group ($N_c=179$) in the summative assessment. However, due to students' meaningful learning experiences flipped classroom seems to be a promising approach for teaching medication calculations. Based on our findings, we have begun further development of the Clinical Calculations MOOC and our educational practices.

INTRODUCTION

Investigations of Grandell-Niemi et al. (2006) revealed that Finnish nursing students that were about to graduate as nurses within 3 months performed poorly in medication calculation skills test. While struggling with medication calculations nursing students may produce "minitheories" that include systematic errors such as "always divide the bigger number by the smaller one" (Huhtala, 2000). Many nursing students in Finland are also suffering from low mathematical self-efficacy and mathematical anxiety (Huhtala, 2000). Thus the educational challenge is both affective and cognitive by nature. According to Sherrieff et al. (2011) research studies have indicated that mathematical anxiety, negative attitudes and poor numeracy skills are evident internationally in the nursing population at both undergraduate and postgraduate levels. Also in Helsinki Metropolia University of Applied Sciences (where this study took place) the statistics show that many students struggle to pass their medication calculation tests.

In this study, we conducted a flipped classroom approach for teaching medication calculations for beginning nursing students at Helsinki Metropolia University of Applied Sciences. With such approach teacher should have more time for each student than in a traditional lecture-based approach (Bergmann & Sams, 2012). Especially, teacher should have more time to deal with students' minitheories and support mathematical self-efficacy by creating a co-operative and informal learning environment. Due to that, in this study the teacher committed himself to base his classroom sessions on instructional scaffolding (see Sawyer, 2005, p. 11) and all of the lecturing was replaced with online material.

RESEARCH QUESTIONS, ACTION DESIGN AND METHODOLOGY

Conducting the flipped classroom approach was motivated both by the need to develop our teaching and to develop the material produced for the online course. Thus, the study had two independent perspectives on user experience:

1. Students' experiences and views of the online material was surveyed for the development of Clinical Calculations MOOC. We were especially interested in students' experiences of the educational video clips produced for the online course. These clips simulated real life situations in health care environment and were directed by professionals.
2. Students' experiences and views of the flipped classroom approach was surveyed and their learning outcomes were compared to the control group. Studying this aspect gave enlightenment whether flipped classroom had potential as a teaching method in this specific case and how it could be improved.

This study can be seen as an action research as it emerges from practical and open ended development (see McNiff, 1995). The main author of this paper was also the teacher of the experimental and control groups and his reflection would play a role in further development. In educational settings action research can be seen as a systematic way to improve teaching practices (Pelton, 2010). According to Pelton (2010) phases of action research are:

1. Issue Identification
2. Data Collection
3. Action Planning
4. Plan Activation
5. Outcome Assessment

The issue identification was described in short in the introduction section. The data collection and the action itself is described in this section and the outcome assessment will be discussed in results section.

The main research questions of this study were:

1. How did the students experience the flipped classroom approach and their learning?
 - a. How did the students experience the online material?
 - b. How did the students experience the classroom situations and their workload?
2. Was there any difference in the learning outcome between the students of the experimental group and the students of the control group?

The students ($N_e=60$) who attended the flipped classroom course (the experimental group) studied the same content as the control group ($N_c=179$). Both the experimental group and the control group students were beginning nursing students at Helsinki Metropolia University of Applied Sciences and their learning goal was to learn basic methods needed in medication calculations. Both groups' classroom sessions were organized in about 30 students' groups and they had the same teacher. The students of the experimental group studied the online material beforehand and then attended the co-operative classroom sessions, whereas the control group studied by attending the lectures and doing take-home exercises.

The online material consisted of video clips and written material (PDF-files). The written material was meant as "support material" and it included mathematical methods needed (such as proportion equations and unit conversions) and typical medication calculation examples. A suitable textbook (Ernvall, 2005) was also appointed but using that was not mandatory and many students did not use the textbook and used the PDF-files instead. The students were asked to watch the videos - and read the material if needed - as a preparation for the classroom sessions.

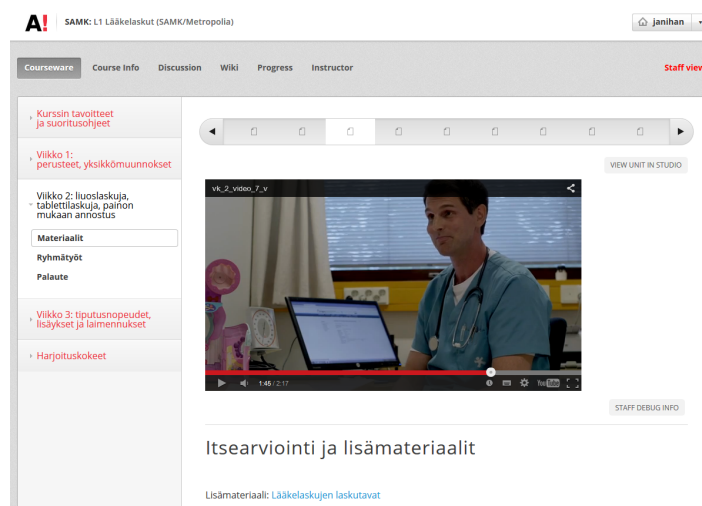


Figure 1: A video clip and the EdX platform.

The classroom sessions were organized so that students worked in groups to calculate typical medication calculations. This included helping each others and was based on cooperative learning (Jacob, cop. 1999). No correct answers were given as we wanted to emphasize the fact that in real life the calculations should be checked together with a colleague. Instead, the exercises were designed so that one pair of students for example converted milligrams to micrograms and the other pair converted micrograms to milligrams so that these calculations would check each other.

In action research, the outcome assessment might concentrate either on cognitive improvement or on affective change (Pelton, 2010). In this study we were interested in both cognitive and affective aspects. The groups were compared in terms of success in the medication calculation test at the end of the course. In addition, a survey was carried out for the flipped classroom group after the course. The response rate was 52 %. The students were asked to evaluate different factors on their learning (e.g. video clips, textbook, teacher's help etc.) in Likert scale. These questions were analyzed using descriptive statistics. In addition, open questions were asked in order to give more detailed information on how the students found the online material and the classroom sessions. The answers were analyzed using inductive content analysis (see Elo & Kyngäs, 2008).

RESULTS

We will first discuss the students' experiences that show for example that the classroom sessions were found very meaningful whereas the online material evoked much more ambiguous affects. Then we will discuss the comparison between the experimental and the control group in which the difference in learning outcomes was not statistically significant.

The students' experiences

In the survey, the students were asked to evaluate how important different parts of the course were on their learning. For example, the importance of online videos was asked in 5-point Likert-scale (1 = useless, 2 = somewhat useless, 3 = in between, 4 = somewhat useful, 5 = very useful). The frequencies and central tendencies are presented in Table 1.

Table 1
The students' evaluations of different factors on their learning

	1	2	3	4	5	No experience	Mean	Median
Online videos	4	4	7	7	6	3	3,3	3
Online PDF-files	0	0	1	9	16	5	4,6	5
Textbook	1	4	4	3	2	17	3,1	3
Classroom sessions	0	1	0	9	21	0	4,6	5
Extra homework	0	0	1	7	19	4	4,7	5
Working in groups	0	1	2	12	16	0	4,4	5
Teacher's help	0	1	1	2	27	0	4,8	5

The students found teacher's support the most important factor on their learning. The textbook-like online material (PDF-files) and the extra homework (calculation exercises) were also very important to them. The educational clips were found important for some students but some students reported that the clips had no effect on their learning.

The classroom sessions

The student's comments regarding the classroom sessions were divided in 3 classes:

1. Teacher's action and learning environment,
2. Implementation of the classroom sessions, and
3. Ideas on development.

These classes and subclasses are presented in Table 2. A positive comment on teacher's action for example was encoded as "Teacher's action +" and a negative comment on teacher's action was encoded as "Teacher's action -".

Table 2

The students' comments on the classroom sessions

Class	Subclass
Teacher's action and learning environment	Teacher's action + (8)
	Teacher's action - (2)
	Atmosphere + (4)
Implementation of the classroom sessions	Effectiveness + (2)
	Learning + (3)
	Working in groups + (4)
	Working in groups - (1)
	Working independently + (1)
	Implementation + (3)
	Implementation - (2)
Ideas on development	A need for teacher's presentations (4)
	Real medication packages should be used (1)

The students found the classroom sessions mainly meaningful and effective. The classroom sessions were described for example as relaxed, effective and leisurely. Teacher's action and the learning environment were described for example as following:

"The teacher was supportive and a very good assistance in the classroom sessions.

"Relaxedness" was very good -> no pressure on calculating!"

Most of the students found that the implementation of the classroom sessions was suitable for them:

"It was nice that one could study independently in groups and concentrate on what was essential in one's own point of view.

- - doing exercises together with a fellow student, it is effective and useful"

Some of the students wanted more structured learning and teacher's presentations.

The online videos

Students' comments regarding the online videos were divided in 4 classes:

1. Usefulness of the videos,
2. Evoked affects,
3. Content and the execution of the videos,
4. Linking to real life.

These classes and subclasses are presented in Table 3.

Table 3

The students' comments on the online videos

Class	Subclass
Usefulness of the videos	Useful (4)
	Useless (3)
Evoked affects	Positive affect (3)
	Negative affect (1)
Content and the execution of the videos	Positive comment on the content (1)
	Negative comment on the content (1)
	Negative comment concerning the pace (4)
	Positive comment concerning the pace (1)
	Negative experience concerning the understanding and reading the mathematics (6)
	Negative experience concerning the errors in the videos (2)
	Negative experience concerning the support material (1)
Linking to real life	Positive comment concerning the practical aspect of the videos (2)

The clips also evoked both negative and positive affects: some of the students found them irritating, whereas some of the students found them fun and interesting. Many students found it hard to follow the clips: some felt that the tempo was too fast and some had hard time making sense of the mathematics included in the clips.

A major issue was that reading, understanding and “finding” the underlying mathematics was hard for many:

“It was sometimes hard to keep up as the assignment was given only by the narrator. If the assignment would be also textual it would be easier to follow why the calculations in question are carried out”

“It would be better if the calculation strategies used in videos would be more explicit.”

Also the pace and the execution of the videos were not good for some students:

“In the beginning of the video the information was given in a terribly fast rate. I could not remember anything. (One should have written the information down or something in order to be able to understand what was calculated and how.)”

“The videos were too slow”

These responses suggest that using the videos as a learning material is not easy for students. In addition, the content and the possible errors of the videos should be revised not only in the production phase but also after the pilot with the students as many students feel unsure and irritated if the videos are not clear or include errors.

Workload

Most of the students found the workload even smaller than the computational load in their curriculum (1,5 ECTS credits = 40 hours of work). Only 3 students felt that they had to work more than 40 hours (Figure 2.). This was, for us, surprising assuming that watching the videos and reading the material could take quite a large amount of time.

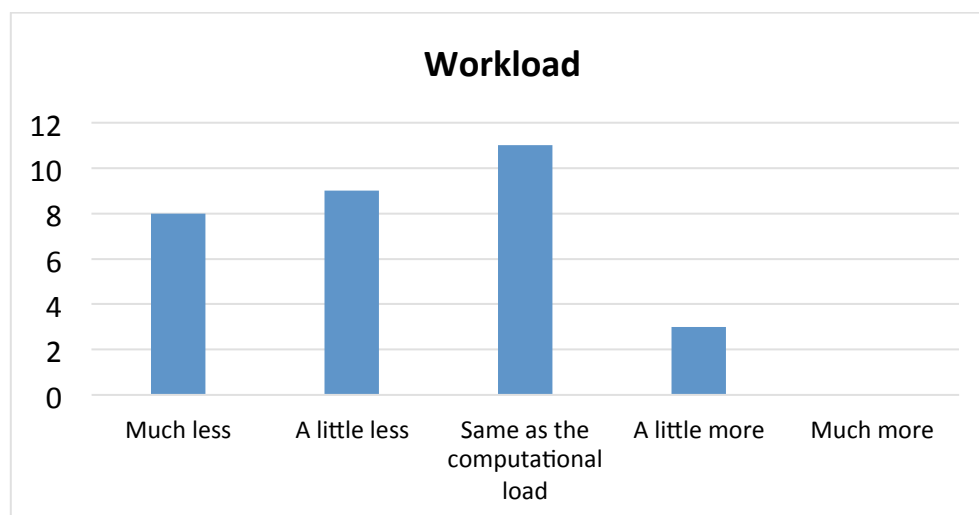


Figure 2: Students' experience of their workload.

In conclusion the classroom situations were experienced as meaningful and the workload was not too big for the students. The largest target for further development is to design the “before-class” tasks so that they would be meaningful and help students' understanding of the mathematical content and the praxis.

Learning outcomes

Both the experimental group and the control group took a medical calculation test after the course. The tests were not identical but the questions were very similar and demanded the same skills. The test was graded as passed if all of the calculations were done correctly. The test results are presented in Table 4.

Table 4

Medication calculation test

	Experimental group (N _e =60)	Control group (N _c =179)
Passed	36	124
Failed	18	44
Passed	67 %	74 %
Did not attend	6	11

The difference between the experimental group and the control group was not statistically significant in terms of success in the medication calculation test (chi-squared test, $p=0.309$). If the absent students would be counted as failed then the p-value would be lower ($p=0.185$) but that is probably not

reasonable way of counting as most of the absent students did not take part of the course at all. All of the (non-absent) students in the experimental group passed the test either in the first examination or in the two resit examinations that were offered afterwards. Also the effect of the resit exams was similar in the control group.

CONCLUSIONS

The results of this study will be used to improve our educational practices and development of our online course. In action research mindset reflection is a tool for further action and development (Figure 3).

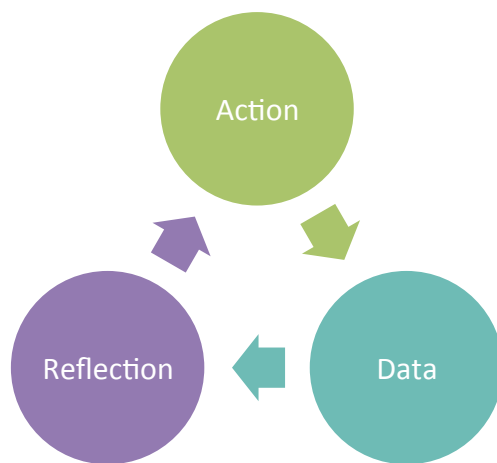


Figure 3: Action research mindset (Pelton, 2010)

Watching the educational clips seems to demand preliminary knowledge or skills. As Bergmann & Sams (2012) have noted, teacher should give a briefing on how to watch educational videos. In addition, we feel that the video itself is not enough at least for those students who had hard times understanding and “finding” the underlying mathematics. A clear assignment can be added for each video to help the learning process.

Tutoring can be seen as an important aspect of online courses as the students found teacher's help essential in the flipped classroom approach. Also in the flipped classroom the scaffolding can be extended to the Net where the teacher can answer anonymous questions.

In consequence of our findings we have developed our flipped classroom approach with four principles:

1. The studying prior to classroom sessions should be well informed and it should include a clear assignment. (*Students' inability to see independently what is important in these cases*)
2. The main points of the assignment should be handled shortly before the actual classroom activity. (*Students' concern about unstructured learning*)
3. All of the calculation exercises should be bound to real life situations. (*Helping to see the practical use of the skills*)
4. There should be a possibility to ask questions anonymously over the Net. (*Increase the scaffolding*)

Long-term effect of these developments will be a topic for further studies.

DISCUSSION

Both professional nurses and nursing students are in need of extra support in medication calculations. Our results can be used when designing online, flipped classroom and blended learning courses in nursing schools. As Chapelhow and Crouch (2007) have pointed out, mathematical skills diminish if they are not used. Thus a need for continuous assessment of numeracy skills of nurses seems necessary (cf. Warburton, 2010). Developing a good quality online courses could offer a good chance for nurses to practice in order to maintain their proficiency.

As Huhtala (2000) has pointed out, mathematical anxiety among nursing students typically starts to develop already in primary and secondary school and it has a major effect on students' learning. Creating anxiety-free learning environments is thus desirable but there is still a need for further studies on the effects of such arrangements. According to many studies (e. g. Hackett & Betz, 1989; Pajares & Graham, 1999) self-efficacy is correlated with mathematics performance. Providing (at least the “weaker” students) first tasks that are easy enough and giving them experiences where they success might be helpful.

Furthermore, the findings about video viewing (e.g. enough skills are needed in order to find the clue) are applicable to all education in some extent. Developing good instructions and meaningful assignments regarding the videos can be seen as an important goal for further studies.

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THE STRATEGY MAP AS A TOOL TO INCREASE THE RETURN ON LEARNING INVESTMENTS: LEARNING PRACTITIONERS FIRST IMPRESSIONS AT THE EAPRIL 2015 CONFERENCE

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ABSTRACT

While strategy maps have their roots in strategic management accounting, they have much to offer to learning departments looking for a good return on learning investments. A strategy map is a visual model that shows which investments are most likely to improve the internal operations of a learning department, which in turn satisfies its customers better and secures that the goals of the learning department are being pursued. A strategy map thus leads to better aligned investments decisions. It also makes it easier for constituents to contribute to the goals of the learning department; and it can be used to trigger compliance. In sum, by creating organizational awareness and commitment to spend the right resources (time, money) towards the goals of the learning department, a strategy map shapes the future of a learning department. However the proof of the pudding is in the eating. This paper shows how strategy maps are received by learning practitioners after being exposed to an EAPRIL 2015 workshop. From factual data and opinions collected via voting software during the workshop, I found that learning practitioners easily picked up the essence of strategy maps. They were also able to make a sound personal judgement about the strategy map. Notwithstanding their short exposure, the learning practitioners identified the same strengths and weaknesses one encounters in the academic literature on strategy maps. Hence I propound that strategy maps are of added value to corporate learning environments.

INTRODUCTION

Most methods for evaluation learning investments, like trainings (e.g. Phillips, 1997), evaluate past performance as they focus on monitoring financial returns of learning interventions. Yet, learning departments rarely frame their goals in purely financial terms. In this paper, I propound that strategy maps are more suitable to help learning practitioners to make better investment decisions which enable them to achieve their goals. A strategy map is a visual representation that shows which investments a business or organizational unit has to consider in order to improve its internal operations and processes, which in turn might entice its customers and result in the delivery of the goals of the unit (Kaplan and Norton, 2004).

Several good introductions, general and critical reviews of the strategy map exist (e.g. Kaplan, 2008; Lueg, 2015; Norreklit et al., 2008). Person (2013) is also worthwhile to mention because he shows in practical detail how to make strategy maps and how to integrate them with balanced scorecards by means of standard office software.

In this paper, I focus on the relevance of strategy maps for corporate learning departments. An example of a strategy map is given in Figure 1, which will be explained in more detail in the paper. Strategy maps can be read from the bottom to the top and from the top to the bottom using an “if-then” logic.

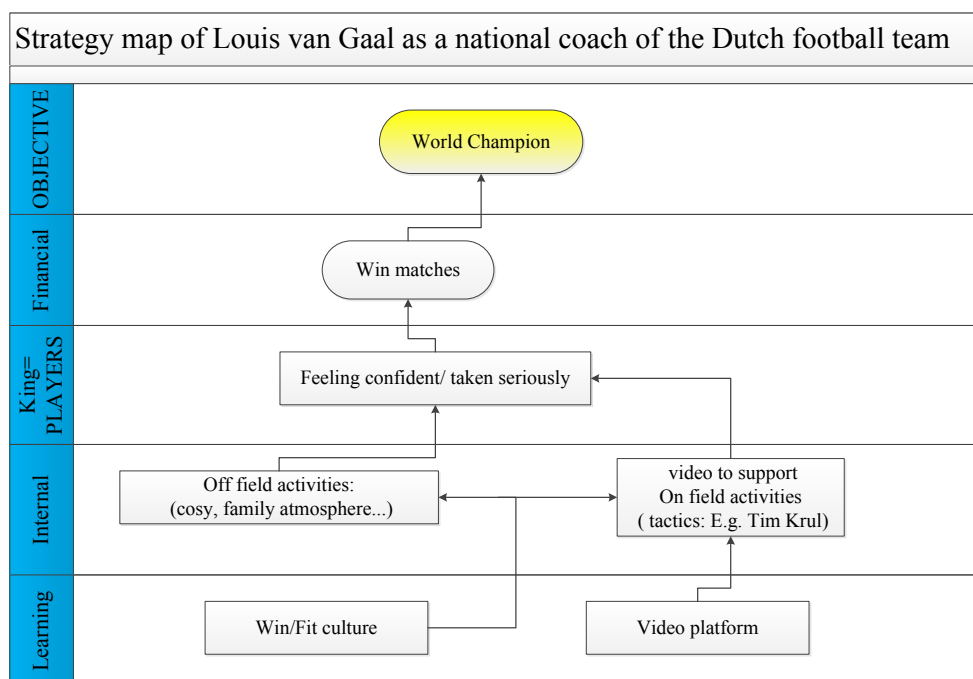


Figure 1: An example of a strategy map for learning practitioners

A proactive rationale for strategy maps

Unlike Figure 1 suggests, the Dutch national team did not become world champion in 2014. Louis van Gaal only came close to it. A strategy map does not tell the truth; instead it tells a story that appeals to the involved constituents. Strategy maps have been traditionally used to steer organizations towards exceptional returns because of its self-fulfilling prophecy effects. A strategy map should be used to

communicate the roadmap of the learning department to its relevant constituents. It should trigger these constituents to think like partners and to have them behave in value creating ways. Therefore, a strong strategy map is convincing and must be evaluated on its power to attract commitment.

If a strategy map can explain to all relevant constituents of a learning department what the department wants to achieve and how it plans to do so, clarity arises. Moreover, once these constituents accept the message in the strategy map, they will start to think about how they can contribute. They will also be willing to put effort in aligning their activities among each other. Hence, once a strategy map has been understood and accepted, it sets in motion a series of initiatives and activities. Therefore, a good strategy map should give learning departments a direction for the future.

Shared knowledge and aligned action are important benefits of strategy maps. These benefits manifest themselves already before investments and initiatives take place. This gives strategy maps a competitive edge over traditional evaluation methods. A strategy map helps to select the right learning investments and to increase the managerial and organizational commitment for these investments. In addition, it creates options for control during the implementation phase of the map. Target setting and precise measuring tools can be used to make sure that stakeholders align their behaviour.

On the process of making a strategy map

Learning departments will only reap the benefits of a powerful strategy map after a set of questions has been answered: what does the learning department want to achieve? Who are our primary customers? When are they satisfied?, How can we help them and tie them to the learning department? In short, the strategy map forces learning departments to make a business case. Making explicit what the business case is for a learning department can be hard; especially when the goals of the learning department are unclear or if there is insufficient support or awareness for these goals. To help making a strong strategy map for learning departments, this paper presents an interview protocol that helps to build the business case. The interview protocol that I developed for learning practitioners is presented in Table 1.

Table 1
Interview protocol for a strategy map

GOAL What does the learning department want to achieve on the long run? (Vision)
FINANCIAL What are the important, immediate, conditions to achieve that goal?
CUSTOMER is KING (2 questions) The Identify question: Who should make a crucial contribution towards shaping these conditions? (These are your customers. Treat him/them as a king.) The Inspect question: What is important for the king?
INTERNAL PROCESSES The Deliver question: How do you make the king commit to the vision of the learning department?
LEARNING AND GROWTH The Invest question: How can the learning department make its internal processes stronger?

Since the answers to these questions are unique for each learning department, they cannot be imposed by neither consultants nor theory. Answers to the questionnaire should arise internally, after group

discussions within the learning department for two reasons. Firstly, overlapping viewpoints of stakeholders challenge and review answers more quickly and lead to more thorough representations of the expected learning effects. The strategy map is a great framework to discuss which investments are needed. More than other evaluation tools for learning investments, it opens up the debate to different kinds of human and non-human intelligence and forces learning departments to pinpoint which investments in human and non-human capital are crucial for success (Kaplan & Norton, 2004).

The second reason why learning departments cannot outsource the construction of their strategy map is related to the commitment that is required from the stakeholders for turning their strategy map into action. Commitment to execute plans generally increases if there is some involvement in the planning process by the ones who have to execute it (Merchant & Van der Stede, 2007, p. 337-338). Therefore it is important to make the maps internally and not have them imposed by some external authority.

In sum there are two reasons why strategy maps are not mainstream in corporate learning contexts. Firstly, strategy maps might suffer from liability of newness. Because of the origins in strategic management accounting, learning practitioners might be unaware of the potential of strategy maps. Secondly, the efforts asked from the learning departments to make a powerful business case, may discourage some learning practitioners to consider it. Consequently, there is a need to trigger the awareness and to discuss the relevancy of strategy mapping among learning practitioners.

Formal training about strategy maps and balanced scorecards is known to help to appreciate and make better use of it (e.g. Dilla & Steinbart, 2005, Humphreys & Trotman, 2011). Learning managers and practitioners need to give it a try. As such, with the support of UP learning, an e-learning consulting company, I started organizing workshops in 2014 that help learning practitioners to appreciate and apply the strategy maps into their organization. The workshops were meant to get learning managers familiar with strategy maps in the context of investment decisions in learning management systems. At the EAPRIL 2015 conference this workshop was repeated and the feedback from the workshop participants was recorded. In the remainder of the paper, I briefly outline the EAPRIL workshop and discuss the responses of the workshop participants.

The relevance of this paper is twofold. First, this paper opens the debate about the usefulness of strategy maps in the corporate learning context. As such, I try to promote the use of strategy maps in the corporate learning context. Secondly, it responds to a call in a fairly recent literature review of strategy maps for more research on the usability of the strategy maps among managers and employees who have to execute the strategy every day (Lueg, 2015, p. 39).

METHODOLOGY

Together with UP learning consultants, I organized a 90 minutes interactive workshop during the EAPRIL conference. The slides of the interactive workshop are available at De Schryver et al. (2015). The outline is as follows: I first presented the agenda and goals of the workshop and explained how to use the voting software Shakespeare, a PowerPoint plug-in. Afterwards, I explained the notion of strategy maps, its conceptual origins and its relevancy in a corporate learning context. In the interactive part of the workshop, I presented two teaching cases, which were pretested in previous workshops. Each case has its own purpose. Below the differences between the cases and the case descriptions will be made clear. The EAPRIL workshop ended by asking participants to highlight one strength and weakness of the strategy map. Again these opinions were recorded and published in real-time via Shakespeare. Finally, consent to analyse the results was asked for and given by the audience. Consequently, the results could be downloaded and used for analysis.

First teaching case

The first case considered the strategy of Louis van Gaal as a national football coach for The Netherlands during the 2015 World Cup in Brazil. This case is well suited because Louis van Gaal faced similar challenges as corporate learning departments. He had to optimize the talent management cycle in order to contribute to results that are beyond his span of control. He therefore had to select, onboard, integrate people so that organizational success can be attained.

The aim of the first teaching case was to make the workshop participants acquainted with strategy mapping in a learning by doing mode. They had to gain confidence in the tool. Therefore I started with a case that could appeal to almost anyone without a lot of instruction material. In particular, I used Louis van Gaal as a teaching case because I speculate that most workshop participants are likely to know him, that the goals of Louis van Gaal as a national coach are also clear to everyone and also that the roadmap to realise this is pretty obvious. Louis van Gaal is a strong manager who expects that players and staff conform to his standards. He also realizes that he needs his players to perform and supports them as much as he can (Posthumus, 2014) I believe that it is just a matter of translating this information into a strategy map.

Another measure to increase their confidence further, was to use group pressure during the teaching case. By organising the first case in a plenary session, I hoped to convince the audience that it is possible to construct a strategy map by means of the interview protocol in Table 1. The audience of the workshop were prompted to reconstruct this story with the help of a trimmed version of the interview protocol. Because of time constraints in the workshop, the inspect question in Table 1 was skipped. (This is only recommended when the case is simple and only for didactical purposes.) To make sure that audience would start, I helped them out by presenting the first three questions in a closed-ended format. The remaining questions were open-ended. Responses were transferred via mobile phones or tablets. They were immediately visible to the audience via Shakespeak. After having completed the questionnaire, I compared their answers with a strategy map that was made before the workshop.

The strategy map, presented in Figure 1, shows that van Gaal was successful at the World Cup 2014 by making the right decisions early on. In particular, van Gaal invested in a win culture (i.e. non human capital) by selecting only players and other staff who had demonstrated to be able to make the difference in their area of expertise. In other words, he did not take the reputation of famous players for granted. Star-players, like Wesley Sneijder, were not sure about being selected for the national team. They had to show that they were fit by playing enough matches in their clubs. Van Gaal subsequently did everything in his power to improve the selection of fit players. For example, from newspaper articles we know that, he used video, which gave feedback about the player's performance and information about the adversaries (Staf Oranje groter dan spelersgroep, 2014). By creating optimal support conditions, both on and off the field, players started to believe they could perform (Posthumus, 2014). They started acting as a solid team. They started making winning goals which were necessary to attain the ambitious goal of van Gaal. Ultimately, he did not make it but the results were satisfying. Since the Dutch team performed beyond expectation by winning the third place play-offs, this case shows the true potential of a strategy map. It creates momentum by commitment, but it is not a guarantee for success.

Second teaching case

The aim of the second teaching case was to make the workshop participants experience that making a strategy map is a non-trivial exercise. I therefore used a client case of UP learning. Participants were asked to make a strategy map for the academy a large insurance company in the Netherlands facing onboarding challenges.

For this teaching case, teaching materials and instructions would be distributed and the audience would be divided into small groups of 5 participants. 30 minutes were given to make a strategy map for the academy of the insurance company. At the end of the second teaching case, groups had to present their visualisation, which would then be compared with a strategy map that was made upfront.

The context of the second teaching case is much more complex than the first, because participants did not have sufficient knowledge about the insurance company, nor its industry, neither its products. Moreover, the overlap between the goals the learning academy and the insurance company are far less obvious. The academy does not want to sell insurance products, it wants to deliver skilled employees.

This high level of complexity is not an ideal setting for making a strong strategy map by laymen under time pressure. It is therefore unrealistic to expect that workshop participants can construct themselves a strong strategy map on such a short timeframe, without any serious stake involved in the insurance company. Yet by presenting the workshop participants a teaching case that is more similar to their working context, we expect to trigger reflections on whether the tool of strategy maps would be of value to their organization as well. Working with a teaching case in a real business context, deepens their notion of the strategy map. After all the proof of the pudding is in the eating. Exposure to an extra case in a small group setting thus serves a better test to evaluate the potential of the strategy map.

RESULTS

Participation to the workshop

14 participants decided to join the EAPRIL workshop on strategy maps. This is a good number to organise a workshop. Yet, this number corresponds to less than 5% of the registered participants to the EAPRIL conference. Participation to one of the 11 EAPRIL workshops/symposia was voluntary. Conference participants made their selection based on abstracts in the conference program. Save for expectations that workshops are interactive; the participants had no extra information about the details of the workshop. It is likely that the 14 participants chose this workshop based on the abstract because it was the workshops organizer's first encounter with the EAPRIL conference or alike. Even though at hindsight it appeared that most of the EAPRIL participants had an interest in school education and less in workplace education, the low attendance can be seen as an indication that strategy maps is not a hot item among learning practitioners. Clearly, some more communication effort is needed to attract the potential of strategy maps.

Results from the first teaching case

The participants constructed a strategy map for Louis van Gaal based on the interview protocol in Table 1. The answers from the 14 participants are presented in Table 2.

Table 2 shows that most (10) participants recalled that Louis wanted to become world champion - i.e. question 1 in Table 1 - and the majority (9) also realized that winning matches is the condition sine qua non (question 2 in Table 1). The third question tries to identify the prime customer(s) of a learning department. A customer in the strategy framework for learning department corresponds to the stakeholder who is most needed to achieve the result in question 2. The votes to the third question lead to more diverse responses. The modus (6) in this case was the players. It could have been interesting to start a discussion in the group why the Royal Dutch Football Association (KNVB) is not the prime stakeholder. Instead, because of time constraints during the workshop I simply explained that the board members of the KNVB are not in best shape to make winning goals.

We then turned to the “deliver” and “invest” question in Table 1. For these questions, the participants had to phrase their own answer instead of choosing among different answers categories. I first present the answers on the “deliver” question. According to the participants, Louis van Gaal has to be clear, honest, had to motivate, to give/get trust, to work together and, to listen. Hence most participants mentioned the need to address the psychological and social dynamics in the team. This makes sense for players that are already talented and fit. Team success depends on other aspects like mutual trust and clear communication. More importantly for the sake of strategy map construction, these answers of the workshop participants rightfully point out to operations that help to tie players to the team, which in this case overlaps with the learning department of the football association.

Table 2
Workshop answers to the interview protocol

1.What did Louis van Gaal want to achieve as a national coach of the football team? (the objective)	Frequency
-to qualify for the World Champions	1
-to survive the group stage	1
-the quarter finals	0
-the semi finals	1
-the final	1
-world champion	10
2.What is the most important condition to achieve that objective?	
-to attract talented players	0
-to have a good team	4
-to score goals	1
-to win matches	9
-other	0
3.Who is Louis van Gaal's customer?	
-the fans	3
-the media	0
-the Royal Dutch Football Association (KNVB)	5
-the players	6
-Other	0
4.What does Louis need to do to make the players listen to him?	
'Give trust', 'Authority', 'Earn their trust', 'Pay much money.', 'Collaboration', 'Gain respect', 'play together', 'motivate positively', 'Listen to them/their ideas', 'Motivate', 'Clear. Honest', 'Have a clear strategy and make sure everyone understands it and can relate their own function and goal to it', 'Respect', 'To give a perspective and trust how to win'	
5.What to do when you lack certain competences?	
'Find another person', 'Reflective coaching and give support', 'Replace', 'Find people who	

have them and work together with them', 'Find it elsewhere', 'different strategy', 'Create learning opportunities', 'train on the lacking competences', 'Replace', 'Job rotation', 'Extra training', 'Change strategy', 'Hustle the team', 'Bribe referee'

Legend: bold answer corresponds to the “correct” answer option in Shakespeak. Order of answers to open questions is chronological order of recording by Shakespeak.

Finally, I asked the participants what to do if some competencies are missing; and showed a player of an injured pivotal player (a picture of player Kevin Strootman was displayed, see De Schryver et al., 2015). As a result, most of the answers of the participants focused mainly on strategies to invest in new players (4) or to train the existing team to accommodate to the new situation (5).

The “invest”-question in Table 1 ought to trigger answers that make clear how the learning department can invest in its operations so that it better supports the existing players. The confusion about the invest question is a limitation of the simplified teaching case. This feedback was also given to the audience just before the second teaching case. At the end of the first teaching case, I showed that stacking the most common answers leads to a strategy map, similar to Figure 1. Hence in less than 20 minutes, workshop participants were introduced to strategy mapping for learning departments.

Table 3

Workshop participants evaluation of strategy maps

1.What is the prime strength of strategy mapping for evaluating learning investments?
'Shared language', 'Common ground', 'Tool for discussion & clarity', 'Alignment of strategy and L&D', 'overview of different processes and relations', 'Shared understanding through the process', 'it gives you a good overview that helps you to plan', 'Overview', 'L&D department helps in achieving company strategy', 'Create a business case', 'To make visible the correlation of cause and effect.'
2.What is the main weakness of strategy mapping for evaluating learning investments?
'Too linear', 'Top down', 'Who are the right people to start this process', 'simplifying', 'misleading terminology (customers, financial)', 'Not easy to construct and to communicate.', 'Process needs to be understood clearly', 'differences between corporate map and map for the academy', 'You cannot be sure that the L&D activity is responsible for reaching the goal', 'Finance - outcome', 'If you're not specific enough, there's a risk of staying to vague', 'Linear, simply.', 'Takes a lot of time I presume...?'

Legend: Order of answers to open questions is chronological order of recording by Shakespeak.

Results from the second teaching case

In this teaching case, groups of five were asked to construct a strategy map for the academy of an insurance company. Because there were 14 participants, the audience was divided into three groups. All groups managed to present a concept strategy map on time. Pictures were taken from them. There was a short debriefing which consisted of comparing their maps with a strategy map I made beforehand for the academy of the insurance company. (The strategy maps of the three groups and mine are available from the author upon request.) Then the workshop participants were asked to identify the main strength and weakness of strategy maps for learning practitioners. Their answers are presented in Table 3.

Eleven out of fourteen participants were able to identify a clear strength of strategy mapping by means of the voting software. As the first row in Table 3 indicates, most participants acknowledged that strategy maps help increasing the organizational awareness/ clarity/ alignment. Indeed in the literature, strategy maps are seen as a useful communication tool (e.g. Lueg, 2015). The workshop participants equally acknowledge that strategy maps have value to learning professionals.

Thirteen participants identified a major drawback or concern of strategy mapping. Three kinds of drawbacks were identified. A first group of responses pointed out that the terminology was confusing, like the use of words ‘customer’ and ‘financial’. This confusion relates to the conceptual roots of strategy maps. I think that more clarification or even translation of the terminology can lower the degree of noise.

A second kind of drawback related to the difficulty of constructing a strategy map. Indeed it is important to spend sufficient time on it and to identify the right group of people to construct it. People involved in the construction phase should all have a stake in the learning department. Multiple rounds are needed to revise answers and to make the answers compatible to each other. Revisions are needed to fine-tune the strategy map. This drawback hence reflects as much as a limitation of the workshop format as it is a weakness of strategy mapping.

The final set of drawbacks raises important ontological questions: are strategy maps not too simple, too linear or too top-down? Some scholars have raised similar concerns (e.g. Norreklit et al., 2008). The value of strategy maps depends on how it is being used. If it is misused as a toy for senior learning managers, then it is too simple and top down. In the latter case, it is misuse because strategy maps should be evaluated on its power to engage others to take ownership. Hence strong strategy maps do not only have top-down effects but should also trigger bottom-up initiatives.

DISCUSSION

In reaction to the latter drawback mentioned by the workshop participants, I would like to emphasize that strong strategy maps are not linear per se, they only point out towards a desired direction. An active attitude of all relevant stakeholders of the learning department is required to take that turn. If one combines the visionary element of strategy maps with its power to appeal, it become clear that strategy mapping requires a self-directed learning environment. Self-regulated learners need to control their learning (thoughts and actions) in order to meet learning goals. Control is only useful when self-directed learners monitor the effects of their thoughts and actions and be willing to adjust their actions; or the strategy map.

The latter should be considered periodically because a strategy map is constructed in time. It is only a snapshot. When it is constructed, the strategy tells a story. It gives a roadmap for the future. It is up to the reader to judge and to believe the story. When strategy maps are operational, they help to interpret reality. New initiatives will eventually lead to new insights and ought to trigger learning departments to reflect on their strategy map. The assumptions within a strategy map will be different from reality. Therefore, as new information unfolds, learning departments should remain open to it. Especially information that is at odds with the strategy map is interesting because differences between reality and plan, can trigger single and double loop learning effects. Single loop learning leads to actions to realign. Double loop learning leads to modifications in the strategy map of a learning department. A very good illustration of the non-linear, positive and disruptive and unforeseen effects of management control systems that were initiated from the top can be found in Revelino & Mouritsen (2015). The

issue is to determine when to stick to the strategy map or when to change it. When one changes a strategy map, its linear and top-down features disappear.

CONCLUSION

In this paper I presented and reflected upon the first impressions of learning practitioners to strategy map after being exposed to a workshop. On paper, strategy maps are believed to help corporate learning managers making better investment decisions. The benefits of strategy mapping seem to be easily understood by the workshop participants. They voice benefits similar to the ones encountered in the scholarly literature. The workshop also highlighted some hurdles in the use of strategy mapping. More efforts need to be done to avoid confusion due to ambiguous vocabulary and accounting jargon. These translation issues can also be solved by providing training and workshops. Training efforts are mostly needed to counter some of the ontological misinterpretations that could arise when using strategy maps. They should not be used neither seen as a bureaucratic, diagnostic tool, but as an interactive control tool. The paper also corresponds to Lueg's (2015, p. 39) call for reflections by middle managers or employees who execute the strategy every day. It cannot be introduced without proper guidance.

Of course this paper suffers from limitations. The exposure to strategy maps was severely limited in time. Workshop participants were only exposed to a crash course on strategy maps. More time needs to be spent on this topic by learning practitioners. Therefore the feedback gathered from the workshop is only a beginning of the evidence that strategy maps have relevancy in a corporate learning context. Only when strategy maps are effectively being used to select and implement learning investments, can we fully assess its potential. This paper, with the interview protocol, the teaching case material, nudges learning managers to take a start with strategy maps.

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CULTURAL AND ECONOMIC DIFFICULTIES FACED BY TURKISH STUDENTS VISITING LATVIA VIA ERASMUS PROGRAMME

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ABSTRACT

The aim of this paper is to study the possible cultural and economic difficulties faced by Turkish ERASMUS exchange students during their studies at the University of Latvia. The cultural difficulties include language barriers and communication problems, differences in the study programs between Turkish and Latvian universities, lack of international atmosphere, and other cultural biases. Economic difficulties include lack of funds and other financial problems, negative effects of the differences of living standards in the host country, lack of appropriate accommodation and unexpected additional costs. The results showed that the students did not face any severe cultural barriers. On the other hand, large portion of the respondents reported that they have faced financial problems, reflected in the low amounts of money for living costs and high dormitory fees.

Keywords: ERASMUS, economic difficulties, cultural bias, mobility

INTRODUCTION

Student mobility has become a common practice within the European Higher Education Area today. Among the variety of student exchange programmes, the ERASMUS (European Community Action Scheme for the Mobility of University Students) Programme is the most successful and renowned one. ERASMUS was started in 1987, and over the years it has expanded in more than 30 countries, reaching nearly 2 million international students (European Commission, 2013). However, the countries in which the program is implemented differ substantially in terms of cultural norms and economic development. It has to be noted that the cultural differences between the sending and the hosting countries might have an effect on the academic achievements of ERASMUS mobile students. Since the level of participation in academic mobility is strongly determined by the economic funding which is regulated by national institutions (Oğuz, 2014), the economic factors have to be taken into account when researching the effects of the ERASMUS programme.

Previous research on this topic has revealed that the most common problem encountered by mobile students is the lack of language skills (Yagci 2010; Tekin, & Gencer, 2013; Souto-Otero et al, 2013). However, even though the lack of language competence represents a major setback, taking part in the ERASMUS programme has largely contributed to the enhancement of language skills (Arslan, 2013; Yucelsin-Taş, 2013). Furthermore, the participation in this programme has contributed to the students developing a positive attitude towards different cultures (Arslan, 2013), as well as to their personal growth (Yucelsin-Taş, 2013). By engaging in academic mobility outside the country, Turkish scholars might develop abilities that are relevant to reinforcing the European attributes of the Turkish higher education system (Oğuz, 2014). Geographical distance between Turkey and the countries of the EU has also been cited as one of the issues that contribute to the financial hardships faced by Turkish mobile students (Oğuz, 2013). The mismatch between the foreign and the Turkish universities' study courses can be cited as yet another commonly problematic issue (Yucelsin-Taş, 2013). Cultural difficulties can also be faced by exchange students at activities outside the university. A study conducted that the Stara Zagora University in Bulgaria revealed that ERASMUS exchange students were experiencing a lack of suitable cultural activities organized by the university at which that can familiarize themselves with the local culture and population (Zhelyazkova, 2013: 383). A large difficulty faced by Muslim Turkish students who study abroad might be the inability to practice their religion because of the lack of praying facilities as well as suitable HALAL food resources. For example, one study of the experiences of the exchange students studying in Poland revealed that one of the major problems for the students was the difficulty to adapt to the different culture including facing deficiency of national food, suitable food for Muslims and inability to adapt to the different meal time periods (Lipowski, 2012: 755).

In the context of Latvia, studies conducted at Latvian universities have shown some of the problems that foreign exchange students face while studying in this country. For example, the research of Ramiņa, Sloka and Gržibovska (2014), has shown that the University of Latvia has a significant lack of study courses offered in English language. Due to the offer of only three to five courses in English in some of the faculties at the University of Latvia, it has often been the case that foreign students are not able to fulfil the average requirement of 30 ECTS, which is the basic requirement at their home university (Ramiņa, Sloka & Gržibovska, 2014). The same study also revealed a problem with the lack of course availability on the University's website. Namely, the University of Latvia has thirteen faculties and only five of them display their course list on the University's website (Ramiņa, Sloka & Gržibovska, 2014). Another

problem reported by the study is also related to language. The students mentioned the insufficient competence of some of the lecturers at the University of Latvia as an occurring problem.

According to another study conducted by the same authors and regarding the University of Latvia, the lack of communication between the international exchange students and the local ones is also a frequent problem (Ramiņa, Sloka & Gržibovska, 2014b). A problem with the lack of a sufficient language level of the staff working at the dormitories at the University of Latvia was also mentioned as a difficulty faced by international exchange students (Ramiņa, Sloka & Gržibovska (2014b).

The aim of this paper is to research and analyse the cultural bias and economic hardships that Turkish ERASMUS exchange students face during their study stay at the University of Latvia. The cultural difficulties include language barriers and communication problems, inability to adapt to the differences in the study programs between Turkish and Latvian universities, lack of international atmosphere at the host university, and cultural problems such as staff cultural bias towards the exchange students. On the other hand, the economic difficulties studies in this research include lack of sufficient funds and other financial problems, the negative effects of the differences of living standards between Latvia and Turkey country, the lack of appropriate accommodation offered to the exchange students and unexpected additional costs faced by the students. It was hypothesized that the Turkish students are faced with extreme language barriers, moderate cultural bias, and insufficient financial funds.

METHODOLOGY

For the purposes of collecting the data necessary for reaching the aim of this study, the author conducted a one-shot survey of Turkish ERASMUS exchange students who are currently studying in Latvia. Since the number of possible respondents is limited, the sample includes 25 Turkish students, 21 of which are male, and only 4 female. 20 students from the sample belong to the youngest age group consisting of individuals between 20 and 23 years of age, 4 respondents are in the age group between 24 and 26 years of age, and only 1 is older than 26. The survey that included open-ended questions was divided into two main sections. The first section was focused on questions about the possible cultural difficulties that Turkish students have encountered during their stay in Latvia, including language barriers, the experience of cultural difficulties and benefits, as well as differences in the organisation of the study programme. The second section of the survey was focused on the possible economic hardships encountered by the group of students, which included questions about lack of funds, experienced differences in the living standards of Turkey and Latvia, unexpected costs, and the living conditions during the study stay. The respondents' answers were then analyzed and the results are presented in the next section along with the discussion.

RESULTS AND DISCUSSION

According to language barriers, the students did not experience serious problems in this area. Acquiring a basic knowledge of the language of the host country might improve the relationship between the international exchange students and the local population. However, none of the respondents took Latvian language classes before their arrival in Latvia. This suggests that there is little preparation for the culture shock that might be experienced by the Turkish students when visiting a foreign country for a study visit.

Only one respondent in the survey requested the ERASMUS coordinator for a Latvian language course that was not provided for him. In addition, 5 respondents answered that they have experienced problems due to their lack of Latvian language skills. One respondent said she was constantly having trouble communicating with the locals while buying her groceries due to their lack of English language knowledge. The contradictory answers from different responders might suggest that they were not competent in answering the questions, or that the social environment in which they were present has contributed to them making rushed generalizations. For example, one respondent answered that the local people spoke only in Russian and Latvian, and another one answered that “not so many people know English”. On the other hand, a third respondent in this section of the survey answered that “fortunately, 99% of people could speak either English or Russian, or both of the languages”.

Concerning the language barriers in the relationship to the staff and the faculty of Latvian higher education institutions, a large portion of the respondents did not face any problems. Only 5 respondents answered that they have faced such problems. One respondent answered that such problems were experienced only in one class. As reported by the student, “we were having difficulties with following the class of the lecturer, because she frequently could not remember the adequate words in English for some terms in her lecture”. Another one reported that all of his classes were in Latvian, which is probably due to the study programme that he had chosen. As suggested in the introduction section of this research, the staff employed at the dormitories of Latvian universities could show a lack of sufficient command of English language. In this context, one respondent reported that he had experienced difficulties in communicating with the dormitory administration, but this was partly due to his lack of English language as well.

Problems related to the lack of signs and information posts written in English at the university facilities were also reported by the respondents. 4 respondents reported that they have faced problems in this area. However, these were minor problems and were not connected with the general infrastructure of signs and information posts at the universities. For example, one of the respondents stated that the slides and references used in the lectures were in Latvian.

Variations in the structure of the academic year in comparison to the universities in Turkey were experienced by 7 respondents, who reported differences in the start of the semester and the fact that the exams in Latvia start later in comparison to Turkey. Most of the students experienced fair and unbiased attitudes of the teachers towards the exchange students. Only 3 respondents faced problems in this area. The rest of the 22 respondents stated that the teachers were generally fair, and in some cases even more tolerant towards the exchange students. This suggests that the negative evaluation of the Latvian teachers' fairness might be due to the students' personal bias.

Financial difficulties represented a recurring problem for Turkish ERASMUS students in Latvia. 8 of the respondents reported that they have faced financial problems during their study stay in the country. The low amount of the grant money was cited as the most important reason for this problem. For example, one of the respondents said: “I’ve got 300 Euros per month from ERASMUS, but I am paying 155 Euros per month to the dormitory, and the remaining 145 Euros are not enough for living here. I am staying at the dormitory most of the days”. Another respondent said: “the amount of money is simply not enough for having a study stay without worrying that the money could be gone by the third week of the month”. Additionally, a third one responded said: “if my parents were not sending me additional money, I really do not know how I would have been able to make ends meet”. These answers are in sharp contrast with the

ones of the rest of the respondents who generally assessed their financial situation during their studies in Latvia as positive.

A divided opinion among the respondents was noticed in relation to the quality of the accommodation that they were presented with. 8 of the respondents stated that they were not presented with an appropriate accommodation during their stay. One respondent stated: "If giving a mark is required for accommodation, I can give 3 out of 10. I faced lots of problems about the dormitory. The general source of problems was the administration". The high prices for accommodation were cited as one of the main reasons for the financial hardships of the Turkish students studying in Latvia. 10 respondents stated that the greatest source of their financial problems was the high amount of the accommodation fees which takes the largest portion of their grant money.

Insurance coverage and currency-exchange charges were cited by 9 seven respondents as additional unexpected costs. These respondents stated that they were not previously informed about having to pay insurance coverage out of their own grant money. 8 respondents from the sample answered that in general they were not satisfied with the financial conditions during their study stay in Latvia. One of the respondents even stated: "If my parents had not given me some money additionally, I don't think I could have afforded to live here as I am living now".

CONCLUSION AND RECOMENDATIONS

Regarding the first part of the hypothesis that the Turkish ERASMUS students in Latvia are faced with severe language barriers and moderate cultural bias, it has not been confirmed by the results of the study. While it has been confirmed that they had faced language barriers, this was not present in the correspondence with the university administration and the faculty. The barriers could have been faced in any other country whose official language is not spoken by the visiting students. Furthermore, the respondents did not experience bias from the teachers at the Latvian higher education institutions. The teachers were perceived as more tolerant towards the visiting students. On the other hand, a large portion of the respondents did experience financial problems, which are essentially reflected in the low amounts of money for living costs due to the high dormitory fees. In this regard, it is recommended that the authorities responsible for the funding should pay special attention to the level of funding of ERASMUS students, since this might be negatively reflected upon student mobility in the future. Since the survey was conducted in English, the biggest limitation of the study was the fact that a large portion of the respondents have a low command of English language.

It is recommended that the Turkish national agency should introduce basic language courses for the outgoing students, so that they can be better equipped with the means that will provide them a true experience of the local culture of the host country. It should not be expected that the local population outside the university will have a basic knowledge of English or will always be willing to communicate in English with the incoming students. From the answers given by the respondents in this study, it can be concluded that their level of English language command was not very good. The Turkish national agency should pay special attention to the level of English language competence of the outgoing students before they are nominated for an ERASMUS exchange. Furthermore, if the level of English language competence of the nominated exchange students is not satisfactory, the agency should provide them preparatory language courses, so that they can reach the sufficient level. It is also recommended that the

Turkish national agency offers comprehensive information about the unexpected additional costs, such as local insurance coverage, which the outgoing students might experience during their study stay at the University of Latvia.

Even though lack of study courses offered in English language was a marginal problem, Latvian higher education institutions should make sure that it has a large number of study courses offered in English. They should also pay special attention to the quality of the accommodation that it offers to the international exchange students.

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APPENDIX 1 – SURVEY QUESTIONS

Dear participant,

We would appreciate if you take the time to participate in our survey. Through this brief questionnaire, your responses will be helpful for the researcher to write her research paper titled: “Cultural and economic difficulties and concerns faced by Turkish students visiting Latvia via Erasmus exchange student programme”

It should take approximately ten minutes of your time.

Your participation is voluntary.

Your responses will not be shared with third parties, all responses will be compiled together in an effort to analyse the group, and results will be only used for research papers of this researcher.

You can ask any questions you may have before or during the questionnaire.

You are free to withhold answering some questions, and/or not complete the questionnaire.

Thank you,

..... (researcher's name)

..... (researcher's contact information)

Questions

PART A - Demographics

1. Sex? ☐ Female
☐ Male
☐ Other
2. Age?
☐ Under 20
☐ 20 - 23
☐ 24 - 26
☐ 26 – 28
☐ over 28
3. Marital status?
☐ Single
☐ Married

Part B - Questions concerning cultural difficulties

1. Why did you choose Latvia as your host country for your studies?
2. Did you take Latvian language courses before your arrival?
3. Did you have a problem with a lack of Latvian language skills during your visit?
4. Have you experienced any communication barriers due to the lack of English language knowledge of the staff at the host university?
5. Did you have any problems with the lack of signs and information posts written in English at the University facilities?
6. Did you have any language problems with the information posted on the web site of the university?
7. Did you experience any variations in the structure of the academic year in comparison to your home university?
8. Did you notice any differences in the schedule of the examinations in the host country?
9. What were the main cultural advantages that you acquired during your Erasmus exchange program stay in Latvia?
10. Were you well accepted as a foreign student in Latvia?
11. Were the teachers' attitudes towards you as an exchange student fair and unbiased?
12. Did you ever face any other cultural hardships during your stay in Latvia?
13. Have you experienced any lack of communication with Latvian students?

Part C - Questions concerning economic difficulties

1. Have you experienced any financial hardships during your Erasmus exchange program stay in Latvia?
2. Did you experience any lack of funds for living expenses during your stay?
3. Did the difference in living standards in Turkey and in Latvia pose any problems for you? If, yes, in what ways?
4. Were you presented with an appropriate accommodation during your stay? If not, what were the biggest problems in this regard?
5. Were the physical facilities (such as libraries, class and laboratory rooms) and supportive services (computers, photocopy and internet) appropriate for your education during the stay?
6. Did you experience any additional costs? If you did, which ones? (for example, additional insurance coverage and currency-exchange charges)?
7. Did the university charge any additional costs that you were not aware of before you came to study?
8. Did you experience any lack of information on the living conditions in the host country that may have contributed to economic difficulties?
9. What to your opinion was the largest financial problem that you have experienced during your stay?
10. Were you in general satisfied with the financial conditions during your study stay in Latvia?

THE INTERPRETIVE ABILITIES OF SCIENCE TEACHERS TO USE VISUALIZING SKILLS IN ANALYZING A SCIENCE PHENOMENON PRESENTED BY PHOTOGRAPHS

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ABSTRACT

Science teachers are required to teach their students how to use the inquiry method. This approach requires the teacher to have knowledge in the subject matter, and expertise in special teaching skills in order to lead guided inquiry learning. The present research was carried out in order to investigate whether science teachers possess adequate training and the necessary skills for teaching science by the use of the inquiry method, after having been exposed to the teaching methods used in elementary school, junior high school, high school, and undergraduate studies in the framework of the national science study program. The assumptions on which the inquiry approach is based are: the science teachers have expert knowledge of the subject being experimentally investigated, and the science teachers possess guided inquiry skills, and are consequently capable of helping their students to develop their critical thinking in science. The study found that most of the science teachers were unable to interpret the photographs of a phenomenon that appeared in an experiment. The experiment showed a flaming candle that is covered by a test tube. Probably the actual demonstration of the experiment did not help most of the teachers to interpret the phenomenon. Most of science teachers who participated in this experiment said that they use this experiment in their classes. The results raise the question: "To what extent can the science teachers ask their student to learn by the use of the inquiry method from scientific photographs while they themselves did not get the adequate preparation?"

INTRODUCTION

This study examined whether science teachers, who have been teaching sciences for more than five years and are studying for a Master's Degree in Science Education, are able to explain photographs of a phenomenon that appears while carrying out an experiment. Actually, this was an attempt to examine whether photographs of scientific experiments can replace practical experience in the laboratory as materials for teaching a lesson based on a guided inquiry. This is one example of the process of learning from photographs and learning from the Internet. We are dealing here with visualization and the extent that science teachers are trained in the skills of making conclusions from what they observe. It evaluates the possibility of a research study using photos of the phenomenon.

Recent researches (Cazden, 2001; Hammer, 2001; Polman & Pea, 2001; Harlow, 2010) have shown that teachers in general and science teachers in particular, need to learn to ask new kinds of questions, and to re-design lessons based on the newly acquired information by the students. The challenge is to develop more profound understanding of scientific phenomena, and to understand the nature of scientific inquiry. Research indicates that many science teachers do not have sophisticated insight into the way in which knowledge has developed through science (Lederman, 1999; Davis, Petish, & Smithey, 2006). This makes it especially difficult to teach science using the inquiry approach. It appears that teaching within a laboratory that involves science experiments in small groups, which is also suitable for individual science lessons, is a teaching strategy that is based on inquiry approach. In this way, the student, who carries out his own laboratory experiments, becomes an active partner in the investigation and learning processes. He will be able to develop and improve his ability to ask relevant questions, to plan an experiment, to think critically and logically about the observations that he makes, and the explanations they suggest, and to provide possible scientific arguments.

Bybee (1997) argues that the emphasis in science teaching, whether as an actual research or by means of research, is on the cognitive abilities; hence, progress must be reckoned in terms of the ability to think scientifically. These are situations that require the student to investigate and to stimulate the development and improvement of skills at high levels of thinking. According to these standards, investigation / research may be considered in two different senses:

1. Research in the sense of understanding of content. In this sense, the students are given the opportunity of building new concepts and models, which give substance to a given idea, in order to explain the phenomenon they are observing.
2. Research in the sense of abilities and skills (Bybee, 2000). Within the category of abilities and skills, Bybee includes the following: asking of questions; formulation of hypotheses; planning and carrying out of scientific experiments; formulation of scientific explanations and arguments. Many of these skills are the same as those required for carrying out research experiments. This approach presents challenges to both students and teachers alike (Krajcik, Mamlok & Hug, 2001).

Laboratory operations have played a major role in the teaching of science for many years. Both teachers and scientists maintain that students derive great benefit from involvement in such activities (Hofstien & Lunetta, 1982; Tobin, 1990; Garnett, Garnett, & Hackling, 1995; Lunetta, 1998). Specifically, they believe that research laboratories have the potential (a) to significantly improve learning among students; (b) to deepen their understanding of scientific concepts; (c) to understand the nature of science. Laboratory experiments that were carried out to apply the inquiry approach are of special value when they are combined with the concepts that were learned in class; they clarify and deepen the student's understanding of those concepts.

Various researches have shown that there are methodological problems, which can create difficulties for students participating in scientific research projects; there are clear data concerning the effectiveness of laboratory study as an environment assisting students in developing cognitive skills in general, and inquiry skills in particular. Among these difficulties are:

Inquiry Science Education

Inquiry education (sometimes known as the inquiry method) is a student-centered method of education focused on asking questions (Dkeidek, Mamalok-Naaman, & Hofstein, 2012). Students are encouraged to ask questions which are meaningful to them, and which do not necessarily have easy answers; teachers are encouraged to avoid giving answers when this is possible, and in any case to avoid giving direct answers in favor of asking more questions. Neil Postman and Charles Weingartner in their book *Teaching as a Subversive Activity* (1968) advocated the method.

The inquiry method is motivated by Postman and Weingartner's recognition that good learners and sound reasoners concentrate their attention and activity on the dynamic process of inquiry itself, and not merely on the product of static knowledge. They write that certain characteristics are common to all good learners (Postman and Weingartner, 1968), saying that all good learners have:

- Self-confidence in their learning ability and no fear of being wrong. The learner shouldn't be hasty in answering.
- Pleasure in problem solving and flexibility in point of view.
- Reliance on their own judgment over other people's or society.
- Respect to facts, and the ability to distinguish between fact and opinion.
- No need for final answers to all questions. It is better to accept the fact of not knowing an answer to difficult questions than settling for a simplistic answer.

In an attempt to instill students with these qualities and behavior, a teacher adhering to the inquiry method in pedagogy should behave very differently from a traditional teacher.

The research experiment

The “burning candle” experiment ((Massalha, 2016; Massalha, Thimor and Gluck; 2012), is used at the junior high school program to prove that there is a component in the air, which is essential to the burning oxygen. The usual interpretation among junior high school science teachers is that in a closed system, during burning, oxygen is consumed and pressure is lowered, resulting in a rise in water level in the experimental vessel.

Scientific Background Phenomenon - inquiry experiment

We fixed a candle upright at the bottom of a bowl and added water to the bowl up to about a quarter of the height of the candle. After lighting the candle, we lowered a bell jar over the candle and created a closed space. The candle was soon extinguished, accompanied by a rise in the water level. Figure 1 shows a series of frames in which the inflation/deflation state of the balloon reflects the pressure changes that occurred during the initial and final stages.

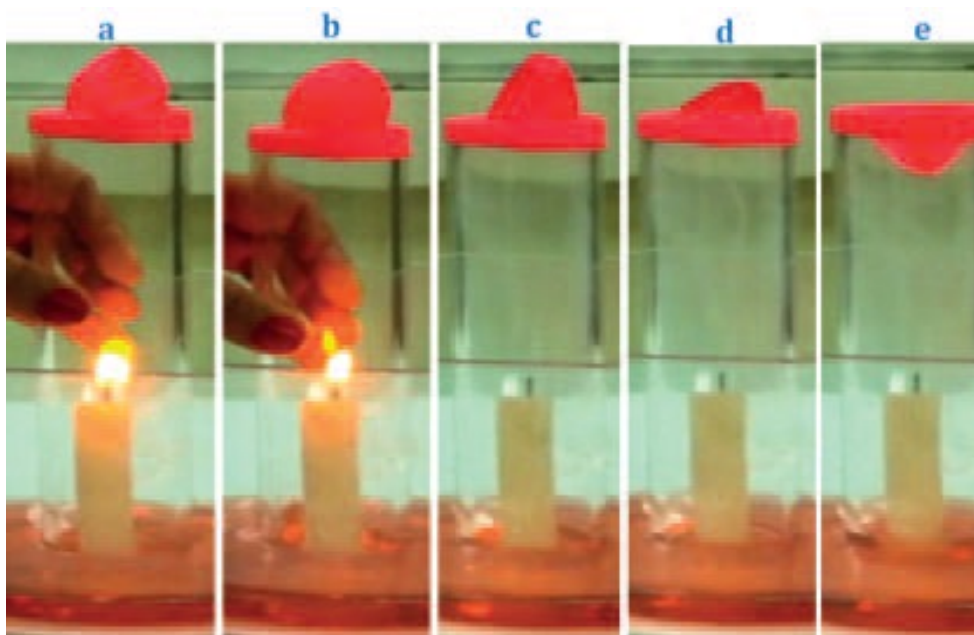


Figure 1: A series of frames showing successive stages in the burning of the candle and the state of inflation of the balloon. In the left frame, gas bubbles can be seen emerging from under the lower rim of the Perspex tube.

The candle is composed of a wick and a carbohydrate substance (Faraday, 1978; Wyssession, Frank, and Yancopoulos, 2011). During the burning of the wick, most of the carbon is transformed into carbon dioxide, the hydrogen turns into water vapor and the wick burns away. The burning of the carbon and the hydrogen consumes the oxygen that is present in the test-tube space. If this is the situation, then what happens in the test-tube space? During the first 5 seconds, the air within the test-tube space expands and causes a considerable rise in the air pressure; the air is depleted of oxygen, since the oxygen reacts with the carbon and the hydrogen. Some of the air is left as bubbles, as we saw (Massalha, Thimor and Gluck; 2012). This causes a drop in the volume of the gases under the Perspex tube. But the quantity of the new gases created—carbon dioxide and water vapor—is higher than the quantity of the gases that left the Perspex tube during the first 5 s, therefore, the pressure inside the Perspex tube rises and the balloon is inflated. About 30 seconds later, after the candle is extinguished, the Perspex tube cools causing the water vapor to condense. This further lowers the volume of the gas under the Perspex tube, resulting in the generation of a vacuum; the balloon flattens and the water rises inside the test tube.

Research Methodology

Research Hypotheses

1. If science teachers studying for a graduate degree are exposed to photographs of a phenomenon, they will be capable of analyzing the observed phenomenon, by the use of the inquiry method.
2. If science teachers studying for a graduate degree are exposed to a performance of the experiment, they will be capable of analyzing the observed phenomenon, by the use of the inquiry method.

Research Method

The research is qualitative; it combines a preliminary questionnaire about the subject of scientific experiments of junior high school level students that science teachers should recognize during their previous teaching (See Appendix). The questionnaire can be examined after the actual experiment (demonstrated experiment), when the dependent variable was "content knowledge" and pedagogical knowledge "occurred after the fact".

In the preliminary research stages, the researchers were observing from "the outside" the coping process of the science teachers in their analysis of the observed phenomenon images that were presented to them. In the latest research stages, after demonstrating the experiment in front of the subjects, the researchers observed their coping process of analyzing the results they watched during the process.

Research Sample

The study involved 52 science teachers, who are also MA students, and have at least between 4 to 19 years of practice, ($M=11.52$, $SD=5.66$) from different regions of the country. Table 1 describes their distribution according to their background variables.

Table 1
Distribution of teachers sharing the same background information

Variable		Number	% percentage
Gender	Man	18	35
	Woman	34	65
Scientific discipline	Physics	8	15
	Chemistry	14	27
	Biology	24	46
	Other	6	12

Research Tools

The research tool is a structured questionnaire, based on viewing static images of the real experiment (See Appendix). The same questionnaire was distributed to the interviewees, after the real demonstration experiment. The questionnaire was built for the purpose of the present study to investigate the teacher's level of success in running inquiry skills and deriving a class-investigated experiment. Two science expert teachers took part in building the questionnaire; they joined the questionnaire, research and testing environment and the scientific research method.

A pilot study was conducted, when the questionnaire was distributed to 11 science teachers. Subsequently, a real demo for the experiment was performed. After conducting the experiment, the questionnaire was distributed for a second time. The purpose of the pilot study was to test the function of the questionnaire questions and their clarity, the time of completing the questionnaire, and other notes and comments. The teachers participating in the pilot were asked to write their comments, which we took into consideration when writing the final version of the questionnaire. The final version of the questionnaire was presented to the two expert science teachers. Choosing the burning candle experiment was done for the following reasons:

- a. The means of conducting the experiment are available in any school lab and can be done relatively easily.
- b. The phenomenon of the rise and the decline of pressure in a single experiment are challenging to both pupils and teachers, and it requires deepening the process of scientific inquiry.
- c. The experiment is supposed to change the perception of science teachers who perform it in their classrooms. From our experience in training science teachers, we encounter with the teacher's misguided explanations for the phenomenon that occur in this experiment. Teachers are required in this experiment, according to the described version by Massalha (2016), to change their way of thinking. There is a state of cognitive conflict between existing knowledge and observable knowledge of the real experiment. The research approach aims to teach the students to relate what they saw and investigate it, ignoring the earlier erroneous information.

The course of study

After building the final version of the research tool, the questionnaire was distributed to a group of science teachers who study for M.A. The study involved 52 science teachers from three heterogeneous groups, who were accepted to continue their graduate studies in teaching science. With the start of the academic studies of the subjects towards their second degree in Science Education, and during one of the weekly lessons, three stages of the study were carried out, which are:

- **Stage A:** 52 science teachers responded to the questionnaire (Appendix)
- **Stage B:** During the lesson, 52 science teachers, who responded to the questionnaire in stage A, watched the demonstration of the research experiment that the questionnaire was built upon. Testing the research more than once, every time the teachers were asked to observe the experiment. In addition, it was suggested that the teachers record the experiment with their mobile phone cameras. After the demonstration, the teachers were asked to watch the video again.
- **Stage C:** 52 teachers, who watched the demonstration of the real study, were asked to answer the same questionnaire again.

The statistical analysis of the two questionnaires before and after the demonstration experiment was carried out manually. The processing results are given on: Table 2 and Table 4. In processing, they gave equal weight to each item.

Analysis of research findings

A qualitative analysis of the science teachers responses to the preliminary questionnaire

Table 2 shows the on-categories and sub-categories received by analyzing the subjects' responses after the demo, as stated; the subjects related to the questions of the questionnaire in their answers to the physical and chemical processes that occur during the experiment both in terms of scientific content, and the level of difficulty in executing and observing of the short period of time - only seconds long. Sub-categories observation allows us to classify them into four on-categories (major categories) that are received from a coarse classification of 17 sub-categories.

Table 2

On-categories and sub- categories in analyzing the answers of the subjects according to the exposure to the static photos only before performing the experimental demo (fine and coarse analysis)

On-categories	Sub-categories (fine resolution)	The percentage of respondents who gave this answer
The experiment is unfamiliar	The experiment is unfamiliar to me at all	23%
Content Knowledge	Air composition	73%
	In the burning process CO ₂ is created	68%
	During the experiment the gas pressure changes inside the tube	%13
The perception of the visual	The candle inside the tube is extinguished	76%
	The water that entered was rising	64%
	The water did not enter the tube at the time when the candle is lit	%26
Logical skills	The Oxygen O ₂ in tube is responsible for the flaming candle	62%
	CO ₂ generated in the burning process extinguishes the candle	65%
	The Oxygen is over in the tube and the candle is extinguished	54%
	The pressure differences are created accompanied by the rise of the water	%32
Misconceptions	There is the process of O ₂ burning	72%
	The water entry to the tube causes the candle to extinguish	19%
	There is no reason for the rise of the water	48%
	The air is a mixture of several gases	23%
	At the end of the burning process, there will be O ₂ in the tube	%32
	The experimental system is a closed system.	%15

Discussion of the results that were received from subjects' responses to the exposure only to photos

Most likely, these teachers have learned science starting from elementary school until junior high; they also learned science at high school, but in their academic studies for the first degree they have studied science in depth. In addition, we assume that the subjects experienced the learning-inquiry method, according to the curriculum. To make a scientific experimental study, 3 main parameters are needed:

1. Basic content knowledge on the subject,
2. Ability to seize the essence of the visible,
3. Developed logic skills.

Our basic assumption was that after 11 years of science education in the school system, which conducted a study of the research method, the subjects acquired a good command of the above parameters. As mentioned above, the first research hypothesis was that the subjects have full control

over the inquiry method. In addition, they acquired the tools they should use when they watch a natural phenomenon, and how to analyze it and explain it.

Looking at Table 2, you can see that the results above are incompatible with the first research hypothesis, the average of the subject's knowledge of the content is only 51.3%, and the average of the ability to seize the visual essence is only 55.3%, while the subject's control over the logical developed skills is only 53.2%. The results are relatively low from the point of view of the researchers; they show lack of control over basic research skills that are required from a science teacher. Moreover, teachers have found a relatively high percentage of misconceptions (34.8%), which solidifies the lack of preparedness to teaching according to the inquiry method.

A qualitative analysis of the consumers' responses to the questionnaire, after viewing the real demonstration experiment

Table 3, shows the on-categories and the sub-categories that were received from the analysis of the consumers' responses after the demonstration of the real experiment. It is worth noting that at this stage of the study, we allowed the group of subjects to use their cell phones to videotape during the experiment and to watch the video once again.

Table 3

On-categories and subcategories in analyzing the subjects' responses after the exposure to the demonstration of the real experiment (coarse and fine analysis)

On-categories	Sub-categories (fine resolution)	% percentage of respondents who gave this answer
Content Knowledge	Air composition	87
	in the burning process CO ₂ is created	84
	During the experiment, the gas pressure changes inside the tube	62
	During the combustion of the candle, water vapor H ₂ O was created (this categorically did not appear in the preliminary questionnaire)	68
The perception of the visual	The candle inside the tube was extinguished	100
	The water that entered was raised	83
	During the flaming time of the candle, the surface of the water went down in the tube (this categorically did not appear in the preliminary questionnaire)	56
	During the lighting time of the candle, air bubbles were seen at the bottom of the tube (this categorically did not appear in the preliminary questionnaire)	48
Logical skills	The Oxygen O ₂ in tube is responsible for the flaming candle	38
	CO ₂ generated in the combustion process extinguishes the candle	68
	The Oxygen is over in the tube and the candle is extinguished	78
Misconceptions	CO ₂ extinguishes the candle	32
	Changing the composition of the gases causes a change in the volume	22
	The purpose of the experiment is to show that CO ₂ is a heavy gas	18
	The oxygen burns in the test tube	23
	The experimental system is a closed system.	8

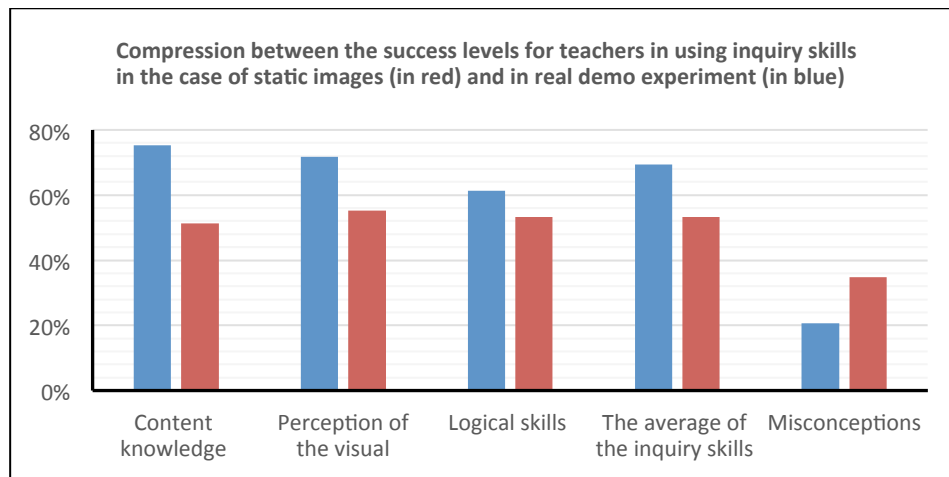
Discussion of the results that were obtained from the subjects' responses according to their exposure to the demonstration of the real experiment

Looking at Table 3, it is possible to see that there is an improvement not only in the results, but also in a number of new Sub-categories, which did not appear in the first stages where we observed the static images of the experiment. For example, “the water vapor was created during the burning of the candle” and “air bubbles went out from the bottom of the tube during the burning of the candle”. In addition, there was a significant improvement in the ability of the teachers to use inquiry skills in a case of observing and capturing the demonstration of the real experiment. Table 4 demonstrates the level of success among the subjects in using scientific inquiry skills during a real demonstration of the experiment.

Table 4

Comparison between the success levels for teachers in using inquiry skills in the case of static images and in real demo experiment

The parameter tested for scientific research skills	% parameters control, in the case of displaying the phenomena using static images (using the photos)	% parameters control the in the case of using the demo (real demo of the experiment)
Content knowledge	%51.3	%75.2
Perception of the visual	%55.3	%71.7
Logical skills	%53.2	%61.3
The average of the inquiry skills	%53.3	%69.4
Misconceptions	%34.8	%20.6



Moreover, a small percentage of 20.6% of misconceptions were found among the subjects after the real demo experiment compared to a relatively high percentage of 34.8% in the case of viewing the pictures of the experiment- a fact that reinforces the improvement in the readiness of the subjects to teach using the inquiry method. However, there is still no full control over the scientific inquiry skills that are required from a teacher who has been teaching for over 11 years.

Discussion

The results show that in the three parameters that were received after the real demonstration of the phenomenon surpass those with the static presentation. This finding was expected, because according to the principles of the illustration-abstraction, a dynamic phenomenon, which is displayed statically in photographs, is more difficult to grasp than it is in the dynamic demonstration. If the dynamic dimension is missing in the displayed pictures, it appeals to the viewer's imagination. This raises the level of abstraction at the expense of the level of illustration. With the "knowledge" parameter, the students' ability in demonstrating has significantly improved. Our assumption is that this is due to the fact that displaying the phenomenon in a dynamic way was more structured, and the communication

about the existing knowledge was better. With the “visual conception” parameter, there was a relatively good improvement in the static mode but still not enough. With the “logical skills” parameter, there was a relatively small improvement in the demo mode compared to the static mode. With regard to the “misconceptions” parameter, there was a declination of 14% in the demo mode relatively to the static mode, which suggests once again the importance of dynamic demonstration experiment compared to viewing photos of the experiment and / or phenomenon.

The average of the three parameters that are engaged in the study improved slightly (See Table 4), but it remains far from being enough for graduate teachers with 11 years of practice. Hence, the hypothesis No. 2 was confirmed, but not adequately, since the expectations of science teachers with about 11 years of experience in teaching is to have a good control in the basic parameters to activate the inquiry skills

CONCLUSIONS

- a. The results that are discussed here indicate that teachers have low control of the basic inquiry skills. Those teachers are science teachers who are studying for M.A. in science, and who have been teaching for 11 years using the inquiry method. Therefore, it is necessary to train teachers on applying inquiry skills in their classes.
- b. It was found that when the subjects were exposed to a static image of the phenomenon compared to the phenomenon in the real experiment, the actual ability in trying to analyze the phenomenon has risen from 53% to 70%; even statistically, it is still not enough for science teachers who are required to gain 100% control. Scientific phenomena in nature contain dynamic elements, and therefore, the illustration must be dynamic. Photographs are static in nature, so their use does not show the purpose of the illustration. Due to this conclusion, in an era of computer technology, there is great projection instead of displaying static images, and it is possible to watch videos that depict real experiments. Until now, the use of static images was for the purpose of illustration only. However, it is not enough in an era of remarkable development in computer technology, because instead of displaying static images, it is highly desirable to replace them by videos that describe the experiment under discussion, or the phenomenon. Teachers as part of the education system are conservative, so action must be taken in the spirit of the era of rapidly evolving technology.
- c. Science textbooks that include photographs that often depict static-dynamic effects. The authors of the books have to give their opinion about the difficulties of interpretation of the image generated by the learner and attach appropriate explanations. In addition, textbooks should include films that describe the phenomenon in discussion; the requested trend is the transition to e-books.
- d. Teachers should be intensively taught how to nurture the three parameters in their teaching toward a structured inquiry education.

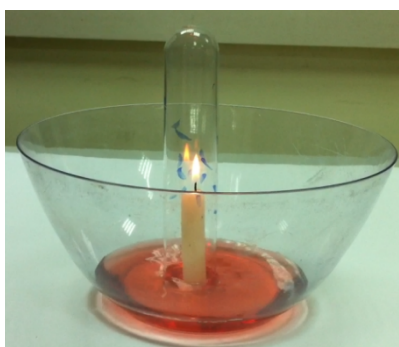
APPENDIX

A questionnaire for testing the inquiry method in teaching: The flaming candle experiment

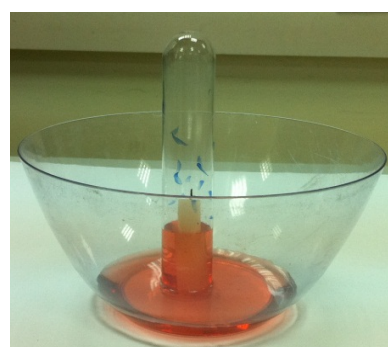
The following series of pictures were viewed; they describe a classic experiment that was performed mostly by junior high school science teachers.



Picture 1: experimental set-up



Picture 2: lowered a bell jar



Picture 3: rise in the water level

Please answer the following questions about the processes occurring during this experiment:

1. Is the "classic experiment that is seen in the pictures familiar to you? Explain
2. If yes, where did you see it?
3. Did you perform the experiment described above? How? What are the difficulties that you had?
4. If yes, what is the purpose of the described experiment?
5. Specify the physical / chemical processes that occur during the experiment.
6. In your opinion, what was in the tube before the beginning of the experiment?
7. In your opinion, what was in the tube at the beginning of the experiment?
8. In your opinion, what will happen after finishing the experiment?
9. As a teacher, what have you learned scientifically and pedagogically, after performing the experiment? Explain!
10. In your opinion, what have your students learned at the end of the experiment? Explain!

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MINDSET AND MOTIVATION

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ABSTRACT

As a teacher in sciences in a secondary school and a teacher trainer at Ghent University, I wondered why some of my students are harder to motivate than others. It seems to me that I couldn't 'reach' my students, that we live in 'separate worlds'. Everything I tried like active learning, cooperative learning, group work... doesn't seem to help them to really start a learning process. This paper aims to reflect on the process of practitioner research I completed to understand this observation and to solve it.

THE THEORY OF MINDSET

In the literature about motivation, it was difficult to find a simple and useful theory. Many is written about motivation (Vanhoof 2013), but as this problem is hard, there are many models to deal with the problem of motivation. It seems me to be important that the model I'll use, would not be too complicated because my students in the secondary school are on the technical and vocational level. I found the answer in the theory of mindset (Dweck 2013).

Growth and fixed mindset

In *The New Psychology of Success* (2006) Dweck developed a continuum upon which people can be placed, based upon their understandings about where their ability comes from. For some people (at one end of the continuum) success and failure are based on the innate ability or the lack of it. Dweck describes this as a fixed theory of intelligence and argues this give rise to a **fixed mindset**. At the other end of this continuum the people believe that success is based on a **growth mindset**.

These individuals argue that success is based on learning, persistence and hard work. So people with the growth mindset believe that intelligence can be improved by effort. Fixed mindset believes that intelligence is fixed: either you are smart or not and that's it. Longitudinal studies of Blackwell e.a. (2007) showed that students with the fixed mindset have more feelings of powerlessness and learned helplessness, especially when they have difficult tasks to do. Students with the growth mindset are far more likely to take on more challenging work and succeed at it than students with the fixed mindset. It seems clear that having a growth mindset benefits motivation (Sypré 2015).

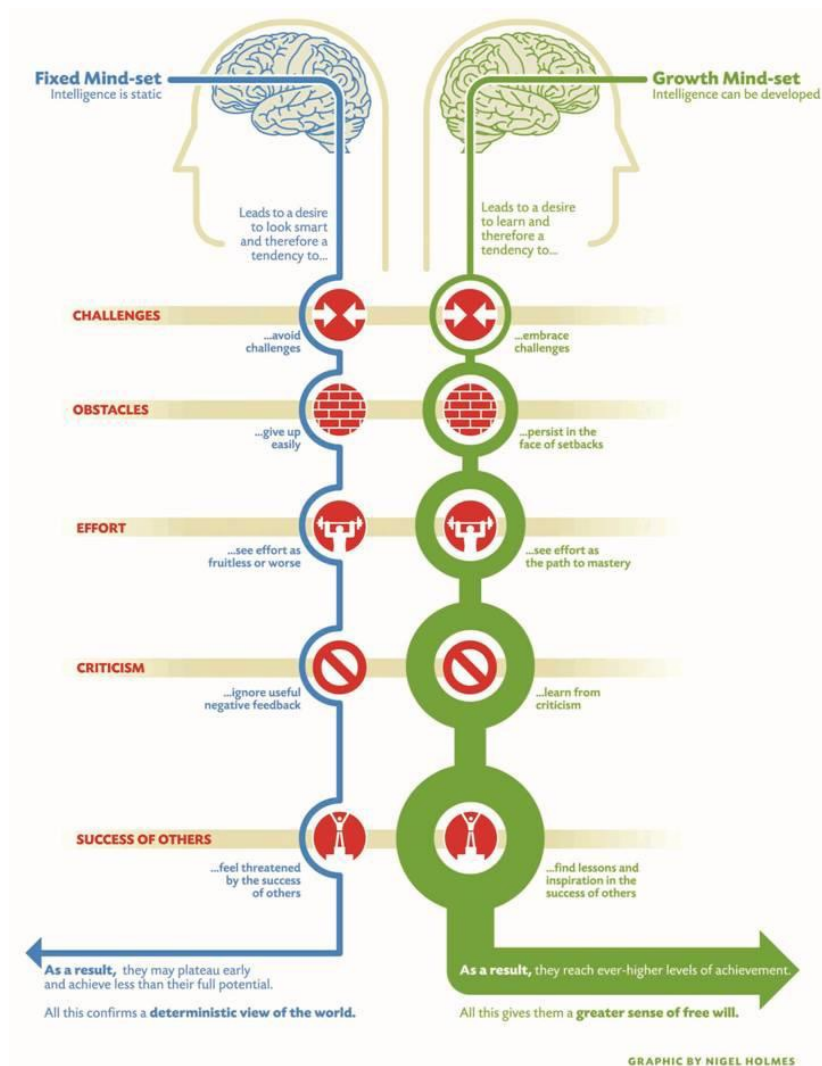


Figure 2: Characteristics of Growth and fixed mindset¹⁵

Focus questions

There are two main questioning in my practitioner research to solve:

- Do my students have a growth mindset or rather a fixed mindset?
- What guidelines can I formulate in changing my students from a fixed mindset into a growth mindset?

DATA COLLECTION

In order to monitor the mindset of my students, I translated a tool from the Brainology© program. The tool is based on propositions with whom you agree or not, or partially. As mindset is a continuum, with this tool it was possible to divide the students in ten groups, five in the fixed (F1 – F5) and five

¹⁵ www.brainology.us

in the growth mindset (G1 – G5) as shown in the graphs with results. F5 is the most fixed, G5 the most growth.

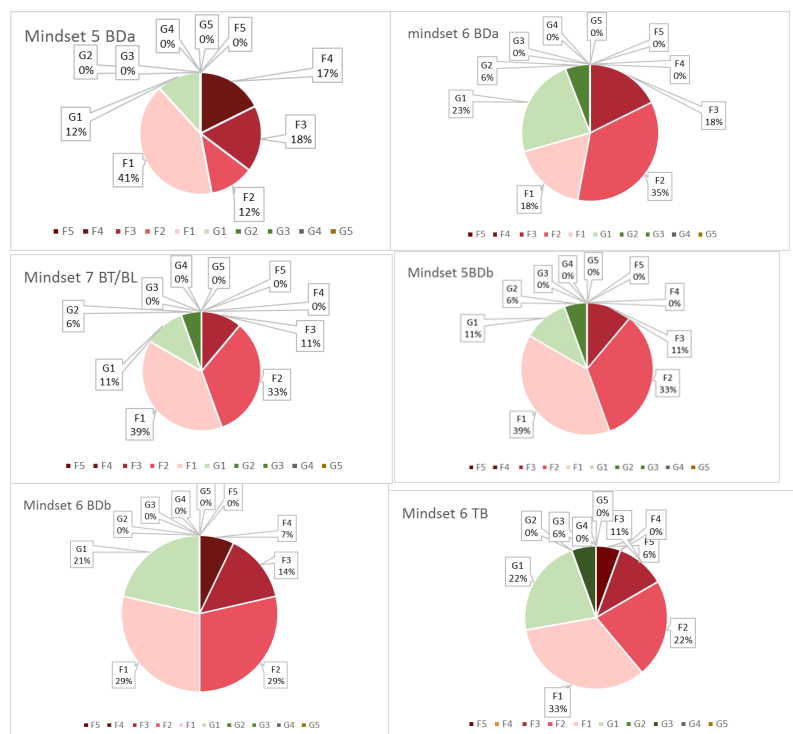
I also had in depth interview with 8 students to double check the tool and I started discussions in a focus group.

RESULTS

In 8 out of 10 class groups, students with the fixed mindset form the majority. Our vocational education classes average 78.5% students with fixed mindset (n=88) (Fig. 1). Our technical education classes average 57.5% of students with fixed mindset (n=67) (Fig. 1). My teacher students at the University (n=14) average 28.5% fixed mindset (Fig. 2).

I wondered also that the class that was assumed the most difficult in school as to the teachers, had the most fixed mindset. In this class 89.5% of the students are in the fixed mindset. The interviews learned me that students in the fixed mindset see smart people as intelligent ones and they feel stupid/bad if they had bad marks. Students in the growth mindset said that even in a difficult task they will succeed 'if they want' and 'if they do with effort'.

As to Sypré (2015) mindset is 'the missing link' in motivation and remediation. You can do many effort, if the mindsed is fixed, nothing will change. Also Farrington, Roderick et al (2015) postulate that the role of non-cognitive factors in shaping school performance is important. Maybe this model can help to improve school performance (Blackwell e.a. 2007).



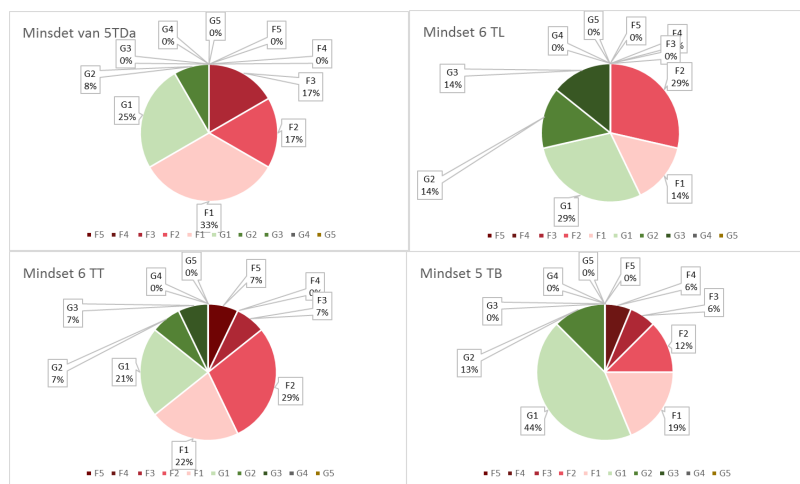


Figure 1

Results of the monitoring of the mindset in ten classgroeps in VABI, Roeselare, first five are on the vocational education level, last five are on the technical education level.

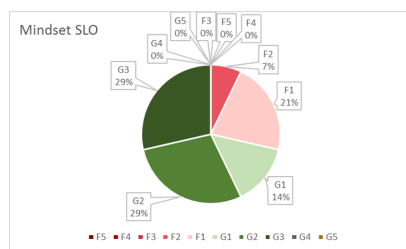


Figure 2

Mindset of my teacher students at Ghent University

GUIDELINES

As to Dweck in Brainology© it is important to change the fixed into a growth mindset by giving explanation about how the brain works and what the difference is between fixed and growth mindset.

*"You don't have to be born with a growth mindset; you can build one. You have a choice"*¹⁶

The second important thing is that teachers have to be aware that giving the right feedback is even more important! Feedback has to be given on the effort. The praise of intelligence can undermine motivation and performance (Dweck 1998). Recognizing and overcoming the false growth mindset is now the new pitfall (Dweck 2016). Praising the effort can only be good if there is an effective practice and strategy. If students aren't learning effectively, they have to be told the truth, even if they worked hard. They have to be able to change learning strategy.

In figure 2 are some bad and good examples of reactions to give to students to strengthen the growth mindset.

¹⁶ http://www.pearsonhighered.com/assets/hip/us/hip_us_pearsonhighered/samplechapter/0133947947.pdf consulted on 20/03/2015

*'Students perform better in school when they and their teachers believe that intelligence is not fixed, but can be developed.'*¹⁷

As in the work of Hattie (2013) mindset has an effect rate lower than 0.4, so it seems that this is not important. But De Witt (2015) is sure that in the studies admitted in the meta-analysis of Hattie (2013) the role of the mindset of the teacher is not questioned. It seems that the influence of the mindset of the teachers is very important to the mindset of the students. This can be an idea for further research. As to my research, 28.5% of my teacher students are in the fixed mindset and the influence is big, it can be necessary to incorporate this knowledge about mindset much more in the teacher education.

HOW TO ENCOURAGE STUDENTS

Growth Mindset

What to say:

"When you learn how to do a new kind of problem, it grows your math brain!"

"If you catch yourself saying, 'I'm not a math person,' just add the word 'yet' to the end of the sentence."

"That feeling of math being hard is the feeling of your brain growing."

"The point isn't to get it all right away. The point is to grow your understanding step by step. What can you try next?"



Fixed Mindset

What not to say:

"Not everybody is good at math. Just do your best."

"That's OK, maybe math is not one of your strengths."

"Don't worry, you'll get it if you keep trying."*

*If students are using the wrong strategies, their efforts might not work. Plus they may feel particularly inept if their efforts are fruitless.

"Great effort! You tried your best!"*

*Don't accept less than optimal performance from your students.



SOURCE: Carol Dweck

Figure 3: Examples of feedback feeding the growth or the fixed mindset

¹⁷ <https://www.nassp.org/portals/0/content/61209.pdf> consulted on 20/03/2015

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ATTACHMENT: POSTER PRESENTED AT EAPRIL CONFERENCE 2015

Mindset and motivation

Practitioner research based on the theory of Carol Dweck in horticultural and agricultural education, VABI in Roeselare – Belgium and the secondary teacher training at Ghent University

Results

- In 8 out of 10 class groups, students with the fixed mindset form the majority.
- Our vocational education classes average 78.5% students with fixed mindset (n=88).
- Our technical education classes average 57.5% of students with fixed mindset (n=67).
- Teacher students (n=14) average 28.5% fixed mindset

Guidelines - Actions

- Give feedback on effort!
- Learn about the brain!
- Learn about mindset!
- Get challenged!



Orientation

- Why are some of my students harder to motivate than others?
- It seems to me that I couldn't 'reach' my students, that we live in 'separate worlds'.

Data collection

- Monitoring mindset in 10 class groups with translated 'Mindset Assessment Profile Tool' (Dweck, 2010)
- In depth interview with 8 students.
- Focus group

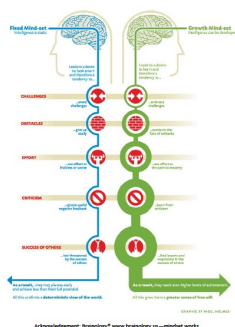
Concept

- **Growth mindset** believes that intelligence can be improved by effort.
- **Fixed mindset** believes that intelligence is fixed: either you are smart or not and that's it.

Theory of mindset, by Carol Dweck, Stanford University (Dweck, 2010)

Focus questions

- Do my students have a growth mindset or rather a fixed mindset?
- What guidelines can I formulate in changing my students from a fixed mindset into a growth mindset?



EXPERTISENETWERK
SCHAKEL TUSSEN THEORIE EN PRAKTIJK

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METHODOLOGIES AND TOOLS FOR THE VIDEO ANALYSIS OF FORMATIVE ASSESSMENT PRACTICES IN THE CLASSROOM (WITH STUDENTS AGED FROM 11 TO 16)¹⁸

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ABSTRACT

The paper presents a systematic observational research on the assessment of teachers' practices in classroom. The research is a specific phase of an international project (FAMT&L - Comenius Multilateral Project) that aims to promote the use of formative assessment in teaching and learning of mathematics for students aged from 11 to 16. The observational study is carried out by a plan of systematic observations of teachers' behaviour in classroom with the help of video recording. Through a specific tool of video analysis (a structured grid), developed starting from international debate and many experiences of in-service teacher training in the five partner countries involved (Italy, France, Holland, Switzerland and Cyprus), we gathered many different indicators on good and bad formative assessment practices used by the mathematics teachers. The analysis of the videos will be used to design the in-service teacher training courses in order to promote a correct use of formative assessment in classroom and to improve students' achievements in learning mathematics.

¹⁸ The paper has been designed and shared in all its parts by all the four authors. In particular, § 1 is by Ira Vannini; § 2 is by Paraskevi Michael-Chrysanthou and Athanasios Gagatsis; § 3, §4 and §5 are by Stefania Lovece.

FORMATIVE ASSESSMENT IN MATHEMATICS TEACHING AND LEARNING

According to recent international researches (OCSE/OECD, 2012; 2015; Eurydice, 2012), the crisis in mathematics education is very diffused, particularly in secondary school. Among the variables that affect students' results, good teaching (Fenstermacher & Richardson, 2005) is essential: in fact, many studies show that using different teaching methods has a substantial impact on students' outcomes (Kane, Taylor, Tyler, & Wooten, 2011; Hattie & Anderman, 2013). This is an important issue in mathematics teaching, where there are many gaps in the use of innovative teaching methods to foster students' learning: in this sense, using strategies of formative assessment and feedback becomes essential (Hattie & Tymperley, 2007; Hattie, 2009; 2012).

Formative assessment in classroom has always been a key instrument in order to promote democratic values in the school, as it is a useful tool to ensure good quality of teaching. In fact, a correct use of the assessment, both at the beginning and during the process of teaching-learning, can point out the differences between the students and their possible learning difficulties and then allows to change teaching actions according to the objectives and the quality for all (Vertecchi, 1976; Grandi, 1977; Weeden, Winter & Broadfoot, 2002).

Formative assessment – which monitors, regulates, supports and promotes each student's learning process – is the key strategy (Bloom, 1968; Black & Wiliam, 1998; Weeden et al., 2002; Guskey et al. 2005) to ensure good skills to the students, according to principles of equality (Crahay, 2013).

Therefore, in the international scientific debate, the main function attributed on the formative assessment (FA) is to be a tool to regulate the process of teaching-learning (Scriven, 1967; Vertecchi, 1976), that is as an assessment *for* learning (Weeden, Winter & Broadfoot, 2002; Allal & Laveault, 2009) because it helps the teacher to gather information, to improve and make her/his teaching more effective by following the students' needs. With this diagnostic function, formative assessment allows the analysis of learning situations that can give information in order to take coherent and effective decisions. It focuses on the "errors" of the student and of the teacher, but considers them as *resources* for the design and re-design of interventions in order to achieve teaching objectives.

The steps that characterize the assessment (Gattullo, 1967), and in particular the formative one are three (Gitomer & Zisk, 2015, p.3):

- an initial step of cognitive representation of which data we want to collect ("what we are trying to measure");
- a step of specific gathering of data, by empiric observation ("how we collect evidence");
- the interpretation of the data ("how we make sense of the evidence").

For this reason, the teacher practices in classroom are particularly important, both in the moment in which the data on the students' results are collected and analysed, and in the phase of interpretation of data. The teacher, in this moment, can make assumptions about the type of errors that students do and give feedback to help them in the most critical steps and reducing their anxiety. This is important also for the teaching of mathematics. The feedback activities is a complex set of actions that the teacher must lead but on which there are no precise operative indications. For this reason, research in this area must be particularly relevant and rigorous.

In school practices, the assessment of mathematical learning is traditionally oriented to a summative function, performed by means of written open tests (only recently the use of multiple choice tests is increasing) and oral-at-the-blackboard interviews. Hence, it focuses primarily on students' *products* (results of calculations, presentations of proofs etc.). On the other hand, formative assessment requires

being careful mainly on students' *processes*. In this sense, we may say that often Maths teachers have no formative assessment tradition and, in fact, there is no systematic presence of it in their pre-service training, and it is sporadic also in in-service training.

It must be noted that assessment, in Maths, has a crucial role in determining students' beliefs and attitudes which, in turn, influence students' achievements (Di Martino & Zan, 2002; Bolondi & Ferretti, 2015). Therefore, recovering a formative dimension for assessment is a strategic goal for Maths teacher and it may become a fundamental tool for switching all the didactic focus from the contents (the mathematical objects) to the actors (the students). Maths activity in the classroom involves many components: discourses, technologies, visual representations; it is performed through explorations, work on specific tasks, explanations. Formative assessment takes place in this complexity of actions. Then it is important to train teachers to observe significant elements of this complexity, and for this purpose video analysis is a natural tool. Therefore, it is very important to know in detail the teachers' assessment beliefs and practices to understand their specific learning needs and to design adequate interventions of teacher training.

The analysis of practices through classroom observation, and especially through the use of the video recording (Casabianca, McCaffrey, Gitomer, Bell, Hamre & Pianta, 2013), is an effective mean to analyse the assessment practices in the classroom. Similarly, researches show the importance of video-analysis as a tool for teacher training (Meyer, 2012; Ertmer, Conklin, & Lewandowski, 2002) in order to mediate between reflexivity and practice (Rossi, Fedeli, Biondi, Magnoler, Bramucci, & Lancioni, 2015).

THE PROJECT COMENIUS FAMT&L AND THE USE OF VIDEO

Project "FAMT&L" (Formative Assessment in Mathematics for Teaching and Learning) aims to promote the correct use of FA in the classroom, specifically in teaching mathematics, with students aged from 11 to 16 years old. The five member partners involved in the project are the Alma Mater Studiorum University of Bologna in Italy, the University of Applied Sciences and Arts of Southern Switzerland, the University of Cergy-Pontoise in France, the University of Cyprus, and the Netherlands' Hogeschool Inholland.

The research started with observational studies and surveys in order to understand analytically Maths teachers' (Michael – Chrysanthou, Gagatsis & Vannini, 2014) and students' beliefs and practices (Michael-Chrysanthou & Gagatsis, 2015). In this way it has been possible to detect training needs to design specific courses aimed at promoting a correct use of methodologies and tools to conduct correct formative assessment activities. In fact, the first explorative phase of the work started with the administration of questionnaires to Mathematics teachers and students of each Partner's Country to gather information about beliefs and practices on assessment. Furthermore, we conducted some case studies, with the help of video recording, to develop and try out an observational tool (a structured grid) to analyse assessment practices in the classroom (that will be described in the next paragraph).

In the second phase, we have carried out a systematic observation study on a larger sample of video sequences of teachers in the five Partner countries involved (Italy, Switzerland, France, and Holland) with the use of a specific tool. The tool was defined by using indications from international literature and experiences of in-service training and it is useful to gather many different indicators on good and bad practices for the formative assessment of Mathematics teachers (their habits about gathering information on the students' learning process, correcting errors and using feedback to support learning). With the videos collected about formative assessment situations, researchers are creating a

web-repository and designing a teacher training program based on the use of such repository. In this activity we will focus on the process of video analysis made in class, and then on the creation of a repository that can be used in training courses aimed to promote FA in the practices of in-service Math teachers.

The videos collected consist in recordings of real class situations, when teachers were performing assessment practices, such as the administration of a test or a task to students, the conduction of a written, oral or practical task; the reflection on the mistakes that were made in a test; the correction of an assigned task (in group, individual or in pairs); the teacher's formative feedback during the work on an individual exercise, and so on. From the "long" videos, a number of short video-sequences were obtained that will be the main training tool uploaded on the platform implemented for the training pilot course. These short videos are being analysed through systematic observations, in order to detect the presence or absence of indicators of behaviour which we defined in detail.

With the use of our grid for the video analysis we can obtain a scheme that allows a meta-dating of each sequence and so a system of annotating the videos that facilitate their storing in a web repository. These systematic processes should give an easy way to find specific materials in the repository, and also to integrate them into "pilot" training courses which should be a guide to promote a correct use of FA as a tool to improve the teaching of Maths. Such courses are aimed to the acquirement of specific skills in the use of formative assessment as an element that improves the quality of teaching. In these courses suggestions coming from the contemporary debate on teacher training will be integrated. It states that the observation by the teachers of their own practices would allow them to change their behaviour by themselves and encourage processes of reconsideration on assessment and teaching.

A TOOL FOR OBSERVATION OF TEACHERS' ASSESSMENT PRACTICES AND VIDEO ANALYSIS

This theoretical framework highlights the importance of observational studies and surveys to understand analytically the mathematics teachers' beliefs and practices on assessment, in order to design effective interventions on teacher training. Therefore, the main questions of the research are: how do math teachers think and act during assessment situations in the classroom? What are their strengths and weaknesses concerning the theory on assessment? The goal is to analyse teachers' training needs through:

- the analysis of their beliefs on assessment
- the observation of assessment practices in the classroom.

Specifically, the aim of this paper is to analyse how much and how these assessment practices deviate from the theoretical and methodological guidelines of educational research. Through video-analysis (and the use of an observation grid) we highlight how teachers gather information about students' learning process, correct errors and use feedback to support students' learning. Many of the natural situations of Mathematics teaching in the classroom, analysed in the five countries through videos, point out a use of assessment with the following characteristics:

- it is specifically aimed at summative assessment, in order to give marks;
- it is not rigorous. The cases observed in natural environment show gaps in "measuring" learning and an incorrect use of feedback to the student (labelling);
- it is poor at recording analytically the learning difficulties of each student.

The first results, highlighted by the systematic observation of the videos, allow us to understand the features of “bad” and “good” practices of formative assessment and to design specific interventions of teacher training. In particular, the “bad practices” observed in the classrooms show weaknesses in the in-service teacher training and, at the same time, they can become an important tool to implement training paths. In fact, sharing systematic analysis of videos with teachers in training may solicit reflective and critical thinking in the teachers themselves and on their assessment practices. Therefore, this is an effective tool to foster their professional growth.

Overall, the use of the grid for the video analysis is important, as it allows gathering information on assessment practices. This work helps archiving and categorizing of video sequences that can effectively be used in future training courses. This grid has been revised in time and it is still subjected to “additions”, above all additions to the list of observable indicators. In fact the researchers were able to complete and validate it via the systematic use of it in video-analysis, hence in observing specific actions and behaviours of teachers and students in class, during processes of assessment. To describe the grid, we can say that its structure is at different levels. At the first level we have the data useful to “identify” and archive the (long) video files: Video’s identification code; Country; Language; Type: audio/video (length, format); Creation date; Author; School level target; Number of pupils in classroom; Presence of students with particular educational needs.

In a second level we find categories which allow a qualitative analysis, because it contains a list of variables which get into play in a specific process of assessment, obtained by taking an environmental perspective (Bronfenbrenner, 1979). The different indicators on assessment practices of Mathematics teachers in the grid are grouped in five macro-categories:

1. Mathematics’ contents (contents and capabilities which are the object of the teaching);
2. time of assessment (before, during or after a specific learning activity);
3. setting of assessment (with all the students in the classroom, with groups of students or with each individual student);
4. kind of tools for data gathering of students’ skills (written tests, oral exams, behavioural observation, ...);
5. phases of formative assessment (presentation of the assessment activity; gathering of information; correcting errors; feedback).

About the Mathematics contents (the first category), we considered not only contents in mathematical knowledge (Maths objects), but also the skills that the students put into play in the learning process. With a view on the complexity of the teaching-learning process, in fact, we adopted a two-dimensional frame contents/capabilities, a scheme based on the OECD-Pisa approach (OECD-Pisa, 2013). Specifically, for the contents: Numbers; Spaces and shape; Uncertainty and data; Relations and functions. For the capabilities: Communication; Mathematizing; Representation; Reasoning and Argumentation; Devising strategies for problem solving; Using symbolic, Formal and technical language and operations; Using mathematical tools.

The second (time: where the assessment activity takes place in the longer time of the whole lesson) and the third (setting: space/context of the formative assessment) categories include important variables, because both can condition the didactic process. These categories have to be pedagogically planned and suited to the specific learning situation, for having a very positive role in facilitating the learning process. The tools (fourth category) that the teachers use in their assessment activity are very important too for guaranteeing a correct and rigorous evaluation. Specifically, they have to be suitable and functional to gather data on what the students have learned.

The last category is perhaps the most interesting and the most characterizing for our tool/grid, because it gathers several kind of behaviours and actions which will be considered as indicators to be observed in the different phases of the assessment procedure. In this section some sub categories are grouped, one for each phase of the assessment procedures:

- presentation of the assessment (when the teacher share the correction and/or assessment criteria with the class)
- administration of the tools/strategies of assessment
- collecting data
- formative feedback (when the teacher give back the results to students)

To better understand the type of indicators contained in this category, a brief extract of the grid (in its section n. 5) is displayed below.

Presentation of the assessment

Sharing the correction and/or assessment criteria with the class

- *The teacher fixes with the students the date for the assessment*
- *The teacher reminds the class that today is the day of the assessment*
- *The teacher shows to the students the aims of the assessment*
- *The teacher asks some questions to the students to verify if the students understood the aims of the assessment*
- *The teacher shows to the students the subject of the assessment*
- *The teacher shows to the students the evaluation criteria to correct the test/task*
- *The teacher explains the test/task instructions*
- *The teacher asks some questions to the students to verify that the students understood the test/task instructions*
- *The teacher recalls the criteria to correct the test/task*
- *The teacher discusses with the students about the above criteria*
- *The teacher keeps care the student's observation about the criteria*
- *The teacher makes clear the ranking for each question*

Our analysis tool has been revealed to be very useful and also well implemented. It has been integrated in an online repository which contains short analysed extracts from the videos, so it makes the analysis itself easy and the metadata to insert in the videos, which can be found using single “words” of the grid as research and gathering criteria.

VIDEOS FOR TEACHER TRAINING ON ASSESSMENT: WEB REPOSITORY AND E-LEARNING PLATFORM

The work of making the analysis grid was long and complex and involved all partners. Specifically, they had done several attempts and hypotheses to produce a list of descriptions of situations. Anyway, this list cannot be exhaustive and foresee all the meaningful possible situations in assessment moments and, for this reason, there are still blanks of the grid which have been left “open” for future comments and notes.

To begin with, the partners considered the experience in video-analysis that the University of Cergy-Pontoise (Paris) led over the years. With their support as a starting point, we carried out a research and

a study of the most well-known software systems (both free and not) that are available for the analysis of human behaviour with the help of video recording (for example The Observer XT by Noldus Information Technology, or iCoda, only for Apple computers, and the free software Transana and Anvil). Starting from the characteristics of the examined software, we realized a specific system for FAMT&L. That system is a web repository which allows, on one hand, to gather the videos which have been endowed of metadata and analysed into a sort of on line catalogue which allows to search easily and find the archived material using different criteria of searching. This metedatation is very functional also to gather quantitative data for statistics elaborations, to a macro-level, since it allows to find the total number of videos containing a particular value of some indicator. On the other hand, this on line system permits also to get an easier visualization of the videosequences, of the categories used to label them and of the behaviour indicators that can be observed in the video itself. Thus, we have collected a number of videos recorded in classroom in school grades corresponding to ages 10-16. We have extracted from these videos a large number of short sequences that were analysed and stored in our repository and in the near future we will use them in training programs specifically directed to in-service Math teachers (but it can also be used in pre-service training situations).

In order to allow the systematic use of videos and other materials in pilot courses for in-service teachers training from the several countries in the project, we implemented also a platform (Espace) which will permit to supply formative routes both on line and face to face. In this learning environment (e-learning platform), different types of tools for teachers will be available: examples of learning contexts, video situations of Mathematics teaching, assessment tools, training courses, and so on. All these educational materials can be used to promote a proper use of formative assessment in teaching-learning situations.

At the beginning, such pilot courses will be tested in every country with in-service teachers and they will have a common model, to which the different materials (in different languages) will be adapted. Our perspective is that those materials and courses could be adapted more specifically to different contexts and also be used in forming the future teachers' teaching and assessment practices. The training program is based both on teaching general knowledge related to didactic design and assessment practices, and on specific knowledge of Mathematics education, with particular regard to formative and summative assessment, and assessment for learning. In fact, we think that the appropriate use of correct FA methods and techniques is a key element to make Mathematics teaching more effective and innovative. The repository can, at this time, be accessed only by the researchers working with our project, because they are working to analyse and upload videos on the present platform. As soon as the number of videos and other material are adequate to be a valuable support for formative teachers activities of several countries, the repository will become public.

THE VIDEOS IN THE TEACHER TRAINING, BETWEEN THEORY AND PRACTICE

This research wants to insert itself in the current international debate on teacher professionalism (Perrenoud, 2002; Anderson, 2004; Darling-Hammond & Bransford, 2007; Koster & Dengerink, 2008; European Commission, 2002, 2003, 2005, 2012; OECD, 2005; UNESCO, 2005) and their training as a strategic factor to improve the national educational systems (see Richardson & Placier, 2002; Darling-Hammond, 2006; Darling-Hammond et al., 2007; Coggi, 2014).

In this debate a very important role is assumed by the relationship between theory and praxis, between knowledge and competences, and in particular the attention is on how to get that the information

obtained will really develop into new behaviours and competences that will enter into play in their everyday teaching practices. In this line of thought, it is particularly relevant the concept of recursivity between theory and praxis, meaning an alternation between distinct (but at the same time interrelated) steps in a specific learning process (Altet, 2003) which are able to translate theoretic knowledge and methodology into action and also, at the same time, reflection on the action itself (a reflection that, in turn, becomes new knowledge, and so forth). Many interdisciplinary studies have aimed to point out the crucial factors in teaching behaviours in order to valuate and promote effective teaching methods, for instance the ones of the Evidence Based Learning theory, or the Gates Foundation's study (2013) or the work by international projects such as PISA, TIMMS, PIRLS (Pearson, 2012).

In these studies seems to be already validated the idea that a fundamental aspect of the professionalization of teachers shows how they manage to conceptualize their teaching practices (Rossi, 2014) and the recursivity (Seidel and Stürmer, 2014). In this process through the steps of: observation, understanding, anticipation or prediction (Rivoltella, 2014) of what may happen as a result of a specific action. From here, several indications result about the most effective methodologies to promote the co-presence of theory and praxis in teachers training (both in-service or pre-service) and about many techniques that can be based on the use of specific support tools, as, in particular, the videos. In the specific, methods that make use of video in training are classified as "media education" (O'Reilly, 2005) and in particular those which are addressed to teachers can be distinguished depending on the specific use that is made of the video (Masats & Dooly, 2011):

- as both an object and a tool for observation and analysis, to show a subject to the teachers (we speak of video-viewing, in this case);
- as an example or display, when the video shows the practices and the behaviour of experienced teachers in specific situations (video modelling);
- as a record of teachers themselves, which is shared with the others, making it an occasion of comparison and debate with colleagues or with a trainer (video coaching).

Content, length, aim of a video can be various. For example, a video can be presented as an example of everyday teaching activity (Carbonneau & Hétu, 2006; Clarke et al., 2008), or as a "best practice" which rarely could be directly observed, or as a specific experience or experimentation (Santagata & Guarino, 2011). Anyway, many studies seem to confirm that the video-based interventions in the training of teachers are very effective: videos are used as a tool able to integrate and support, via the visual activity, the direct observation and the learning of good teaching practices of which, otherwise, there could only be a description, oral or written (Santagata, Zannoni & Stigler, 2007).

For instance, we can refer to a technique used actually, based on experiences made in the '60-'70's by K. Romney and D. Allen at Stanford University. This is the technique of microteaching which consists mainly in having the trainee teacher to present to a small group of students a short time teaching session, concentrated on a specific subject. The short session is monitored from trainers which use video recording as main tool. The trainees, analysing a teaching sequence, can reflect asking themselves about the abilities which will help them to solve a specific problem in a the teaching practice and about the errors they can do in their activities. Such an analysis can promote and facilitate a reflexion on what is done in the class, which contributes to an improvement of the teaching practices. Therefore, the reflexivity as an attitude of the teachers to analyse and think over about their own practices is essential to get an educational success (Dewey, 1961), and it is what allows us to speak on the teachers as reflective practitioners (Schön, 2006; Damiano, 2007). Anyway, it is also important that this use takes place within a well structured educational path, characterized by:

- a clear and thought over choice of the learning objectives that one wants to achieve with the trainees teachers (Blomberg et al., 2013; Seidel et al., 2011; Rossi et al., 2015);

- the production or selection of the videos best suited to the defined objectives;
- a good support and guide to the vision, comprehension and analysis of the video;
- elaborating suitable tools for evaluation, appropriate to the objectives (Calvani et al, 2014).

Following these ideas, the FAMT&L project aims to the elaboration of a pilot course for Mathematics teachers that can be followed in part as a distance course and in part face to face. Such a course should integrate and use the analysis of videos made in class with teachers involved in the project with different modalities, but all oriented to the achievement of specific formative targets. Using the video stored in the web repository, we intend to promote a training process in which the observation of teaching practices by themselves could allow changes in teachers behaviour and encourage in them (through a critical thinking) a reconsideration on assessment and teaching. In fact, the pilot course that will be developed will seek to use the video sequences analysed in order to promote critical thinking of teachers in training.

The model of the course will be tested and its efficiency verified with small groups of Mathematics teachers in the several partner countries, so that it can be proposed as a model to be adopted also in other activities, both for in-service or pre-service teachers. Currently, the international research team is organizing the pilot course in each of the countries involved and videos are proving to be an excellent support tool for planning of these training courses. The idea for the future is that videos and other materials uploaded on the web repository could be used in several different activities:

- activities of self training, for expert teachers;
- more “formal” activities, where teachers are guided using analysed videos to promote development of assessment skills;
- activities in which the teachers may decide to be filmed to start a process of critical reflection on their teaching and evaluation methods so to be able to improve themselves.

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THE PEDAGOGICAL TACT – TRANSFER FROM (SCIENTIFIC) THEORIES TO PEDAGOGICAL PRACTICE

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ABSTRACT

This paper illustrates parts of a research project about a much discussed issue in research in education: the relationship between theory and practice. The project “Pedagogical Tact” is supported by the FWF Austrian Science Fund [P27191] and is realized at the Department of Education of the University of Salzburg from January 2015 until December 2017. The main aim of the project that contains five studies is to formulate a comprehensive theory of pedagogical tact (the intermediate link between theory and practice first addressed by Herbart, 1802/1896) and to operationalize this construct in its complexity. For the integration of issues such as situation specificity, goal multiplism, theory multiplism, the generality-concreteness antinomy (Herrmann, 1979), “the situation talks back” (Schön, 1983), unexpected events, etc. it seems to be necessary to explore the pedagogical tact (Patry & Präauer, 2014). The Cognitive Affective Personality System (CAPS, Mischel & Shoda, 1995) provides important information for theory-practice-transfer as well. Since scientific theories can be used by practitioners only if they are integrated in their subjective theories, Study 1 of the project will focus on subjective theories and the comparison to scientific theories. The elicitation of the tact relevant elements will be accomplished in Study 3 and Study 4 using stimulated recall (Wagner, 1987, Calderhead, 1981). Study 2 deals with the development of a standardised manual for implementation and data analysis using this method. The results of all four studies will serve valuable information for Study 5 that will contain the conception of a practice-oriented book for teachers of any level, social-workers and other professionals of education.

THEORY OF THE RELATION OF THEORY AND PRACTICE

The recognition of the problem about the impossibility of a direct application of scientific knowledge into practice is not new. To overcome this “gap” Johann Friedrich Herbart formulated the term “pedagogical tact” in his first pedagogical lecture (1802/1896) as intermediate link between theory and practice.

Disambiguation

Before introducing the concept of pedagogical tact, it is necessary to outline some relevant terms. To avoid any possibility of confusion in the research project we distinguish between (scientific) theories about education that practitioners might use (labelled theories₁) and theories concerning the relationship between theories₁ and practice (labelled theories₂). Thus a theory about the pedagogical tact is a theory₂.

Further, it is necessary to distinguish scientific and subjective theories, both with respect to theories₁ and theories₂. All four kinds of theories are of interest for the present project. Subjective theories are complex cognition aggregates of one’s view of oneself and the world. They show an (at least implicit) structure of argumentation and the same form and functions as scientific theories: explanation, prognostics and technology (Groeben, Wahl, Schlee, & Scheele, 1988; Gastager, Patry, & Gollackner, 2011). The main assumption in the research project is that theories₁ (whether scientific or subjective) can guide actions only if they are incorporated in the practitioner’s system of subjective theories₁ (Patry, 2012).

Pedagogical Tact

Herbart’s concept was influential in “geisteswissenschaftliche Pädagogik” (e.g., Muth, 1982) and in phenomenology (e.g., van Manen, 1991) but so far it has not been analysed empirically.

Barriers at the transfer from theories to pedagogical practice

Recent theoretical investigations (Patry, 2004, 2009, 2012; Patry & Präauer, 2014) show which “barriers” are present in practitioners’ attempts to base their decisions on subjective theories₁ in practice. According to these studies, situation specificity, events that trigger a specific focus of attention, goal multiplism, theory multiplism, the generality-concreteness antinomy (Herrmann, 1979), “the situation talks back” (Schön, 1983) and unexpected events play a decisive role in pedagogical actions.

- *Situation specificity*: In complex and always different situations and depending on how these are perceived and interpreted, different actions are seen as expedient in different situations by the practitioner (Patry, 1991, 2000).
- Practitioners have different and often contradictory goals in the same situation (*goal multiplism*) and draw on several subjective theories₁ simultaneously (*theory₁ multiplism*). However, research deals typically with one goal and one theory₁ at a time.
- The generality-concreteness antinomy states that the more general a statement is, the less concrete (or more abstract) it can be. The more concrete it is, the less general can it be (Herrmann, 1979, p. 160ff.). Herbart (1802/1896) refers to this as follows: “Theory in its universality stretches over an expanse of which any one in his practice touches on but an infinitely minute part. On the other hand, in its indefiniteness, which is the immediate

consequence of its universality, it passes by all details, all the individual circumstances that surround the practical teacher at every given moment.” (p.18)

Cognitive-Affective Personality System (CAPS) Theory

A useful theory that accounts for situation specificity, goal and theory₁ multiplism and other relevant issues in this context is the Cognitive-Affective Personality System (CAPS, Mischel & Shoda, 1995) that can be used as theory₁ or as theory₂ and that addresses situation specificity. The CAPS is a personality theory according to which personality does not only depend on the person alone but on the situation in which the person is involved as well. Personality is characterized by a system of mediating processes. The organization of so called Cognitive-Affective Units (CAUs) leads to personality.

Mischel and Shoda (1995) distinguish six different CAUs:

- Competencies (What am I *able* to do? What behaviours are at my disposition in the present situation?);
- Perception (How do I interpret the situation?);
- Expectations (What outcomes will my behaviour have?);
- Goals and values (What is important to me? What do I want to achieve?);
- Self-regulatory strategies (How can I manage to have self-control?); and
- Emotions (What do I feel in this situation?).

CAUs are internal factors that address, each in its way, how the person deals with the situation and decides how to act. Each CAU addresses several issues (e.g., different competencies, perception foci, etc.). In any given situation, the practitioner activates a set of such issues in different CAUs. For instance, in a complex classroom situation, the teacher might

- focus on specific features of the situation he or she perceives, such as on “disturbing behaviour by student Peter”, at the detriment of others, like “the students in the back row are working very well” (CAU 2);
- refer to specific values, such as “it is important for me to avoid Peter disturbing the class”, at the detriment of others, such as “I appreciate the good work of other students” (CAU 4);
- check for potential behaviors in this situation, such as “reprimanding Peter might be an option” as opposed to “ignoring Peter” (CAU 1);
- ask about expectations like “how likely is it that reprimanding Peter will reduce his disturbing behavior?” versus “how likely is it that ignoring Peter will reduce disturbances in class” (CAU 3);
- experience emotions like anger about Peter (CAU 6); and
- use self-regulatory strategies like anger control (CAU 5).

As this example shows, the CAUs are organized and interact with each other, thus influencing the individual (patterns of) behaviour. A particular example is the relationship of knowledge about behavioural options (CAU 1), and expectancies (CAU 3) which, together, yield subjective theories₁ of the type “If I do X, it is likely that I get Y.” Combined with the value “Y is important to me.” (CAU 4) this might lead to the conclusion “X might be a good action in this situation.” We assume that these six CAUs play a decisive role in the practitioner’s tactful actions.

Situation – Person – Action – Theory – Practice – Pedagogical Tact

The theories presented above intertwine to provide a theory₂ of tact by interlinking situation, person, action, theory₁, and practice, as illustrated by the figures.

Figure 1 represents a *person* in a *situation*. Thus her or his *action* is also part of this situation und determines it together with other features (the problems of defining a situation is discussed in detail in Patry, 2014a). The *person in the situation* has internal factors – CAUs – that together constitute *personality* (Figure 2). He or she activates the CAUs in function of the situation and its interpretation. The CAUs relate to each other. A *person's* perception (CAU 2), for example, will depend on her or his knowledge (subjective theory₁; perception is theory dependent, e.g., Hanson, 1957; CAU 1), but also on her or his emotional state (CAU 6). Concerning subjective theories₁ (CAU 1, possibly combined with CAU 3) and goals (CAU 4) it should be reminded that people usually have several subjective theories₁ (theory multiplism) and several goals simultaneously (goal multiplism) guiding their actions.

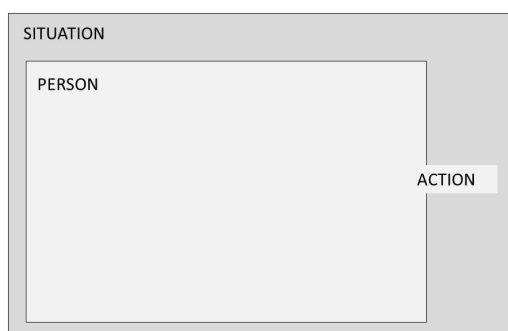


Figure 1: Acting person in situation

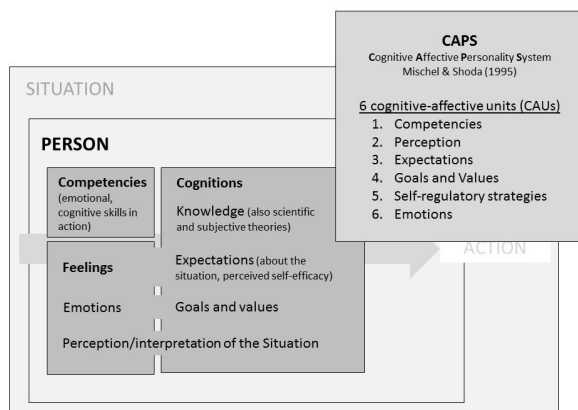


Figure 2: CAPS (Mischel & Shoda, 1995)

In Figure 3 the outer box marks the practice – the situation including how it has evolved (e.g., in the example above, the teacher's prior experiences with Peter). The *action* is the interface between *person* and *situation*. The situation includes the circumstances and the previous situation and the persons in there. In practice situations can yield unexpected events (Schön, 1983: "the situation talks back"). In his book about the pedagogical tact Muth (1982) characterized education as being "not plannable"; the pedagogical tact, then, is "assurance in situations" ("Situationssicherheit"). But many events cannot be anticipated – in Herbart's terms: „If he has anticipatingly indulged in extensive plans, the practical circumstances will mock him" (1802/1896, p. 21). In opposition to inappropriate plans, it is helpful to use theories₁. These are part of the person's personal knowledge that Figure 4 shows with the inner dark mark: Knowledge, for example, can arise from experience or by being told about scientific theories, etc. Researchers develop theories that they share with practitioners in an adaptive form

geared to the target group for example in schools or training and development. These scientific theories are incorporated in the practitioner's system of subjective theories₁. The practitioners will base their decision how to act partly on them.

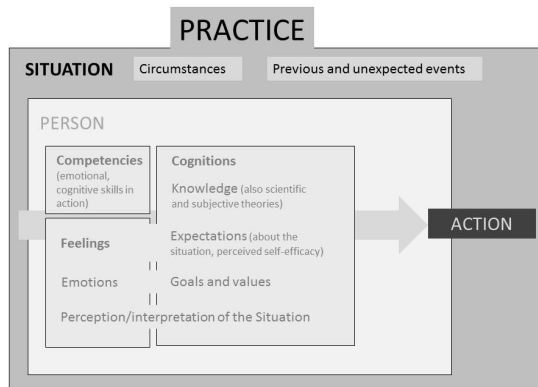


Figure 3: Action in practice

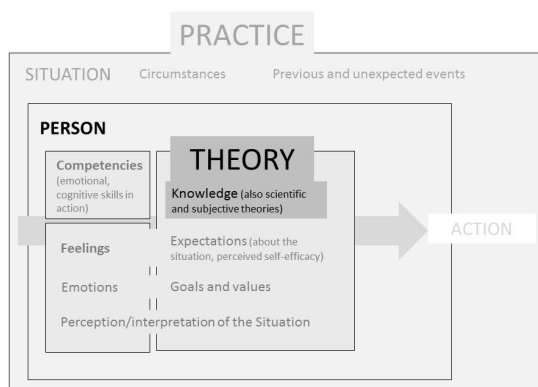


Figure 4: A person's theories

To sum up, the transfer from theory to practice concerns the situation and the person including individual subjective theories₁. Figure 5 represents the complex system of elements that influences acting and shows the position of the pedagogical tact.

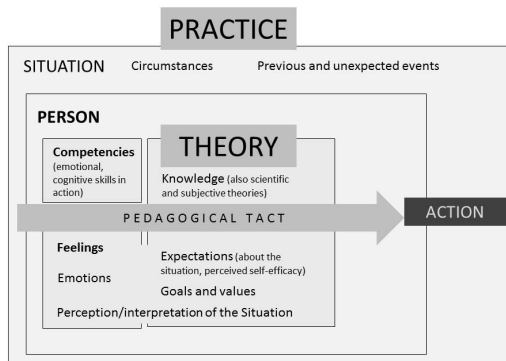


Figure 5: Pedagogical Tact

FIELD WORK

How it is possible to gather these elements that form such a complex system? In our project we assess (1) the subjective theories through the structure laying approach and (2) the action-leading cognitions through stimulated recall.

1. Subjective theories can be assessed using a structure-laying procedure (Gastager, Patry & Gollackner, 2011). The same can be done for scientific theories using textbooks presenting them and research reports (*Study 1*). The hypotheses are that subjective theories₁ are more complex, less general, and contain more contradictions and more normative elements than scientific theories₁. These hypotheses have been confirmed tentatively, among others, for theories₁ about praise (Patry, 2014b). Studies addressing scientific and subjective theories₂ are in planning.
2. As several studies (Messmer, 2015; Präauer, 2013; Lyle, 2003; Stough, 2001) show, the application of the so-called “stimulated recall” (see, e.g. Wagner, 1987; Calderhead, 1981) is a possible method for examining action leading cognitions. This method consists in two steps: Firstly, a practitioner gets video-recorded in a pedagogical situation; secondly, based on this video, a guided interview follows as quickly as possible: The practitioner is asked to utter her or his action-guiding cognitions. This method needs, first, to be specified for addressing the pedagogical tact by conceiving precise assignments how to lead the interview and a handbook for the practitioner’s statements (*Study 2*). More precisely, *study 2* includes the generation of a manual for implementation and data analysis. Apart from short theoretical background the manual contains a detailed description of the stimulated recall method, necessary instructions, preparation and application. The video-based interviews will be explored by qualitative analysis of content. Therefore transcription rules are written down and the category system is already developed in a deductive way. A further part of the manual concerns the coding rules for analysis.

The categories to be used in coding are those addressed in the theory₁ above: the CAUs, the generality-concreteness antinomy, the subjective theories₁ used, etc.:

1. Subjective assumption of explanation
2. Competencies
3. Perception
4. Goals and values

5. Self-regulatory Plans
6. Emotions
7. Unforeseen Events
8. Metacognition

Issues like situation specificity, theory₁ and goal multiplicities, etc., can then be deduced from comparing different codings within and between situations.

The stimulated recall method will be applied in two settings: *Study 3* deals with teacher novices and experts. There will be a sample of 12 mentors and 24 student teachers at the University College of Teacher Education in Styria. Through stimulated recall we compare the students' tactful acting with the mentors' tactful acting. The assumption is that mentors act more tactfully; confirmation of this assumption by using stimulated recall is interpreted as an indicator of its validity. *Study 4* focuses on the pedagogical acting of five kindergarten teachers from an academic course in Salzburg for leadership, mentoring, and counselling for kindergarten teachers. At three points in time stimulated recalls will take place to assess the evolution of pedagogical tact as related to the course.

CONCLUSION

The main aim of the research project is the development respectively extension of theory₂ about the pedagogical tact (Patry, 2012; Patry & Präauer, 2014) by drawing on the results of the presented studies. Further the results represent the basis for *study 5* – the publishing of a practice-oriented book for teachers, socialworkers and other professionals of education or other person who work in a pedagogical context.

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DIALOGICAL PODCASTS TO PROMOTE REFLECTION AND SELF-DIRECTION IN HIGHER EDUCATION

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ABSTRACT

We investigate the value of a learning resource that we have named “dialogical podcasts” when it comes to promote reflection and self-direction in freshmen students attending a course on Developmental Psychology in a Teacher Training Degree. These podcasts were not thought as a way to convey course contents, nor as a way to reproduce face-to-face lectures. Rather, they consisted of weekly informal conversations that we, the teachers, maintained, recorded, and then made available for our students to listen to. These conversations were about the development of our course, the students’ progress, our own teaching practice or theoretical, personal and professional issues that we connected with developmental issues. Data collection consisted of student’s texts elaborated at the end of the course regarding the meaning that they gave to the dialogical podcasts. A sample of 30 students’ texts was explored through a thematic analysis, which led us to identify four themes: 1) Dialogical nature of podcasts as a facilitator of teachers-students relationships; 2) Dialogical podcasts as promoters of reflection; 3) Students’ management of an optional learning resource in a course aimed at promoting self-direction; 4) Dialogical podcasts as triggers of the formation of a “developmental perspective”. Themes are discussed at the light of developmental-constructivist learning principles. Emphasis is put on the value of dialogical podcasts for fostering students’ meaning-making processes, and their competence in both tracing and enhancing their own development, particularly in relation to their transition towards self-direction. To conclude, directions for future teaching practice and research are covered.

Keywords: Dialogical podcasts, Higher Education, Teacher Education, Freshmen Students, Developmental Psychology, Reflection, Self-Direction

INTRODUCTION

Podcasts in education: a brief overview

In recent years, there has been an increasing interest in the use of audio podcasts in educational settings, being Higher Education the level where most of the research has been carried out (for a literature review, see Hew, 2009; McGarr, 2009; Walker & Milman, 2011). In this context, podcasts have been employed in different ways. Hew (2009), for example, distinguishes between: duplication of the face-to-face classes; addition of information to what is covered in such classes; preparation of subsequent classes through providing materials; or giving voice to the students by asking them to elaborate their own podcasts. So far, the most common use of podcasts has consisted of teachers' distribution of recordings of lectures or supplementary materials for students to review (Hew, 2009; Lonn & Teasley, 2009). This spread use of podcasts as deliverers of lectures has led some authors to conclude that the utilization of podcasts cannot be more than an extension of transmissive teaching practices (McGarr, 2009; Nataatmadja & Dyson, 2008) and some others to emphasize that the main benefit of the inclusion of such podcasts in education is that they allow a more interactive use of face-to-face training (Carvalho, Aguiar & Maciel, 2009; Lonn & Teasley, 2009).

Our proposal: Podcasts from a developmental-constructivist approach

We believe that the potential of podcasts can be other than merely duplicating or substituting lectures. Rather, we plead that podcasts can play a role in enhancing students' knowledge construction and development. In this respect, hereafter we frame our particular use of podcasts by stating our assumptions on learning and by illustrating them in the context of our course on Developmental Psychology.

The developmental-constructivist learning experience under research

From a constructivist approach, learning is understood as a qualitative change in individuals' way of meaning-making (Kegan, 2000; Mezirow, 2000). This qualitative change requires learners to actively elaborate information in order to build more complex forms of knowledge, and teachers to facilitate such processes by generating contexts of exploration where learners are encouraged to make their own discoveries.

As Higher Education teachers interested in fostering learning and development (Baxter Magolda, 2000; Kegan, 1994; King & Baxter Magolda, 1996), we are committed to facilitate students' transition toward increasingly complex ways of meaning-making (see for example, Nogueiras & Iborra, 2016). An illustration of this is a course on Developmental Psychology that we teach to freshmen students in a Teacher Training Degree and which aims at developing two interrelated competencies:

1. Analyzing and understanding cases from a developmental perspective, by generating explanatory hypotheses about children's development. The formation of a developmental perspective involves, for us, being able to describe in detail a case in order to notice subtle changes that, when considered jointly, can help to understand how such case evolves over time.
2. Reflecting on the development of oneself, which is a case in itself, in the light of theoretical models presented in the course. In this respect, the evolutionary moment of our students makes especially relevant the transition from an interpersonal stage toward an institutional stage, according to Robert Kegan's (1994) model of development. While in the interpersonal

stage individuals carry out mental tasks following external approval, from an institutional stage such mental tasks are based upon internal criteria. The latter stage is related to the possibility of self-direct one's learning. Self-directed learners are those who show critical thinking and individual initiative, set their own goals and standards, use resources to pursue these goals, and take responsibility for their learning (Grow, 1991). In becoming a self-directed learner, individuals have to engage in an epistemological reflection which entails examining and questioning their pre-existing ways of meaning-making and creating new ones in order to see the world from a more complex perspective (Baxter Magolda, 2004; Mezirow, 2000).

In order to facilitate the development of the above competences, the learning context that we attempt to generate in our course is characterized by:

- The conception of learning and development as social and interactive processes which consist in a shared exploration (Anderson, 1997) and which rely on the quality of the relationship created between teachers and students (Brady, 2014).
- The generation of a context of optionality where students have to make decisions about how they get involved in the course both in the face-to-face classes and outside them as a way to encourage their self-direction as learners.
- The combination of experiential learning (McWhirter, 2002) and collaborative learning (Iborra, García, Margalef & Samaniego, 2010) activities as a path to trigger that students become aware of and question their ways of meaning-making.
- The proposal of learning spaces and resources outside the face-to-face classes, such as blogs and dialogical podcasts, where to promote that students reflect, elaborate ideas and make connections between several sorts of information.

Our dialogical podcasts

In this paper, we investigate one of our learning resources, which we named “dialogical podcasts”. They were born four years ago, when two of us were teaching together a group of students and came up with the idea of recording in audio and sharing with them the spontaneous conversations that we used to have after the face-to-face classes. Last academic year we took up this idea, sharing with our students our weekly dialogues about the development of the course, the students’ progress, our own teaching practice or theoretical, personal and professional issues that we made connections with. Although we did not plan in advance the topics to be discussed, we had these conversations with the intention to encourage students to develop the core competencies of the course. In this respect, we find the dialogue format interesting for two reasons.

On the one hand, every moment of a dialogue provides the basis for the next one in a way that the structure of the dialogue emerges throughout the dialogue itself, which is an illustration of the epigenetic principle¹⁹ presented within the course and that explains how development occurs. This feature of the dialogue might be valuable in relation to the students’ formation of a developmental perspective.

On the other hand, a dialogue is a context that enables participants to think further than they could do on their own, since they have not only to develop their own point of view, but also recognize the other’s point of view, notice the difference between both and try to generate something new and potentially more complex, which is an illustration of another course content, the orthogenetic

¹⁹ “The form of a structure is literally constructed by the construction process itself” (Van Geert, 2003)

principle²⁰. The described demand raised by the dialogical context might enhance that students engage in an epistemological reflection, especially useful in relation to their transition toward a self-directed developmental stage.

Thus, dialogical podcasts were intended to generate a context that encouraged students to be more sensitive to developmental processes and more prone to engage in meaning-making processes relevant to promote their own development.

As for the latter, it must be noted that in all meaning-making processes there are potentially pieces of information which are *noise* until one is able to give meaning to them. In this regard, we expected our students to convert the intentional *noise* that we generated in our conversations in *meaningful noise* (Keeney & Ross, 1985) through their active reflection and making of connections between the several sorts of information available, such as the content and the form of the dialogical podcasts themselves, activities developed in the face-to-face classes, readings and other activities made at home or personal experiences.

That our students engaged in the mentioned meaning-making processes required, in the first place, that they became involved in listening to the dialogical podcasts. Aligned with our principle of generating a context of optionality, it was up to the students to listen or not the podcasts, since we did not ask them to do any specific activity involving the podcasts. Thus, students had to take decisions on whether listening to the podcasts, how to listen to them and what to do while listening to them. This demand of active decision-making was potentially meaningful in relation to students' development of self-direction.

Within the above framework, throughout the course we recorded 10 dialogical podcasts which were weekly uploaded both to the virtual platform and to the blog of the course. They were available for the students to listen in those spaces or being downloaded to their personal player devices. The dialogical podcasts covered different topics which we discussed from a developmental perspective. Table 1 presents a numbered list of the dialogical podcasts, including the date when they were recorded, their length and a summary of their content.

Table 1
List of dialogical podcasts including date of recording, length and content

No.	Date	Length	Content
1	30/09/2014	00:05:27	The experience of beginning the university and its relation with personal change processes.
2	07/10/2014	00:09:57	The dialogue as a conversational format in connection with the epigenetic principle, already presented in class.
3	14/10/2014	00:16:49	Motivational processes when participating in a learning context and their connections with development.
4	21/10/2014	00:12:59	What for and how to concretize a revision in a blog's post. Teachers' expectations and students' perspectives.

²⁰ This is an example of the orthogenetic principle: "Wherever development occurs it proceeds from a state of relative globality and lack of differentiation to a state of increasing differentiation, articulation and hierarchical integration" (Werner, 1957:126)

5	29/10/2014	00:17:59	The temporal perspective when reviewing former course contents with peers: do they mean the same two weeks later? What processes can a revision enhance?
6	11/11/2014	00:06:58	The learning process of the main character of the novel "The name of the wind" (Rothfuss, 2007): a learning that can be facilitated but not consciously attained.
7	11/11/2014	00:10:20	From a student's question about attachment posed in class... quality Vs. quantity in the relationships created with babies in their first months of life.
8	17/11/2014	00:12:33	An example of a former student reporting a change in her way to relate with a teacher. Connections with personal development.
9	27/11/2014	00:19:18	Possible films to choose for the final case analysis, aimed to integrate both the theoretical distinctions and the competencies worked throughout the course.
10	17/12/2014	00:12:04	Robert Kegan's developmental-constructivist theory (1994) as an integrative approach to development.

Aim of this study

As practitioner researchers, the goal of this study is to investigate the value of dialogical podcasts in a Higher Education course on Developmental Psychology as a resource to promote students' competencies of reflection and self-direction.

In this regard, some questions that we attempt to explore are the following: To what extent can be dialogical podcasts more relevant for learning than monological podcasts? What is the contribution of dialogue when it comes to enhance students' meaning-making processes? Does the relationship between the teachers who dialogue affect the relationship that they have with their students? What might be the value of dialogical podcasts in developing the competence of both tracing and enhancing one's development?

METHOD

Research context and participants

The focus of this study is a course on Developmental Psychology addressed to freshmen students in a Teacher Training Degree. The course was held at a Spanish university throughout the first semester of academic year 2014/2015. It took place throughout 43 hours distributed in 28 sessions. Participants were 149 students (57.72% women, average age 19.98, age range 18-39) distributed in three groups. Teachers were the first two authors of the present paper.

Data collection

At the end of the course, and as part of a written integrative assignment, students were asked about the meaning that they gave to the dialogical podcasts, specifically in a course on development. The

students were informed about the conduct of the research and given guarantees as to the confidentiality of the information gathered.

Sample

Among the texts written by the 149 students, we selected a sample composed of 30 (66.66% women, average age 20.27, age range 18-39). In doing so, and in our wish to count on various degrees of complexity of performance, we appealed to students' final grades on the course and selected two examples of every of the five possible grades from each of the three groups of students.

Data analysis

Students' texts were subjected to a thematic analysis (Braun & Clarke, 2006) carried out with the aid of the software *NVivo*. Throughout the coding process, an inductive approach which involved being open and sensitive to the meanings expressed by the students was adopted. The joint consideration of certain codes enabled us to identify themes and to get a compelling structure to better understand the meaning that students gave to dialogical podcasts.

FINDINGS

The analysis led us to identify four themes:

1. Dialogical nature of podcasts as a facilitator of teachers-students relationships;
2. Dialogical podcasts as promoters of reflection;
3. Students' management of an optional learning resource in a course aimed at promoting self-direction;
4. Dialogical podcasts as triggers of the formation of a "developmental perspective".

In what follows, we will describe the themes and illustrate them with excerpts from students' texts. It must be acknowledged that these excerpts come mainly from the texts of those students in our sample who had obtained the highest grades in the course. Such grades were related to a higher degree of development of the competences of elaborating information, making connections between several sorts of information and self-assessing their own learning processes from a complex perspective. In this regard, it is not surprising that these students were the ones who, in elaborating on the meaning that they gave to the dialogical podcasts as a learning aid, did provide the more insightful and interesting testimonies.

Theme 1. Dialogical nature of podcasts as a facilitator of teachers-students relationships

Students described dialogical podcasts as informal, colloquial, close, natural, accessible, spontaneous, free, open and even humorous. These features appear to have facilitated the generation of a close and equal relationship between teachers and students. In this regard, the following student stressed the value of dialogical podcasts in generating an informal relational context characterized by sincerity and openness: *They are a way of relating in a closer and more informal way, making ourselves comfortable, making us to see that there is nothing to hide and that teacher-student relations can be open* (student 21, male).

In this line, the next student highlighted the role of dialogical podcasts in helping her to understand that teachers were interested in sharing with the students a communicational space outside the classes.

This is evidence of teachers understanding their relationships with the students as something to be taken care of: *Dialogical podcasts are important to create personal connections between teachers and students. They are a creative way to tell students that you have some important things out of the class to share with them* (student 18, female).

Theme 2. Dialogical podcasts as promoters of reflection

Actively listening to our dialogical podcasts encouraged students to reflect on the topics that we discussed and on the way in which we discussed them, “think by themselves”, get in contact with our perspectives and compare them with their own, and make connections between the content of the dialogical podcasts, activities developed in the classes or outside them and personal experiences.

The above processes revolve around the necessary active role of individuals when it comes to generate meaning and understanding. In this regard, some students reported how listening to our dialogical podcasts made them feel active participants of our conversation, what is illustrated in the next excerpt: *Although the dialogical podcasts dealt about topics that we have seen in class, you got to understand it better in this not too academic form, which enabled to think in some things that you would add, from your point of view as a student* (student 28, female).

In addition to the promotion of students’ active involvement, dialogical podcasts enhanced that they came into contact with our particular understandings and ways of meaning-making and compare them with their own. In this regard, the following student’s excerpt is evidence of someone who became aware of the value of dialogical podcasts in the promotion of the two mentioned processes: *Dialogical podcasts enable to encourage that we understand what the teachers propose to us and their points of view, and that we think by ourselves and generate our own hypothesis from the conversations* (student 6, female). The next student, on her part, is an illustration of how listening to us thinking, reflecting or making connections, enabled students to count on examples of different ways of meaning-making to be compared with hers: *I think that dialogical podcasts help us to know how the teacher understands the things and compare this with our way* (student 12, female).

With regards to the value of dialogical podcasts to facilitate that the students made connections between different sorts of information, it is interesting to acknowledge how podcasts seem to have provided pieces of information that enabled students, if they were sensitive enough, to understand better some of the pedagogical principles in which our teaching practice was grounded. This is illustrated by the next students’ excerpt, in which the term “clue” is a key element: *Dialogical podcasts give us many clues on what we have been doing in class* (student 23, female).

Theme 3. Students’ management of an optional learning resource in a course aimed at promoting self-direction

There are several students who, in describing the use that they made of the dialogical podcasts throughout the course, provided interesting insights about the inherent challenge of taking responsibility for optional and not-guided learning activities. In this respect, the next student reports how she was expecting the teachers to tell the students what the dialogical podcasts were, what they were for and what to do with them, what is evidence of her dependence on external sources of authority: *They [dialogical podcasts] seemed something weird to me and they didn’t seem to make any sense. Furthermore, no one informed us in advance about what a dialogical podcast was. I learned about their existence by myself, but as I thought that they were probably materials which would be later explained, I did not browse. It was when I asked my classmates and they told me a little bit about*

them, that I started [to listen] the first one. In other words, at the beginning the dialogical podcasts did not make sense to me and I was waiting for you, the teachers, to make us understand their aim (student 22, female). As it can be noticed, although this student knew about the existence of the dialogical podcasts, she only started to listen to them when some of her peers told her about them.

An alternative to depending on external sources of authority such as teachers and classmates is to commit oneself with exploration. In this regard, the next excerpt is an illustration of a student moving towards a higher autonomy: *When I started to receive alarms of the virtual platform announcing that there were dialogical podcasts, I did not understand. I listened to them and it was entertaining but I did not find too much utility because they were things that seemed to fall on deaf ears: we did not discuss them in class, nothing about what dialogical podcasts were was commented and nobody explained us their function and usefulness. They were simply there for those who wanted to listen to them in any moment. Although they did not seem very useful in terms of utilizing them in class or for an assignment, they were useful to help me to reflect, to know a little bit better my teachers and to know how they think* (student 6, female). This student, as the former, describes her confusion regarding the fact that the teachers did not provide a script on what to do with the podcasts. However, she decided to listen to them, what led her to the interesting paradox between thinking that our podcasts were useless because they were not attached to structured tasks asked by the teachers and noticing that they were interesting and useful in helping her to reflect and to know about her teachers.

Theme 4. Dialogical podcasts as triggers of the formation of a “developmental perspective”

Consistent with both the theoretical content of the course and the different activities developed during the face-to-face sessions, such as case studies, peer discussions or periodic revisions of the former sessions, several students’ testimonials refer to how, by listening to the dialogical podcasts, they noticed how they were becoming aware and more sensitive to how processes develop over time. The following students’ excerpt illustrates this: *Dialogical podcasts can be useful to become aware of the development of things, to realize and appreciate how they take place and evolve* (student 22, female).

In this vein, the adoption of a “developmental perspective” when it comes to analyze and understand experiences was also applied to the form of the dialogical podcasts themselves. The next students’ excerpt, focused on the dynamism and the divergence of our podcasts, is an example: *They combine two minds which bring more ideas that just one person thinking. That’s why dialogical podcasts are enriching in the context of learning, because they don’t get just to one point, they go to several points and they aren’t static* (student 11, female).

DISCUSSION

Dialogical podcasts were defined by our freshmen students as informal, natural, colloquial and accessible. These features collide with the students’ usual expectations about university, where teachers are distant, serious or rigid. Facing hierarchical and asymmetrical relational contexts, typical of transmissive teaching models, our principle of taking care of the relationship generated and maintained with our students throughout the course is fundamental, we believe, in order to facilitate a suitable point of departure for students to learn. It is in a context of closeness and accessibility where teachers can be displayed as people who are interested in sharing their thoughts with students (Brady, 2014). In such context students might be more prone to become engaged in a joint dialogue with their teachers while at the same time they start to think and explore on their own.

Even though the intention to generate close and symmetrical relationships with our students impregnated all our interactions with them, we believe that our informal dialogical podcasts had the potential, if students decided to actively listen to them, to provide a more intimate relational context. In this regard, previous research on podcasts in education reported that listening to them generated in students a sensation of proximity with their teachers (Carvalho, Aguiar & Maciel, 2009) or amplified their sense of contact (Fernandez, Simo & Sallan, 2009). With respect to the informal style adopted in our podcasts, Edirisingha, Salmon & Nie (2008) highlighted that including content such as people's experiences or opinions in podcasts and adopting a friendly tone played a key role in building intimacy between teachers and students, something that we achieved in our students' view.

The referred results are in line with our own findings. However, two aspects in which our research attempts to go further than studies focused on the use of podcasts as a way to deliver content are: on the one hand, the quality of the relationship between teachers and students, being the one described by our students based on equality and on the promotion of students' active involvement; on the other hand, the cognitive processes that our dialogical podcasts, unlike monological and content-delivering podcasts, proved to foster in our students.

Relating to the latter, as opposed to the passivity and the lack of intellectual elaboration reinforced by transmissive teaching contexts, the constructivist learning context attempted to be generated by our podcasts encouraged students to actively engage in meaning-making processes. In this point, it is appropriate to refer back to the format of our podcasts. Their content was not a presentation of concepts or a set of guidelines, but a natural and spontaneous conversation where we discussed issues which we found interesting and that were related to the course, in our aim of generating what we called *noise* (Keeney & Ross, 1985). In this regard, the value of our conversations in terms of learning resided on what the listeners, that is, the students, made with such *noise*. An active response to the *noise* consisted of the students identifying relevant content, reflecting on such content and making connections between such content and other sorts of information, such as theoretical distinctions, discussions held in class, case studies, texts that they read, other courses or personal experiences. An illustration of this process was provided in the findings section through a student's excerpt referring to the "clues" that dialogical podcasts provided to students in order to understand what they had been doing in class. The "clues" mentioned by this student were in fact a result of her meaning-making process and of her own connections between selected content of our conversations (initially *noise*) and class experience.

This dialogical aspect of our podcasts makes sense, we believe, from a conception of learning as something which is constructed in dialogue with others (Anderson, 1997). Thus, both of us dialoguing happened to be an example for the students of such construction process itself. Furthermore, when students engaged in such dialogue, they became part of the creative process of constructing knowledge, being able to think further than they could do on their own. Thus, by giving the students the opportunity to come into contact with our particular understandings and ways of meaning-making, potentially more complex, they were able to reflect on and question their own meaning-making processes, compare them with ours and, thus, be in a position to generate more complex ones. In this sense, dialogical podcasts were a path for the students to gain autonomy over their meaning-making processes (Baxter Magolda, 2004; Mezirow, 2000).

Responding to the demand of thinking in a qualitatively more complex way is a competence to be developed in order to become a self-directed learner. In this respect, we believe that dialogical podcasts facilitated the transition towards self-direction at two levels. On the one hand, they fostered the development of such competence in the same way as other learning proposals within our course in that the decision of what to do with them or from them was something up to the students and linked to

the development of their individual initiative and the assumption of responsibility for their own learning (Grow, 1991). On the other hand, dialogical podcasts could have specifically triggered students' self-direction as far as they contributed to the development of their critical thinking (Grow, 1991) through the contact with life examples where different ideas were shared, compared, and used as a basis for thinking out loud.

The transition toward self-direction involves that individuals moved from a reliance on externally driven ways of thinking to internally driven ways of thinking (Baxter Magolda, 2001; Kegan, 1994). This is challenging for individuals used to transmissive teaching contexts which reinforce students' dependence on external authority by encouraging them to merely memorize and reproduce knowledge provided by experts. This was the case of most of our freshmen students. In this point, and in order to pay attention to the various individuals' possible transitions toward self-direction in a context of optionality, we refer back to the two different students' testimonies highlighted in the finding sections.

Both students showed evidence of a dependence on the teacher and were therefore confused in face of the lack of explicit and concrete demands with respect to the dialogical podcasts. However, there are obvious differences between them. Regarding the first student, the fact that she did not listen to the dialogical podcasts until their peers told her about them, shows her need to be encouraged from the outside when it came to do something which was not clear for her. It is a further evidence of her dependence on external sources of authority, what corresponds to an interpersonal stage in Kegan's (1994) model of development. Regarding the second student, the fact that she autonomously decided to listen to the dialogical podcasts in spite of not getting an external validation of her behaviour, enabled her to start to experience an internal validation in the form of personal benefits that she started to notice. This is particularly relevant with regards to the transition toward an increasingly complex epistemological stage from where one is able to self-direct one's own learning process, what corresponds to an institutional stage in Kegan's (1994) model of development. In spite of the differences between the students, we believe that for both the dialogical podcasts were a context that enhanced them to go beyond their departure points in terms of self-direction, the first one needing her peers' encouragement, and the second one being open to explore on her own.

With respect to the foregoing, we believe that the transition towards a more complex way of guiding the own actions was enhanced by the students' increasing sensitivity to how development takes place (Nogueiras, Herrero & Iborra, 2016). This competence led students to better understand and follow-up their own learning and developmental processes. In this quest, the dialogue format proved to be especially suitable in that it was an example of how the structure of something alive and dynamic like a conversation emerged gradually from the conversation itself. Thus, the excerpts provided in this regard in the findings sections are evidence of how students were practicing, by actively relating to our dialogical podcasts, the competence of "tracking" processes or adopting a "developmental perspective". The development of this competence was especially relevant in relation to the monitoring of their ongoing development throughout the course.

DIRECTIONS FOR FUTURE TEACHING AND RESEARCH

Regarding future teaching practice using dialogical podcasts as a learning aid, we are considering two possibilities aligned with our principle of optionality: to present to the students the dialogical podcast in a more explicit way at the beginning of the course, in an attempt to generate greater interest and curiosity, and to suggest to the students that they record their own conversations and share them.

Regarding future research on dialogical podcasts, we would like to get a deeper understanding on the quality and effects of students' use of dialogical podcasts. In doing so, we plan to elaborate a more comprehensive guidance when asking the students about their use of dialogical podcasts at the end of the course and we are looking at the possibility of proposing students to participate in a focus group.

CONCLUSION

Considering limitations identified in previous research on podcasts in education (Hew, 2009; Woods & Philips, 2009), in this study we intended to respond to the needs: 1) to make explicit the pedagogical foundations driving the use of podcasts, which in our case were developmental-constructivist; 2) to investigate new uses of podcasts beyond the distribution of lectures, which in our case was materialized through the adoption of a dialogical approach; 3) to appeal to students' voices to explore whether podcasts can improve learning, what we did by asking them directly about the meaning that they gave to using dialogical podcasts.

The dialogical use of podcasts in education is something relatively new, as far as we know. In our view, dialogical podcasts might be a resource of interest for teachers who are concerned with: 1) Promoting closer intimate relationships with their students through the generation of a relational context beyond the face-to-face classes, 2) Facilitating students' engagement in reflective and self-directed processes in a context of optionality and 3) Enhancing the sensitivity of students' towards developmental processes. Particularly relevant for us is the value of dialogical podcasts when it comes to trigger students' increasingly complex ways of meaning-making that might lead them to become self-directed learners more prepared to respond to the complex demands of nowadays society (Kegan, 1994).

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FOSTERING REFLECTIVE THINKING ABOUT INFORMATION IN 5TH GRADERS WITH BLOGS: HOW HELPFUL ARE LEARNING SUPPORTS?

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ABSTRACT

This study is about fostering media and information literacy and, more precisely, reflective thinking about information in 5th graders. A learning scenario integrating weblogs into a class by providing learning tasks, learning supports and learning resources was elaborated and tested. The class was divided into a test group and a control group, which did not receive learning supports. Over five weeks the pupils' degree of reflection was measured by analysing their blog entries by means of pre-defined evaluation criteria. We also observed them while blogging and recorded our impressions. The results showed that, against our expectation, the pupils of the test group were less reflexive in their entries than the ones of the control group. However, we observed that the test group pupils verbally expressed many reflections, which they did not write down. This suggests that our learning scenario comprised of learning tasks, resources and supports promoted reflective thinking about information of all the pupils even if this is not recognisable in their entries.

THE NEED FOR NEW COMPETENCIES

In a rapidly changing society, in which information and communication technologies play an undeniable part, we need new competencies to face personal, professional, cultural and social challenges. For this very reason, new concepts of Literacy, such as the concept of Media and Information Literacy (MIL) by the UNESCO (2013), have been developed. Looking at the skills of accessing, understanding, evaluating, using, creating and sharing information, one can see that critical and reflective thinking about information is essential for being a literate of the 21st century. Likewise, the Ministry of Education of Luxembourg defined that media education should not be limited to learning with media, but that it should also comprise learning about media. The 'digital natives' do however not necessarily use reflective competencies in their everyday use of ICT (Hourigan & Murray, 2010) and, accordingly, fostering the reflective thinking about information in children constitutes a challenge for every teacher.

HOW TO FOSTER REFLECTION ABOUT INFORMATION

Journal writing and peer feedback were identified as effective methods to foster reflective thinking (Xie, Ke & Sharma, 2008). A weblog can be considered to be the modern version of journal-writing, effective at stimulating reflection and allowing to express and share it (potentially) with the world. Therefore, a question addressed in this study was how to integrate blogging in class in a way that would foster reflection about information encountered while blogging. We elaborated a learning scenario based on learning tasks, learning supports and learning resources (Strampel & Oliver, 2008) in order to test its practicality and to derive recommendations regarding future integration of blogs into classroom efforts. The learning scenario had to be adapted to the primary school setting by taking into account the development of the reflective thinking skills of children and by proposing appropriate learning tasks, supports and resources. Beside the question of the effect of the whole scenario on the reflective thinking of the pupils, the helpfulness of the learning supports was analysed by dividing the class into two groups, the control group not receiving any learning supports to encourage their reflection.

ELABORATION OF THE LEARNING SCENARIO

Previous research about fostering MIL was mainly done in secondary schools and at universities, where various learning scenarios and tools have been experimented (Strampel & Oliver, 2008; Wang & Woo, 2010; Xie et al., 2008). They all showed the following main advantages of weblogs: the sharing of ideas and the peer feedback. However, they also showed that peer feedback is not always beneficial. For example, one should have the choice of different partners and there should be a more capable peer in order to stimulate reflections.

Reflection takes place in situations that pose a problem by confronting different perspectives. In such situations one has to review own experiences and consider different perspectives. Critically analysing the perspectives means an even deeper reflection. "Reflection is an effortful action and students find it difficult to engage in it over extended periods of time without external support" (Xie et al., 2008, p.19). After the reflective judgement model of Kitchener & King (1997), 5th graders are to be situated in the second stage of reflective judgement. This stage is characterised by the assumption that every problem can be solved, but that not everyone has the knowledge to do so. Also, the existence of false beliefs is possible, whereas authorities (like teachers or doctors) can procure the right answer.

Finally, in order to adapt the learning scenario to the cognitive development of the pupils, we had to give them space for interaction and different perspectives, as well as give them external support. These aspects are part of constructivist and problem oriented strategies to integrate ICT, as for the learning scenario of Strampel and Oliver (2008), which was elaborated around three structure elements: learning tasks, learning resources and learning supports. We choose these elements as a framework for the development of our learning scenario and ensured that resources and supports were provided for every task (figure 1).

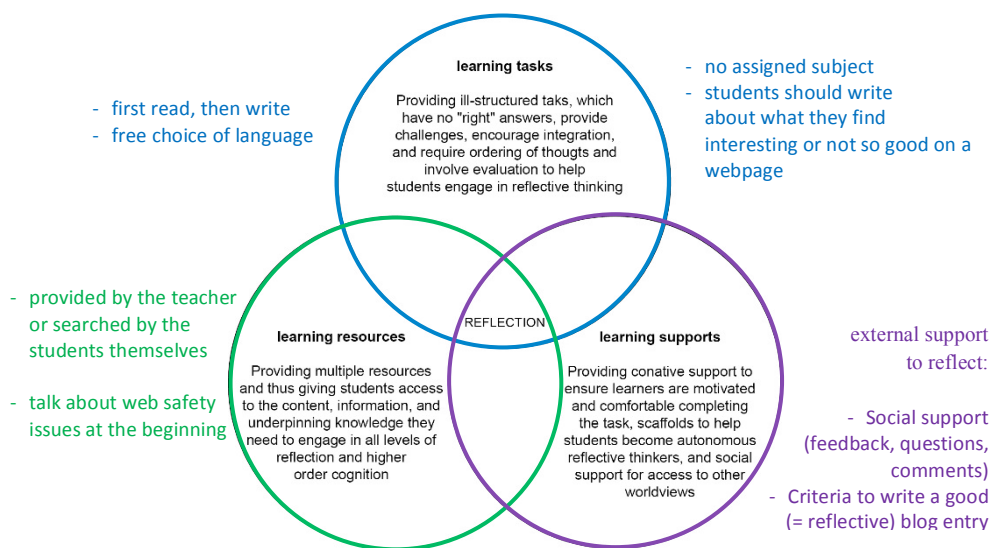


Figure 1: based on the Constituent elements of a learning environment promoting reflection (Strampel & Oliver, 2008)

Currently, there are only a few instruments to evaluate reflective thinking (Kember et al., 2000) and the existing methods are tailored to college and university students. This is why, based on our definitions of reflective thinking and the competencies needed to be media literate, we established our own criteria to analyse and to evaluate the pupils' blog entries (table 1). The method we used was derived from the five-point-system of Ray and Hocutt (2006), after which an entry can obtain from one to five points. The number of points depends on whether there is a reflection or meta-reflection and on how many examples are given. To obtain one point more, one has to fulfil one additional criterion, which also shows a deeper reflection.

In our study, we however wanted to use more criteria to evaluate the degree of reflection and we wanted to be able to consider every criterion separately. Therefore, every criterion obtained a coefficient, which represents the depth of the reflection. Additionally, for every criterion there are three achievable points. Zero points are assigned if the criterion is not fulfilled, one point if it is fulfilled and two points if it is more than just fulfilled. For example, a pupil who pronounces his uncertainty about a piece of information obtains one point at the criterion "certainty about the information". If the student also explains his statement, he gets two points.

Table 1

Criteria to evaluate the reflection in the blog entries

Criteria	Coefficient	Achievable points		
		0	1	2
Enumeration of information	1			
Link of the resource	2			
Justification of the choice of the resource	3			
Certainty about the information	2			
Argumentation of the accuracy of the information	3			
Personal experiences	2			
Different perspectives	2			
Critical analysis of the perspectives	3			
Personal preferences	2			
Emotions	3			
Organisation / Structuration	2			
Proposition for amelioration	2			
Decision (what one should believe or do)	3			

INTEGRATION OF THE LEARNING SCENARIO

The elaborated learning scenario based on learning tasks, supports and resources, was integrated in a class of thirteen 5th graders aged between ten and twelve years. To further adapt the scenario to the pupils, a questionnaire about their habits with ICT was given to them beforehand. The class was randomly divided into a test group and a control group and we worked one hour per week (always at the same day and the same time) with each group.

At the beginning, we gave every pupil a list with links of school blogs. Their first task consisted in reading them or simply looking at them to see what blogs can look like. After that, they were told that everyone will have his own blog for five weeks and we discussed web safety issues. Even though the blogs were only accessible to the class due to a limitation imposed by the ministry of education, we considered them to be essential in a MIL project. Explanations about how to access a blog and how to write an entry were also given (the pupils got material support in the form of screenshots).

Secondly, the pupils had to choose a blog or a webpage to write about in an entry. To manage this task the test group received as a support a list with formulations to help them express what they find good or not so good.

The third task consisted in continuing blogging by writing entries and commenting the entries of their peers. To accomplish these tasks, learning supports were given. However, the control group did not receive learning supports other than the support of their peers or help with technical or practical issues. In the test group, the criteria of a good blog entry were discussed and handed out. Furthermore, they were given social support from us to stimulate reflections.

As said before, the pupils kept their own blog for five weeks and each week one of their entries was analysed with the help of the criteria measuring the reflection on the information. To complete the data, the entries were analysed by an independent evaluator, a research journal was kept and after the five weeks four pupils were interviewed about their experiences and impressions of the learning scenario.

THE PUPILS' DEGREE OF REFLECTIVE THINKING

In the questionnaire given to the pupils at the beginning of the study, the majority specified using a computer or laptop at least once a week and using the Internet several times in a week. Their habits and activities however differed. The pupils of the test group used the Internet more often to look up information or to access social networks. Regarding the entire group, half of the group indicated to access social networks once a week to several times a day, whereas the other half did it every few months or never. Also, the pupils used the computer to look at pictures and homepages or blogs, but they did not keep them. All in all, the pupils estimated themselves as "very good" in using the computer and the Internet, even those who indicated to use it once a month or less.

To evaluate the pupils' degree of reflective thinking about information while blogging, we calculated the average of the total points received by both evaluators. The score thus obtained by every evaluated blog entry was recorded in the two following tables (table 2 & 3).

Table 2

Evaluation of the test group's blog entries

Blog entry	P 1	P 4	P 5	P 8	P 9	P 12	P 13	Average TG
Week 1	6,5	16,5	6	5,5	24	9	/	11,25
Week 2	/	5	7	11,5	12,5	5,5	/	8,3
Week 3	6,5	(absent)	7	(absent)	5,5	6,5	7,5	6,6
Week 4	/	5	11	/	6,5	/	6,5	7,25
Week 5	7,5	(absent)	28,5	9,5	13,5	11,5	10	13,42
Average / Pupil	6,83	8,83	11,9	8,83	12,4	8,13	8	~9,32

Table 3

Evaluation of the control group's blog entries

Blog entry	P 2	P 3	P 6	P 7	P 10	P 11	Average KG
Week 1	/	/	/	/	/	/	/
Week 2	15,5	5,5	14	12	10	12	11,5
Week 3	24,5	14	13	14,5	15,5	15,5	16,17
Week 4	26,5	/	11,5	7	7	13	13
Week 5	12	14	6	8	8	11,5	9,92
Average / Pupil	19,63	11,17	11,13	10,38	10,13	13	~12,61

All in all, forty-four blog entries were written by the test group and thirty-two by the control group. Twenty-six and twenty-three entries were evaluated. The control group did not write any entry in the first week due to the intensity of the discussion about web safety issues. The learning task planned was postponed to the next week and the scenario then was conducted as planned.

The tables show that, on average, the control group's blog entries manifested a higher degree of reflection. Though, the degree was especially high in the third week and decreased afterwards. At the end of the study, their degree of reflection was lower than it was at the beginning and also lower than the test group's degree of reflection at the end of the study. The latter achieved the control group's average score and, in exception of one pupil, everyone had a higher degree of reflection in the last

blog entry than in the first. For the control group this was exactly the opposite: every pupil had a lower score in the end, except one. One could say that the reflection scores over time in both groups were almost mirrored (figure 2).

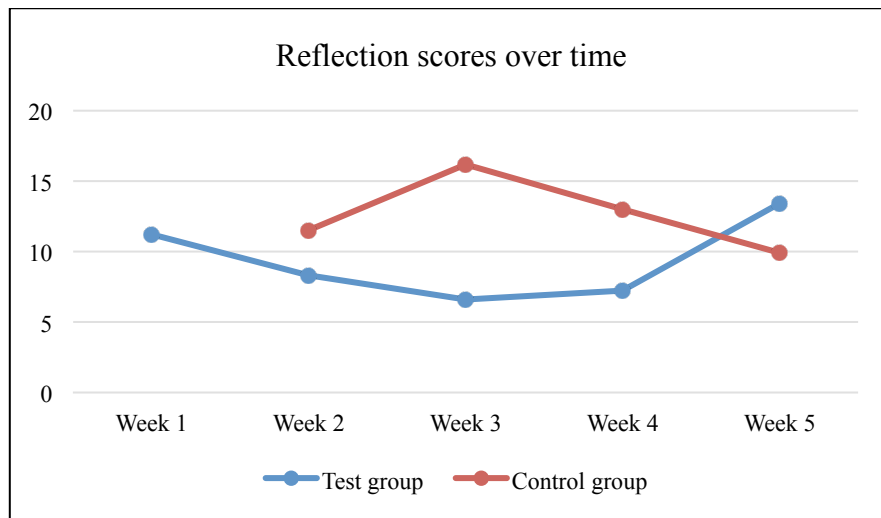


Figure 2: Reflection over time in both groups

Regarding the criteria fulfilled in the blog entries, most entries contained the elements of structuring the entry, of listing information, of linking the source material and of telling personal preferences. Certitude about information, argumentation about their accuracy and critical analysis of different perspectives were rarely given. Accordingly, the pupils' degree of reflection was reflected in the criteria they fulfilled in their blog entries. Both groups fulfilled mostly the same criteria, but the control group overtook in the third and fourth week by fulfilling more criteria, as well as criteria having higher coefficients.

In addition, the entries featured different and recurrent subjects, as for example the writing about celebrities, chain letter stories and websites. Relating to these dominating subjects in the student's entries, the research journal highlighted the discussions amongst the pupils and the reflections in them. The pupils talked about what they had seen on the Internet and expressed their opinion, questions and even emotions. Working on the computer at school seemed to be special for them and they were motivated to show what they have found on the Internet to their comrades, as well as to the teacher. Also, they invited their classmates to visit their blog, they read aloud some entries and they called attention to web safety issues. We were able to have an insight in the kids' reality, to build friendly relations and to use their contributions to excite new reflections. However, only few of those reflections were written down.

While the prevalent need for technical support diminished over time, the pupils kept asking for social supports regarding the form of their entries. Even though they had no assigned subject, they asked what they should write and if their entries were alright, which we related to them meeting school expectations. This showed that the circumstances in which the pupils are asked to reflect play a decisive role. Besides the space to bring in personal ideas and experiences, one has to be aware that reflecting is effortful and adapt the circumstances. The research journal clearly showed that the pupils were less attentive and less reflective after they had written a test. Also, we noticed that they wrote for the audience of their classmates and, according to this, used spoken language and particular contents. In reaction to the answer "Why should I write more? They do know her", we asked ourselves if the

pupil's reflection would have been higher if their blogs were open to a larger public. In the interview, the four pupils told that they wrote about different subjects, as for example web pages, celebrities or themselves. However, they did not write their own opinion, private information or secrets. Writing their own opinion constituted a difficulty for them because they did not want to hurt anybody. Also, they did not want to write mistakes and all of them encountered difficulties while using the Internet.

During the interview, the comparison between writing on paper and writing on a blog came up spontaneously. One pupil saw the difference in the material and technical aspects, whereas another one explained not to be used to the method of writing down information by means of a computer. Furthermore, the pupils claimed that they visited their classmate's blogs to eventually find something interesting and to comment their entries. Often they then wrote about the same subjects on their own blog, which is one explanation for the recurrent subjects in the blog entries of both groups. When asked after their personal meaning of blogging, the pupils mentioned writing for other people, looking at blogs, commenting them, as well as receiving comments. Not to disclose personal information and to always insert the link to their resource were aspects retained as being important and they all liked being allowed to choose a subject and to communicate with their friends. Rather negatively experienced have been the difficulties while entering the password and while encountering various pieces of information on web pages, which could not be accurate. Finally, the pupils said they had learned that they should not publish personal information and also how to use blogs. Regarding the learning scenario, they preferred having more time to have fewer difficulties with technical issues and they expressed the idea of blogging with more than one class. One pupil also mentioned the fact that they did not always know what to write about and proposed that the teacher could tell them about a specific subject about which they could write afterwards. Another pupil noticed that some pupils needed a lot of support and requested their autonomy, which illustrates the diversity of their needs.

DISCUSSION ABOUT THE USED METHODS

The questionnaire we used at the beginning of the study to adapt the learning scenario also provided us an insight into the pupils' habits and skills and so we could already see how divergent their needs were. However, as we took the average answer from every question to adapt the learning scenario, we kind of ignored those pupils needing more or less supports at this stage of the study. In addition, the collected data was very subjective due to their self-assessment indicated in the questionnaire, which did not always match the reality. With the help of the elaborated criteria to evaluate the blog entries we were able to perceive the pupils' reflection and to trace it over time. Though, the overlapping of some criteria posed problem to the evaluators. It was not always evident if a particular expression was to be classified under a certain criterion or another. So the evaluators had to choose if they count the expression for one or for both criteria. Furthermore, some expressions could be seen as an implicit existence of a criterion. Nevertheless, the criteria measured what they were meant to. Sometimes an entry positively rated at first sight scored poorly after the analysis. Also, the evaluation with the criteria was extensive but not too time-consuming, which is an important aspect with regard to its practicability.

The research journal was useful to capture situations and impressions while blogging in class, thanks to which we gained another view on the learning scenario than the finished product of the blog entries. We gained additional data regarding the pupils' behaviour, their challenges, their questions and their statements. Unfortunately, those were not recorded and could not be transcribed verbatim.

The semi-structured interviews depended on the pupils participating. Two of them talked a lot spontaneously, the other two interviews could rather be described as a question-answer-dialogue. Yet,

in the end, we got to know their personal views of the learning scenario, being conscious that the interpretation of their statements was not always evident and that the latter could be attempts to meet the interviewer's expectations.

THE ISSUE OF BLOGGING

To evaluate to what degree our learning scenario promoted reflection amongst the pupils, we will address the learning tasks, learning supports and learning resources structuring the whole scenario. The first learning task consisted in looking at different blogs about which the pupils should write afterwards. For this task, we acted on the assumption that reading proceeds writing and that writing about what one likes or not consists a first reflection (Downes, 2004; Richardson, 2011). However, we had the impression that the pupils did not read the blogs, but were rather interested in the pictures and videos on them. Possibly, they were not interested in the other contents or they simply didn't like reading. Nevertheless, a first reflection occurred when they wrote about what they saw. They enumerated information, justified the choice of their resource, inserted its link, expressed personal preferences and made suggestions for improvement, and all this in a certain form. The pupils also were clearly motivated to work on the computer. Even though we name them "digital natives" (Hourigan & Murray, 2010) and half of the class uses the Internet every day, this reality is sparsely taken into account in school. The pupils use the computer in reward for having finished their exercises, they type their handwritten stories or they print pictures for their presentations. They do not use the Internet to learn and neither can they look at the same contents as they do at home, which however is precisely what promoted reflections in our study.

When planning the lessons, the teacher should therefore be conscious that the pupils are easily distracted and he could eventually use a projection or a direct transmission from one computer to their screens to show them the single steps on a blog. Also, the blogs could be integrated interdisciplinary by working on the topics encountered while blogging in other school subjects or by writing about topics worked on. That way the pupils' motivation to learn, as well as their ability to reflect, could be enhanced through the collaborative learning and the confrontation with different perspectives. By telling the pupils to visit and to comment their comrade's blogs, we wanted them to become conscious that the whole class could see their blog and also to be more attentive and reflective when writing. We ensured the accessibility of the blogs by establishing a link list on every blog from where the pupils could access all the blogs of the class. Indeed, they used that list very much, they began to communicate about the blogs and about what they had seen, they told each other to visit their blog, they read some entries aloud and they asked the author if they did not understand something in his entry, which in our opinion wouldn't have occurred without the link list on the blogs. Due to that exchange in the class, the second week most of the pupils did not write about a webpage or a blog, but they first wanted to personalize their blog by inventing a profile or by presenting their preferred brand or music. They considered the web safety issues and encountered different perspectives of how to build up a blog. Over time, the pupils became a "community of bloggers" (Richardson, 2011, p. 37). They learned from each other and the confrontation with information and their comrade's reasoning lead them to a deeper reflection (Downes, 2004). Also the choice of the topics the pupils wrote about, as well as their language register, suggested reflections. They addressed their comrades, who are at the same time kids of their age and friends, and from this audience they expected a reaction. They chose contents of which they thought their comrades would be interested in, they used a familiar, spoken language and their entries often began saying "Hallo" or "Hi people", making clear that their audience was always "potentially in the text" (Myers, 2010, p. 9). The several trends of topics in the two groups were also striking. Some topics evoked different emotions and the narration of experiences, others

only resulted in the posting of pictures, which shows that they had an impact on their reflections. As the control group and the test group blogged one after another, they could see what the other group wrote about and often they inspired themselves from their topics. Most of the topics were topics the pupils were confronted with in their every day, outside-of-school life. In the interaction about these subjects over five weeks, the pupils participated in a social construction of knowledge and sense (Huann et al., 2005). Accordingly, we can extend the definition of blogging as writing proceeded by a lecture (Richardson, 2011) to writing proceeded by looking at pictures and videos, hearing information and making personal experiences. This highlights the importance of the multimodality the pupils are confronted with and which they consume. Concerning this matter, one should also be aware that the pupils may look at contents which are inappropriate for their age and even publish entries about or with these contents. For this very reason, one should always check their blogs or use the administrator's possibility to check the entries before they are published. Also, one could always use such an occasion to discuss and foster more reflections.

The learning supports were divided into three categories: practical or technical supports, supports to foster reflection and the discussion about web safety issues, which could also be classified in the two first categories. To help the pupils to access and use the blog, we went through all the steps from accessing the blog to writing an entry and publishing it. Also, the pupils received a folder with screenshots of the single steps, which they could use at every moment, and they could ask "personal scaffolds" (Roblyer & Doering, 2010, p. 40), meaning a teacher or a comrade. The pupils mostly had difficulties to log in, to insert pictures and to know what to do with popup windows. These difficulties still persisted in the fifth week of blogging. However, at this moment the need for practical and technical support decreased. Thus, there were more pupils who could give a hand and a more relieved teacher who could help those who had bigger difficulties. A realistic time frame to develop blogging skills therefore is necessary to exploit the possibilities of a blog (Hourigan & Murray, 2010). The pupils cannot engage in reflections if they are too occupied with finding out how to use their blog.

The supports to foster reflection were only given to the test group. On one hand we discussed the content of good blog entries and they got a summarizing sheet to help them to write down their reflections. During the discussion, the pupils brought their own experiences in, which we could use to concretise the criteria and to engage them in further reflections. However, some pupils expressed that they would not tell secrets on their blog, nor write their opinion, because they feared to hurt somebody's feelings. Xie et al. (2008) explain that for some people blogging constitutes an introspective process, which they do not want to externalise. They may be afraid to encounter incomprehension or being laughed on. This shows that the pupils were concerned about the audience and made decisions in function of that audience (Myers, 2010). Teaching the pupils how to give constructive feedback therefore seems to be essential in order to create an environment where they are comfortable and dare to express their reflections. In our study, we detected more reflections in the conversations amongst the pupils than in their blog entries. In addition, the entries about websites were more reflexive than those about celebrities, which is why we assume that the pupils only associated the criteria with the writing about webpages and not necessarily with every piece of information found on the Internet. A supplemental discussion or learning task about celebrities and their influence could be integrated by the teacher if he sees the need to do so. On the other hand, we gave them personal feedback and confronted them with different perspectives to excite reflections. Before they published their entry, the pupils often asked us if it was alright, if they should add something or if they had no mistakes. One possible explanation is that they wanted to meet expectations, even though they knew that their entries would not be taken into account for their evaluation at school. Also, these questions could be reflections regarding the audience. According to Downes (2004), the consciousness about the blog's publicity implies that the pupils are more attentive when they write. If they had problems or doubts while writing, they asked our help to solve their problem, which is typical for the second

reflective judgement stage. In this stage the right answer can be obtained by an authority figure, as for example a teacher (Kitchener & King, 1997). On the level of the methodology, this raised the question if the pupils of the control group really did not receive any personal supports to help them reflect. We paid attention to not give them feedback regarding the content of their entry, but we cannot ensure that we never did it.

The comments the pupils got from their comrades also represented a learning support to foster their reflection. As the blogs of both groups were accessible to every pupil, they could interact with more and any desired comrades. According to Wang and Woo (2010) this is effective to foster reflection and it should lead to higher attention and motivation. Nevertheless, the pupils' comments were no constructive feedback and gave no perspectives. They were of a rather social nature, saying "cool" or "I like it, too". Maybe they didn't want to hurt someone by giving their own opinion and not every pupil who commented a blog was a "more capable peer" (Xie et al., 2008). The study of Xie et al. (2008) also showed that giving constructive feedback is difficult for secondary school students. Therefore, we anticipated that it would also be difficult for our pupils and, as for the test group, we commented their blogs every week.

As learning resource for the first task, the pupils got a list of Internet addresses from blogs kept by school classes. They should get to know what blogs are and they also could use them at a later time. Additionally, they received another list with addresses of appropriate websites, because young bloggers do quickly frustrate when they have to choose a topic to write about and when they have to rely on their own resources (Downes, 2004). The pupils could use these websites, but they didn't have to. Though, the analysis of the entries showed that the pupils wrote about some of these websites in the third and in the last week and, besides, these entries belonged to the most reflexive ones. The link list on the blogs, already mentioned before, also represented a learning resource, thanks to which pupils could access their classmates' blogs without having to enter their entire blog address. This direct linkage is one of the main characteristics of blogging and surely contributed a lot to the pupils' motivation.

CONCLUSION

The implemented learning scenario did foster the pupils' reflection on information in a way that it could be recognised in their blog entries and in their conversations. Most of the criteria were fulfilled in their blog entries and those only rarely fulfilled, like the argumentation about the accuracy of the information, were present in their conversations. Beside the directly expressed reflections, the blog entries showed that the pupils addressed a specific audience, their classmates, and adapted their language and the contents to that audience. The learning scenario made the pupils integrate their own experiences and interests, which stimulated reflections and which could also be used for that objective. The degree of reflection depended on the topics the pupils wrote and talked about. However, even if they expressed many reflections in their conversations, they only wrote a few of them down. How precisely the different material and personal supports helped to foster their reflection could not be determined due to the limited time of the study. Considering the several learning tasks, supports and resources, we can say nevertheless that all of them helped more or less to foster reflection and that the elaboration of the learning scenario with these three structure elements was favourable.

Since reflective thinking is an effortful action and the more writing the reflections down, one should probably first exploit the discussions with or amongst the pupils to make them express and become aware of their reflections. The multimodality of the Internet and the consumed contents should be considered and used. Several blogs offer the possibility to publish audio files and videos. So, instead

of writing down the reflections, one could record them or create video-blogs, known as vlogs. The basis of blogging, which consists in reading and then writing, is extended to seeing, hearing and speaking, which offers a lot of possibilities to help the pupils to express their reflections. To evaluate these reflections the same criteria, which we used to analyse the written entries, could be used. If the pupils should write down their reflections, one should give them additional supports. Finally, such a problem-oriented approach to blogging not only fosters the reflective thinking skills, but all the MIL competencies. Furthermore, on the curriculum level, the fostering of reflective thinking skills constitutes an interdisciplinary objective and while blogging the “digital natives” could become “digital learning natives” (Hourigan & Murray, 2010, p. 212).

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MOOCS IN BUSINESS ADMINISTRATION – AN OVERVIEW OF ASSESSMENT PRACTICE

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ABSTRACT

The study explores 31 MOOCs in the field of business administration, equipped with a conceptual framework documenting 18 facets of assessment design. As a second step, the data collected on 3 MOOCs about assessment is submitted to university members in charge of external courses accreditation procedures in order to ascertain its possible influence on their decision to credit a MOOC or not. Main results indicate that, a) the typical profile of the assessment procedure for MOOCs in business administration is: QCM-based, automatic, continuous, individual, product-centred, standardized, b) secure ways (proctoring, test-centres) to warrant learners' identity for the tests can already be found in some MOOCs of this field, and c) concerns of course accreditors bear first and foremost on these student authentication aspects.

INTRODUCTION – A FOCUS ON ASSESSMENT PRACTICE

As MOOCs (Massive Open Online Courses) continue to spread (Shah, 2015), calls for detailed pedagogical research on this instructional format have been issued (Bali, 2014; Toven-Lindsey, Rhoads, & Berdan Lozano, 2015; Hayes, 2015). They are sharply summarized by Margaryan, Bianco, and Littlejohn (2015, p. 83): “Existing evaluation frameworks focus on learners’ opinions and experiences of learning, but tend to disregard instructional design quality, which is an important variable in the overall quality of a course. (...) Even though MOOCs are still in the experimental phase, they would benefit from the application of instructional design principles”. The increasing availability of MOOCs also commands and allows research in specific disciplines. This paper locates at the crossroad of these two trends. It presents a focused investigation on assessment procedures as practiced in MOOCs (Bates, 2014; Cisel, 2013a) in the specific content-domain of business administration. This centration on assessment practice draws itself on two reasons. On the one-hand, this aspect of instructional design has not retained much attention so far, even in Margaryan et al.’s (2015) extensive analysis of 76 MOOCs according to the “MOOC-scan”, an instrument derived from Merrill’s (2013) instructional quality principles. On the other hand, the choice of MOOCs’ assessment practice as an object of research stems from practical concerns. Yet, it is very likely that, in the near future, the authorities of the Liège Business School (HEC) will face a growing number of students’ requests to be credited for MOOCs they have completed. It appeared worthwhile to anticipate by investigating the ins and outs of assessment in MOOCs in business administration and by looking at how academic accreditors think through this upcoming trend (Chauhan, 2014). Hence, two research questions guided this study:

- how does assessment practice present in MOOCs in business administration?
- does an accurate account of these assessment practice have any value for persons in charge of validating student participation in MOOCs and possibly transforming it into “transcriptable” academic credit (Sandeem, 2013)?

METHODOLOGY

The methodology of this research articulates an observational approach of assessment practice in business administration MOOCs and the presentation of its results to accreditors, in order to ascertain whether accurate information on assessment procedures can have an influence in their decision of validating a student’s attendance to a MOOC as credits.

Data sources

Data related to assessment practice was collected in an opportunity sample of 31 MOOCs (Appendix I) available during the six-month period dedicated to the research (January - June 2015). The first author enrolled in these MOOCs and carried out a systematic examination of all their assessment of/for learning instances. The researcher reported her observations in the “Assessment Prism” framework (see below). With regard to the gathering of authorities’ views, 2 faculty and one administrator regularly involved in accreditation boards were invited to a 30-min interview. They were presented the syllabus and the assessment modalities of 3 MOOCs from the sample and were asked whether, on this basis, they would grant the credit, and for what reasons.

Instruments

The instrument used to inspect the MOOCs is called the “Assessment Prism”. Documented and

illustrated in 3 main documents (Leclercq, 2006; Leclercq & Poumay, 2005; Verpoorten & Dupont, 2007), it presents as a conceptual framework qualifying 18 “facets” of assessment design (Fig. 1). Most of these facets are refined into two “dimensions”. For instance, the facet “Focus” (of the assessment) splits in the dimensions “processes” and “products” as instructors can decide to address the first or the second or both in their assessment actions. The facet “target” (of the assessment) is another illustration. It materialises in the dimensions “individual” and “group” as an assessment procedure can be designed towards a single student and/or a group of students.

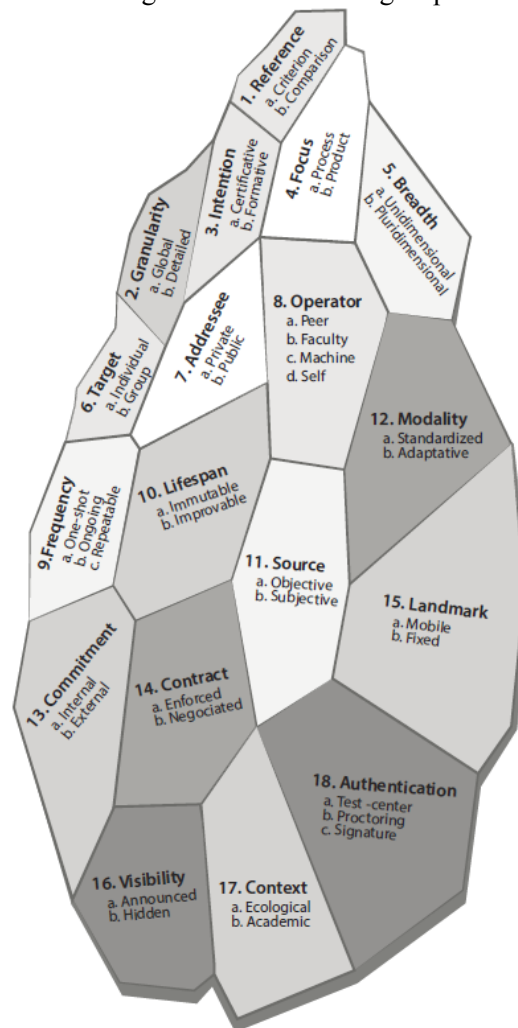


Figure 1: The Assessment Prism

By establishing 18 facets, the framework offers a comprehensive and structured approach useful to describe assessment procedures that any MOOC (or regular course) implements and to spot assessment trends in a sample of MOOCs. In all cases, the prism helps to make instructors' pedagogical choices appear²¹. The prism metaphor has been favoured because the

²¹ Up to now, the “Assessment Prism” has only been released in French. The Earli Conference 2015 provided a first opportunity to work it out in English. In order to secure the translation as much as possible, a comparative analysis was conducted upstream between three versions of the framework, presenting convergent but not identical stances, vocabulary, illustrations, and elaboration levels. It must be noted that one version (Leclercq & Poumay, 2005) relates the Assessment Prism to a conceptual model – ETIC-PRAD – concerned with 8

quantitative/qualitative picture of an assessment episode can greatly vary according to the facets through which performances are observed (measured and judged). As for the second part of the research, the 3 accreditors were asked to examine in detail, prior to the interview, the descriptive file of 3 MOOCs. The file included the request letter from a fictive student to be credited for its participation, the MOOCs' syllabus, and the main characteristics of the MOOCs assessment procedures, as found during the observation phase. The interviewer asked interviewees to issue their decision in terms of "yes/no credit" and their reasons for it. The conversation transcripts were analysed and compared in order to identify the rationale underpinning either a credit approval or refusal. As the researchers anticipated the importance of the facet "authentication", the 3 submitted MOOCs were selected in order to offer 3 contrasted types of final assessment: a) in M1, identity control was performed in an authorized local test-centre (Pearson VUE, 2015), b) in M2, through online proctoring (Negria, 2014), c) in M3, through a combination of profile picture (coupled with a biometric comparison with ID card) and personal keystroke dynamics analysis (MOOCs' Directory, 2014).

RESULTS

Scanning the 31 MOOCs with the Assessment Prism framework discloses the following trends (for detailed results, see Appendix II):

- To a large extent (29 to 31 instances), MOOCs in business administration present assessment procedures that are: a) based on non-negotiated (facet 14), objective (that is, here, MCQ-based, facet 11) and announced (facet 16) criteria (facet 1), b) certificative (facet 3) c) focused on individual (and not collective) performance (facet 6) and on learning products (and not processes, facet 4), d) conducive of global and detailed feedback (facet 2), e) automatic (facet 8), f) ongoing (facet 9), and g) not released (results) publicly (facet 7),
- Automatic assessment (facet 8) can be complemented by peer-assessment (9/31) and by self-assessment (5/31). Complex (facet 11, 12/31) and ecological (facet 17) performance can also be assigned to students besides traditional academic MCQ.
- The dominant authentication process is the signature track but identity control through proctoring (2/31) and test-centre (2/31) have also been found.

assessment validity dimensions (ecologic, theoretical, informative, consequential, predictive, reliability, acceptability, deontology). Two versions (Leclercq, 2006; Verpoorten & Dupont, 2007) also suggest an overarching conceptual layer encapsulating the facets and based on questions (who, what, why, how of assessment) and/or keywords (agents, tempos, methods, etc.). Albeit interesting, none of those extensions have been kept here due to the additional complexities they bring about. Although faithful to a large extent to the initial documents, the version used in this paper has as its key purpose to make the prism as much operational as possible for the observation of the 31 MOOCs. In this respect, the framework was also complemented with the facet "Authentication" (related to learners' identity control), a strong concern in MOOCs that was not present in the initial framework, designed before the emergence of this instructional format.

The interviews with the administrative and academic exemption board deliver the following observations:

- When dealing with a MOOC, the accreditors operate as with a regular external course: they check whether the syllabus is compatible with a course delivered in their institution. If it is judged compatible enough, the course is submitted to the faculty in charge of the course, who takes the decision of equivalence or not. However, in the case of MOOCs, authentication issues comes in the way of this normal process. Accreditors refuse to go further when the identity is only controlled through signature track. The possibility of cheating the system with this method induces an immediate rejection of the credit request.
- When told that identity control can be certified through a test-centre or proctoring, accreditors accept to check the compatibility. It would therefore be theoretically possible for a MOOC to be considered as an alternative to regular course in the institution.
- When provided with the overview of assessment practice (facets 1-17) in the MOOCs, accreditors judge them interesting but not decisive.

DISCUSSION

Along with the learning goals and the learning methods, assessment is a major component of Leclercq's triangle (Castaigne, Petit, & Verpoorten, 2007) or constructive alignment (Biggs, 1996). The study aimed at documenting this component with a dedicated conceptual framework. This effort resulted in a snapshot of the current situation in 31 MOOCs in business administration.

A first observation is that MOOCs have largely been caught up with by assessment, which was not an initial concern of this movement (Downes, 2013). Although the seminal role of MOOCs was to instruct and not to certify (Belleflamme & Jacqmin, 2014), the delivery of a certificate and the procedures to warrant identities show that MOOCs have eventually embraced the very traditional concerns of any university course and context.

A second observation is that MOOCs favour in general quite common ways to assess. Tests are individual, standardized, largely anchored in automatic MCQ and feedback, even though some alternatives do appear in 9 MOOCs (assessment of a case study in M25, an elevator pitch in M5, a business plan in M4, a concept map in M15, a video in M11, a functional analysis in M27, etc.). It is not impossible that the development of AES (machine-automatic scoring) contributes to intensify this diversification of assessment procedures (Balfour, 2013; Markoff, 2013). Automatic assessment of programming assignments in computer sciences opens also promising avenues. These innovations are likely to boost the adoption of application exercises, in addition to plain questions and checks for knowledge and understanding (Ala-Mutka, 2005; Pieterse, 2013).

A third observation is that MOOCs foster repeatable (fact 9) and improvable (facet 10) assessment episodes. Suleman (2008) grants these iterative actions a positive impact on learning where Douce, Linvingstone, and Orwell (2005) suspect adverse effects: less effort from the student to elaborate right from the start a comprehensive reflection. More research work is needed about these opposite interesting effects.

A fourth observation is that a range of MOOCs have fruitfully incorporated the principles of formative assessment (12/31, facet 3). Automatic feedback is usually provided on this occasion. However, it is worth noting that this feedback is only retroactive (ex post). Doing so, MOOCs do not apply so far the two other modes of regulation: proactive and interactive (Allal, 1988).

CONCLUSION

This research analysed the assessment practice in 31 MOOCs in business administration and asked accreditors whether such a review would allow them to deal with MOOCs as “normal courses” in the accreditation processes. The first contribution of this work is methodological as it exhibits a systematic application of the Assessment Prism framework in the innovative context of MOOCs deployment. Its second contribution is disciplinary as the research enlighten the state-of-the-art for assessment practice in MOOCs in business administration. By providing a better identification of current strengths, weaknesses and potential of assessment practice in MOOCs, this work intends to benefit both to researchers committed to this new type of instructional resource and to instructional designers in charge of MOOCs implementation. As facet 18 “Authentication” pinpoints assessment practice that have different prices²² for the students and institutions, economists (Cisel, 2013b; Parr, 2015) in the domain of higher education might also find relevance in this research.

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²² As for Proctoring, students pay on average 100 EUR while the institution pays on average 23 EUR per student. With regard to Test-Centre: students pay on average 200 EUR while the institution pays on average 60 EUR per student. Regarding Signature track: students pay on average 43 EUR.

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APPENDIX I

ID, MOOC's title, institution, and platform of the 31 MOOCs reviewed in the business administration field. In bold face: the 3 MOOCs submitted to the accreditators

- M1, Du manager au leader 2.0, CNAM, FUN.
- M2, Gestion de crise, Université Panthéon-Assas Paris II, FUN.
- M3, Management de la force de vente, Université de Montpellier, FUN.
- M4, Entrepreneurship 101: Who is your customer?, MIT, Edx.
- M5, Entrepreneurship 102: What can you do for your customer?, MIT, Edx.
- M6, Innovation and Commercialization, MIT, Edx.

- M7, Networks, Crowds, and Markets, Cornell, Edx.
- M8, Introduction to Global Hospitality Management, Cornell, Edx.
- **M9, Innovation for Entrepreneurs: From Idea to Marketplace, University of Maryland, Coursera.**
- M10, Modèles de regression, Johns Hopkins University, Coursera.
- M11, Devenir entrepreneur du changement, HEC-Paris, Coursera.
- M12, Introduction to Marketing, Université de Pennsylvanie, Coursera.
- M13, How to Build a Startup, Steve Blakn, Udacity.
- **M14, Understanding Modern Business And Organisations, University of Strathclyde Business School, Future Learn.**
- **M15, Gestion de projet, Centrale Lille, Site Centrale Lille.**
- M16, Gestión Empresarial Exitosa para Pymes, Pontificia Universidad Católica de Chile, Coursera.
- M17, The Power of Microeconomics: Economic Principles in the Real World!, University of California, Irvine, Coursera.
- M18, Entrepreneurial Strategic Management, The university of New Mexico, Coursera.
- M19, Introduction to Financial Accounting, Wharton university Pennsylvania, Coursera.
- M20, Introduction to Corporate Finance, Wharton university of Pennsylvania, Coursera.
- M21, Le marketing dans le monde numérique, Université de l'Illinois, Coursera.
- M22, Fundamentals of Management, University of California, Irvine, Coursera.
- M23, The Power of Macroeconomics: Economic Principles in the Real World, University of California, Irvine, Coursera.
- M24, The Art of Negotiation, University of California, Irvine, Coursera.
- M25, Foundations of Business Strategy, University of Virginia, Coursera.
- M26, Essentials of Entrepreneurship: Thinking & Action, University of California, Coursera.
- M27, Digital Analytics for Marketing, University of Illinois at Urbana- Champaign, Coursera.
- M28, Managing Your Money: MBA Insights for Undergraduates, University of California, Irvine, Coursera.
- M29, Introduction to Operations Management, Wharton university of Pennsylvania, Coursera.
- M30, Negociación exitosa: Estrategias y habilidades esenciales, University of Michigan, Coursera.
- M31, Les principes de la finance, Université catholique de Louvain, Edx.

APPENDIX II

The Assessment Prism framework is made of 18 facets (column 1), refined in at least two dimensions (column 2). Column 3 gives a definition of each dimension. Column 4 gives the MOOCs wherein each dimension could be observed as a concrete assessment practice. Most of the references come from Leclercq (2006).

Facets	Dimensions	Definition – The assessment...	MOOCs
1.Reference (Sluijsmans, 2008, p. 10-12)	a. criterion	... measures the individual performance according to criteria (criterion referenced test, Glaser, 1963)	All
	b. comparison	... measures the individual performance against a group (mean score, ranking, etc.)	None
2.Granularity	a. global (de Landsheere, 1979, p. 115)	... is summed up in one single mark	All but M13
	b. detailed	... is broken down into sub-scores so that learners can distinguish strengths and weaknesses	All but M30
3.Intention	a. certificative (assessment of learning)	... leads to a decision (the student is admitted, the student gets the degree, etc.)	All but M13
	b. (in)Formative (assessment for learning) (De Landsheere, 1979, p.113)	... indicates a position on the way towards the ultimate learning objectives	12 (1, 4, 6, 12, 13, 14, 15, 21, 25, 27, 29, 31)
4.Focus	a. process	... measures aspects of the learning process	None
	b. product	... measures the result of the learning process	All
5.Breadth	a. unidimensional	... takes into consideration one dimension of students' performance (good answers)	21 (1, 2, 3, 7, 8, 9, 12, 13, 14, 16, 17, 19, 20, 22, 23, 24, 26, 28, 29, 30, 31)
	b. pluridimensional (Leclercq, 1982)	... takes into consideration more than one dimensions of students' performance (good answers+confidence degree+speed, etc.)	10 (4, 5, 6, 9, 10, 11, 15, 21, 25, 27)
6.Target	a. individual	... rates the performance of one learner	All
	b. group	... rates the performance of a group	None
7.Addressee	a. confidential	... makes the results available to the learner only	All but M15
	b. public	... makes the results public	1 (15)
8.Operator	a. faculty	... is performed by an instructor	2 (14, 15)
	b. peer (Kulkarni et al., 2013)	... is performed by a fellow-student	9 (5, 6, 10, 11, 14, 15, 21, 25, 27)
	c. self (Verpoorten, Westera, & Specht, 2011)	... allows learners to measure their own performance	5 (4, 5, 6, 11, 15)
	d. machine (Malmi, Korhonen, & Saikkonen, 2002).	... is performed automatically	All but M5
9.Frequency	a.one-shot	... is stand-alone and not combined with other assessment episodes	2 (13, 30)
	b. ongoing	... is combined with other assessment episodes for an overall appreciation	All but M 13/18
	c. repeatable	... is always identical and can be taken several times	21 (4, 6, 8, 9, 10, 12, 13, 14, 15, 16, 17, 19, 20, 21, 23, 25, 27, 28, 29, 30, 31)
10.Lifespan	a. immutable	... provides results that that cannot be modified anymore	10 (1, 2, 3, 5, 7, 11, 18, 22, 24, 26)
	b. improvable	... enables learners to submit several	21 (4, 6, 8, 9, 10,

		performance iterations to improve	12, 14, 15, 16, 17, 18, 19, 20, 21, 23, 25, 27, 28, 29, 30, 31)
11.Source	a. objective	... gives the same result regardless of the operator(s) identity (QCM for instance)	All
	b. subjective	... is based on the subjective judgment of the operator(s) (portfolios for instance)	12 (4, 5, 6, 10, 11, 14, 13, 15, 18, 21, 25, 27)
12.Modality	a. standardized	... puts learners in the same exam conditions (questions, time, place, etc.)	None
	b. adaptive	... tailors exam conditions to learners' choice	All
13.commitment	a. internal	... is performed by assessors who were involved in the training process	All
	b. external	... is performed by assessors external to the training process	None
14.Contract	a. enforced	... is imposed "top-down" to all students	All
	b. negotiated	... presents aspects that can be negotiated between instructors and students	None
15.Landmark	a. mobile	... defines a performance that varies according to learners' level	1 (15)
	b. fixed	... defines a performance identical to all learners but weights its components according to learners' level (Leclercq & Van der Vleuten, 1998)	All but M15
16.Visibility	a. announced	... makes its criteria explicit to the students prior to the performance	All
	b. hidden	... does not give students the criteria on which their performance will be rated ("do your best")	None
17.Context	a. ecological (Brunswick, 1943)	... favours an authentic performance (close to the future professional situation)	11 (5, 6, 7, 11, 15, 19, 20, 21, 25, 27, 31)
	b. academic	... favours a traditional scholarly performance	18 (1, 2, 3, 4, 8, 9, 10, 12, 13, 14, 16, 17, 18, 22, 26, 28, 29, 30)
18.Authentication	a. signature track	... checks assessee's identity through biometric procedures (typing pattern, picture comparisons)	25 (4, 5, 6, 7, 8, 9, 10, 11, 12, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31)
	b. test-centre	... sends learners to a certified local centre where they will pass the exam	2 (14, 15)
	c. proctoring	... allows a distance exam but under real-time control	1 (15)
	d. no check	... does not set any authentication process	4 (1, 2, 3, 13)

TEAM SUPPORT IN DEVELOPING THE ENTREPRENEURIAL READINESS AND SELF-EFFICACY OF TEACHERS

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ABSTRACT

This study explores the role of team-learning and team support in the development of the entrepreneurial competences (readiness) of teachers. It focuses on the interplay between team support and self-efficacy. The study draws from an integrated theoretical framework describing entrepreneurial readiness as a conceptual construct, which takes elements from economics and educational research. This study also apply theoretical perspectives on self- and team efficacy and examines them from a social perspective. The empirical research is based on an authentic teachers' team-learning intervention which was carried out within vocational education in Finland. The data consist of the teachers' written learning reflections gathered during the learning process. Straussian Grounded theory (GT) was applied as the research methodology and data analysis method. The research results indicate that there is a positive relationship between team support mechanisms and the development of the teachers' self-efficacy beliefs resulted in their increased entrepreneurial readiness.

INTRODUCTION

Owing to economic, social and political changes and challenges, there is a growing need for the reform of education and a call for renewal within teaching in Higher Education throughout Europe. Educational institutions are especially expected to contribute to solving the abovementioned challenges by providing entrepreneurship education that fosters entrepreneurial mind set and competences in students, referring to sense of initiatives involving creativity, risk-taking and the ability to turn ideas into action. Entrepreneurial competences are thus not only understood as the abilities required when setting up a business, but as the transversal key competences of each individual (European Commission, 2006). Being entrepreneurial can thus be understood as a broad work- and life orientation. Similarly, the concept of competence has evolved and instead of fixed work-related attributes, competence can nowadays be seen as readiness, which refers to the potential action capacity in a given situation (Sandberg & Targama, 2007).

In Finland entrepreneurship education has been embedded into the curricula of basic and upper secondary education since 1995, and since then many other European countries have set up their own entrepreneurship education policies. However, as a recent EU report (Eurydice, 2012) shows, there is large variation from country to country in how entrepreneurship education is embedded into curricula and the way entrepreneurship is taught.

Teachers are key agents in implementing entrepreneurship education into the operating culture of educational institutions. Consequently, teachers are being encouraged to adopt new pedagogical approaches and tools as well as to create more innovative and open learning environments, which foster the development of entrepreneurial mind set and behaviour amongst students (Hannon, 2006; Hytti & O’Gorman, 2004, Matlay & Carey 2007; Peltonen, 2015). This means that teachers need to display entrepreneurial behaviour themselves in order to be able to foster such abilities in students.

This leads to the question: to what extent are teachers willing and able to meet these demands? Earlier studies indicate that despite growing demands for more creative and entrepreneurial teaching approaches, conventional teaching methods are still widely used. Teacher attitudes towards entrepreneurship education are generally positive, but they need more information, further training and support if they are to implement entrepreneurship education successfully (Backström-Widjeskog, 2008; Eurydice, 2012; Gibb, 2011; Peltonen, 2015).

Earlier studies show that teacher collaboration (Collison & Cook, 2004; Doppenberg et al. 2012), teacher study groups (Stanley, 2011) and peer learning (Nieto, 2003) are effective ways to enhance the professional development of teachers, which, in turn, stimulates the development of innovative schools (Doppenberg et al., 2012). However, relatively little is known about how teachers learn in collaborative learning settings (Doppenberg et al., 2012) and studies exploring the role of teams in supporting the development of the entrepreneurial readiness of teachers are marginal.

This paper aims to narrow this research gap by presenting the findings of an explorative case study on the role of team support in developing entrepreneurial readiness and the perceived self-efficacy of teachers. It focuses on examining the interplay between team support and self and team efficacy beliefs, which are regarded as essential drivers of entrepreneurial behaviour. The study is based on an authentic team learning intervention within vocational education in Finland. The following section addresses how the entrepreneurial readiness of teachers has been conceptualised in prior research. The third section discusses the significance of perceived self-efficacy on entrepreneurial behaviour. The fourth section presents the research context and methodological choices, which are followed by a

discussion of the research findings. The final section presents the theoretical contribution and offers practical implications and suggestions for future research.

THE ENTREPRENEURIAL READINESS OF TEACHERS

Readiness as the potential capacity for action

Drawing upon Taylorism, rationalistic approaches have long been dominant approaches to competence. According to this tradition, competence is regarded as an attribute-based phenomenon (knowledge and skills) or as individual level traits and motives (Lans *et al.*, 2008; Sandberg, 2009). Though the rationalistic tradition is still prominent, it has mainly faced criticism because it subsumes the idea that competences equal innate abilities. Furthermore, having competences does not automatically lead to competent behaviour. For instance, a teacher, who has acquired competence in terms of the set standards (qualification) may not perform well in the classroom (Luukkainen, 2004). On the other hand, a teacher, who does not have a formal qualification, may be highly capable with the students. Furthermore, a rationalistic competence does not sufficiently consider the importance of the mental processes affecting human behaviour (Cheeltham & Chivers, 2005).

Along with the increase of interpretive approaches and practitioner research in social sciences, a more holistic typology of competence, which takes into consideration the importance of a context, situation or role, has gained a foothold in the study of competence. As a result, competence is nowadays understood as potential action capacity, which is related to tasks and to the comprehension and understanding of those tasks (Sandberg & Targama, 2007). Potential action capacity involves attitudinal elements, therefore some scholars (Armenakis & Harris, 2002; Westerholm, 2007; Kyrö *et al.*, 2011) have adopted a concept of readiness instead of competence. Readiness as a concept is applicable in this study as it refers to being open to change and being prepared for it (Armenakis & Harris, 2002).

Entrepreneurial readiness in the teaching context

As already noted, entrepreneurial readiness as a key competence is applicable in a broad range of activities. However, the way entrepreneurial readiness is manifested in action is context-dependent. For instance, being an entrepreneurial farmer involves different activities to those of an entrepreneurial teacher, thus the meaning of entrepreneurial readiness needs to be opened and specified in a given context (Peltonen, 2015; Onstenk, 2003).

Teacher entrepreneurial readiness can be seen as an integrated conceptual construct drawing from educational research and the descriptions of the professional competences of teachers, which are combined with the portrayals of entrepreneurial competences identified within entrepreneurship research (Figure 1). Based on literature the definitions of the professional competences of teachers highlight pedagogical content knowledge, professional beliefs, work-related motivation, and self-regulation, plus a complex combination of knowledge and skills, good interpersonal and communication skills, moral values, as well as devotion and sensitivity to educational, personal, social, moral and cultural needs – all of which emphasise development and are core aspects of a teacher's professional competence (Kunter *et al.*, 2013; European Commission, 2013; Kulshrestha & Pandey, 2013). In a similar vein, entrepreneurship research literature offers multiple definitions of entrepreneurial competence. Drawing from economics, they tend to emphasise combinations of the knowledge, skills and attitudes required for new venture creation, emphasising the ability to generate

ideas while recognising and envisioning the development of business opportunities. In addition, new venture creation requires decision-making, communication, risk-taking, business operational and management and leadership skills (Mitchelmore & Rowley, 2010).

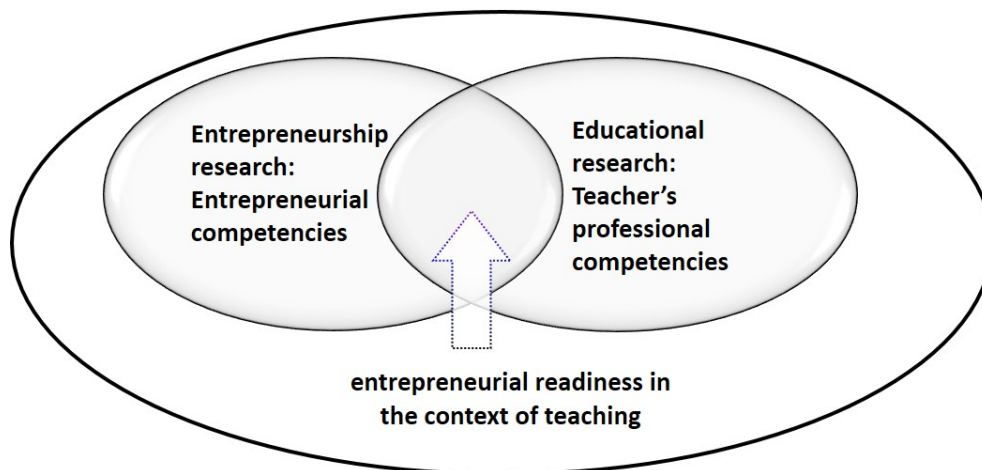


Figure 4: Entrepreneurial readiness as an integrated conceptual construct

Nevertheless, the essence of entrepreneurship lies in entrepreneurial thinking and behaviour, which are rooted in cognitive (identity, beliefs, knowledge, skills), conative (motivation, personal interests, self-regulation skills) and affective structures (values, attitudes) (Ruohotie & Koiranen, 2001; Krueger, 2007; Kyrö et al. 2011; Peltonen, 2015). Building upon the abovementioned elucidations, the entrepreneurial readiness of teachers involves the ability to understand entrepreneurship as a broad work and life orientation, a positive attitude towards entrepreneurship, a willingness and ability to act as an entrepreneurial role model for students, the ability to adopt pedagogical practices and to create learning environments that enable and promote entrepreneurial thinking and behaviour among students. Furthermore, the ability to guide and sustain entrepreneurial learning processes while being aware of the ethical and moral underpinnings of education are also required (Bécharde & Grégoire, 2005; Heinonen & Poikkijoki, 2006; Peltonen, 2015; Hägg & Peltonen, 2014).

THE ROLE OF SELF-EFFICACY AND TEAM SUPPORT IN LEARNING ENTREPRENEURIAL BEHAVIOUR

Connection between self-efficacy and entrepreneurial behaviour

There are many individual cognitive, emotional, motivational and environmental factors which predict entrepreneurial behaviour (Wakkee, Elfring & Monaghan, 2008; Mair, 2005; Shook et al. 2003; Orhan, 2005; Schwarz et al., 2006). Based on social cognitive theory (Bandura, 1977), perceived self-efficacy, e.g. an individual's perceived beliefs and judgement about his/her capability to execute given types of performance have a strong influence on how a person thinks, feels, motivates themselves and acts. Perceived self-efficacy thus plays a major role in how new challenges and situations are faced. Based on the research literature (e.g. Erikson, 2003; Hmieleski & Corbett, 2008; Mair, 2005), efficacy is also fundamental in learning entrepreneurial competences.

Correspondingly, studies on teacher efficacy have indicated that teachers with high perceived self-efficacy have a positive impact on student learning outcomes (Mojavezi & Tamiz, 2012; Tschannen-Moran & Hoy, 2001). For instance, Pihie and Bagheri (2011) reported that the entrepreneurial motivation and competences of students are influenced by their teachers' self-efficacy and attitudes towards entrepreneurship. Furthermore, as Wheatley (2005) and Schechter and Tschannen-Moran (2006) point out, there is a positive correlation between teacher self-efficacy and openness to more innovative pedagogy and new teaching methods. This implies that teachers with high self-efficacy might be more willing to adopt an entrepreneurial approach and renew their teaching practices accordingly, although there is a lack of empirical studies focusing on this linkage.

The role of team support in boosting self-efficacy beliefs

Team support is today understood as a multifaceted concept involving four types of social support: informational, instrumental, emotional and appraisal (West, 1994). Informational support refers to the ability of the members of a team to exchange and share information. Instrumental support involves practical support and tangible assistance, such as helping with tasks and duties or substituting for a colleague. Emotional support refers to empathy, trust, acceptance, concern and sympathetic understanding and encouragement, whereas appraisal support refers to consultation on professional problems and exchanging perspectives and opinions. According to Drach-Zahavy and Somech (2002) teacher teams tend to prefer immediate tangible assistance and knowledge sharing, whereas emotional and appraisal support are more infrequently used.

The importance of team support as a crucial precedent of teacher effectiveness is well acknowledged. However, so far, little is known about how teacher teams utilise different types of support to enhance team effectiveness (Drach-Zahavy & Somech, 2002) and even less is known about the dynamics between team support and team-efficacy. According to Bandura (1997) self-efficacy beliefs are formed through four primary sources: past mastery experiences, vicarious experiences (learning by observing others), social persuasion (e.g. encouraging feedback) and physiological and affective states. Past mastery experiences are seen as the strongest way to boost self-efficacy beliefs, whereas past failures tend to undermine people's beliefs in their abilities. However, it is not just the mastery experiences *per se* which increase self-efficacy beliefs, but the way these experiences are interpreted. For instance, Cope and Watts (2000) argue that entrepreneurial competencies are developed by experiential learning and through reflection on critical learning incidents. However, the meanings given to the learning experiences are also dependent on the feedback received from other stakeholders involved in the learning experience. Thus, learning new competences is seen as a socially constructed phenomenon in which the quality of learning interaction and team learning are crucial (Murray, 2003; Doppenberg *et al.* 2012; Stanley, 2011).

Collective efficacy, also known as team-efficacy, is a parallel but group level concept to self-efficacy (Arnold, Barling & Kelloway, 2001; Jung & Sosik, 2003; Katz-Navon & Erez, 2005), which refers to the team members' collective perceptions of their collective competence and performance. For instance, collective teacher efficacy refers to the collective perceptions of teachers in a given school on their abilities make an educational difference to their students (Schechter & Tschannen-Moran, 2006). Perceived collective efficacy enhances a team's commitment and motivation to their mission and helps to increase their abilities to accomplish the set tasks (Bandura, 2006).

Team-efficacy beliefs are formed through similar mechanisms to self-efficacy beliefs. However, earlier research (Jung & Sosik, 2003; Adams & Forsyth, 2006; Bandura, 2006) indicates that social persuasion and constructive performance feedback among group members have a stronger effect on

the formation of collective efficacy beliefs than they do on the development of self-efficacy beliefs. Following this logic, it seems that when wanting to enhance the self- and team-efficacy beliefs of teachers – and thus further the development of their entrepreneurial readiness – more emphasis needs to be put on their team-learning, collaborative reflection on learning incidents and supportive behaviour in teams. However, most professional development efforts are directed towards enhancing individual learning among teachers (Collison & Cook, 2004). The next chapter introduces a case study that focuses on exploring the dynamics between the perceived self-efficacy of teachers and team support.

RESEARCH CONTEXT AND METHODOLOGICAL CHOICES

Research context, the informants and the data

The empirical data of this study is based on the written learning diaries of a team of teachers – consisting of three members, who as tutors and learning facilitators were in charge and carried out a training programme targeted towards vocational level teachers in Finland in 2006. The aim of the training programme was to introduce the basics of entrepreneurship education to the vocational teachers.

This context also offered the possibility to study the impact of collaboration and team support on the facilitating teachers' perceived self-efficacy in an authentic setting. The data consist of 23 in-depth reflection documents written by the tutor teachers. The reflections were systematically gathered before and after each training session during the training programme. The average length of the documents was two pages.

Data analysing process

Straussian Grounded theory (GT), initially presented by Glaser and Strauss (1967), was applied as the research methodology and method in this study. GT is rooted in Symbolic Interactionism and pragmatism and is a widely used qualitative research method in the social sciences. GT was applicable in this study owing to its interpretative mode of inquiry, which aims to deepen the understanding of the behaviour patterns of people within a group or to gain insight into the prevailing processes of the phenomenon under exploration (McCallin, 2003; Coyne & Cowley, 2006).

The process of analysis in GT is inductive and iterative in nature. The analysis process in this study applied the guidelines suggested by Charmaz (2006) and involved three stages of coding: initial coding, focused coding, and theoretical coding. The initial coding is similar to open coding and involved a sentence-by-sentence open coding of data in which descriptive labels were attached to each segments of data. The purpose of the focused coding phase is to concentrate on the most meaningful and frequent categories identified in the open coding phase, to clarify these categories by exploring variations within and between the categories and by expanding them in terms of their dimensions (Moghaddam, 2006). Theoretical coding is the final phase of the analysis. It involves theory building by figuring out the relationships between the categories and identifying the core category to which all other categories are related (Hernandez, 2009).

KEY FINDINGS

Initial coding

This coding phase was data drive, which means that the codes emerged from the data. Following this principle, some segments of data (excerpts) received more than one labelling code, as illustrated below (Table 1).

Table 1
Example from open coding

Excerpt:	Emerging codes:
<i>This strengthened my feelings that we share a similar understanding of the aims of entrepreneurship education, as well as see the objective of this project in similar way.</i>	Mutual understanding, shared vision, becoming more confident

This initial coding was followed by categorisation in which the initial codes were clustered to create broader thematic categories. In this study, a total of 492 expressions were coded and, based on them, 73 preliminary sub-themes were identified. Open coding revealed that the coded expressions related mostly to collegial support, team performance, team and individual learning (Table 2).

Table 2
Most frequent categories

Identified category	Number of coded expressions	% of all coded expressions
Collegial support	95	19.3 %
Team performance	92	18.7 %
Team learning	89	18.1 %
Individual learning	68	13.8 %

This analysis of the identified sub-themes also revealed that team-efficacy was the most frequently coded sub-theme within team learning category, whereas there were only 14 references to strong perceptions of self-efficacy within the individual learning category. Hence, in order to find if and how the efficacy perceptions changed, the coding process continued by classifying the expressions related to efficacy beliefs in chronological order – according to the phases of the teaching project (planning, action, evaluation) (Table 3).

Table 3
Change in efficacy perceptions

Efficacy perceptions	PLANNING		ACTION		EVALUATION	
	References /Category		References /Category		References /Category	
	Number	%	Number	%	Number	%
Team-efficacy	14	93.3	8	72.7	3	23.1
Self-efficacy	1	6.7	3	27.3	10	76.9
References N=39	15	100.0	11	100.0	13	100.0
Documents =23						

As Table 3 indicates, team-efficacy perceptions were strongest in the beginning of the team-learning intervention, whereas self-efficacy perceptions increased during the project. In order to find out what the mechanism was behind this variation in perceived team- and self-efficacy, the analysis continued with focused coding.

Focused coding

As the main interest in this study was to explore the role of collegial support, the coded excerpts related to supportive behaviour within a team received a deeper analysis. These excerpts were re-classified according to the different phases of the learning intervention (planning, action and evaluation phases) and West's (1994) typology of the support patterns was used as a mini-framework for exploring the variation within support types (Table 4).

Table 4
Variation in support types

	PLANNING		ACTION		EVALUATION	
	References /Category		References /Category		References /Category	
	Number	%	Number	%	Number	%
Support types						
Instrumental support	12	30.8	16	19.1	4	21.0
Informal support	9	23.1	11	13.1	3	15.8
Emotional support	8	20.5	28	33.3	6	31.6
Appraisal support	10	25.6	29	34.5	6	31.6
References N=142	39	100.0	84	100.0	19	100.0
Documents =23						

The focused coding showed that instrumental and appraisal support were the strongest support types in the beginning of the learning intervention, whereas emotional and appraisal support were perceived as being stronger in the action phase. Tangible support was appreciated in the beginning phase because it enabled the division of practical tasks and duties between team members. However, although the practical benefits of teamwork were appreciated, intangible social support was essential in this phase. The role of emotional and appraisal support seemed to be highest in the action phase and clearly the importance of receiving social support decreased towards the end of the learning intervention.

Theoretical coding

The perceived team-efficacy combined with team support seemed to be the “glue” that ties the identified central categories (collegial support, team performance, team and individual learning) together. A strong sense of collective efficacy, connected with supportive behaviour among team members, formed the basis for individual and team learning and enabled the development of self-efficacy beliefs. The findings indicate that there is a positive connection between supportive behaviour and the development of the formation of self-efficacy, as suggested by Bandura (1977). This study also indicates that despite the perceived self-doubts in the planning phase team members still had the incentive to act and achieve the desired outcomes because of their strong commitment and belief in the team and also because of the perceived tangible and intangible supportive behaviour from the team members. In this phase, instrumental support was utilised in order to complete the practical issues

before starting the training programme, whereas appraisal support was exploited to increase the cohesion of the team and to overcome the confusion related to the challenge ahead.

In the action phase, perceived team-efficacy was still strong, but at the same time the team members' perceived self-efficacy started to increase due to the emotional and appraisal support received from the other team members. The perceived support decreased stress and helped team members work efficiently in order to reach the set goals. When the learning intervention was nearing completion, the team members' perceived self-efficacy was much higher than at the beginning of the learning process and at the same time the references to team-efficacy decreased. Emotional and appraisal support were still perceived by the team members, but, in this phase, perceived support was exploited to empower and strengthen individual readiness. Thus, it seems that a strong sense of team-efficacy is a crucial catalyst for changes in perceived self-efficacy. This is an interesting finding, because although earlier studies have shown a connection between team support and the development of a perceived collective efficacy, they emphasise a strong sense of self-efficacy as a predictor of team-efficacy.

CONCLUSIONS

Entrepreneurial competences, referring to readiness, i.e. potential action capacity involving a sense of initiative, creativity, risk-taking and the ability to turn ideas into action, are today seen as necessary for all people (European Commission, 2006). Entrepreneurship education, which aims at fostering an entrepreneurial mind set and competences among students, is thus strongly emphasised within European education policies. Teachers have a significant role in enhancing students' entrepreneurial competences, because the development of the entrepreneurial competences of students' are highly influenced by the abilities of teachers to integrate entrepreneurship education into curricula and implement it by use of pedagogical practices. This means that entrepreneurial readiness is a vital part of a teacher's professional competence as well. However, entrepreneurship education can be a rather controversial issue in a school context owing to its many interpretations as well as discussions about what entrepreneurship education stands for and why, and by whom and how it should be taught (Henry, 2013).

This study aimed at deepening our understanding of the role of team support in developing teachers' entrepreneurial readiness and self-efficacy. The research findings show that strong collective efficacy and perceived social support have an effect on the development of the team members' self-efficacy beliefs, which is one of the key predictors of entrepreneurial behaviour. The research findings contribute to earlier theories on entrepreneurial competence development by indicating that there is a positive connection between teachers' teamwork, team support and the acquisition of entrepreneurial readiness. This study also contributes to the earlier previous studies on team support mechanisms by indicating that teacher teams utilise different types of support to enhance their effectiveness as a team. In the light of the findings of this study perceived emotional and appraisal support are found to be especially significant in the process of forming beliefs about self-efficacy.

This paper also offers practical contributions for policy makers and teacher trainers by providing new insights into entrepreneurial readiness in a teaching context and by outlining the essential elements of self-efficacy formation. In order to enhance entrepreneurial working culture in educational institutions, more emphasis needs to be put on developing operating models and practices which would enable teamwork amongst teachers and foster supportive behaviour. These insights might be useful for teacher educators in planning and executing teacher training programmes and also for HR personnel when planning and conducting professional competence development interventions for teachers.

The study also provides avenues for future research. Acknowledging the limitations of this small-scale research, further empirical evidence is needed on the ways in which social support is given and perceived in larger, heterogonous and multidisciplinary teams. In addition, more empirical research is needed on the impact of the efficacy and entrepreneurial readiness of teachers on the learning outcomes of students and the subsequent development of those students' entrepreneurial intentions.

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JUDGING PEOPLE AND THEIR LANGUAGE USE: EVIDENCE FOR THE DISTINCTNESS OF ATTITUDES TOWARDS LANGUAGES AND SPEAKERS' NATIONALITY

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ABSTRACT

In verbal interactions, the language spoken is one of the most salient cue eliciting evaluative outcomes. According to the Social Process Model of Language Attitudes (Cargile, Giles, Ryan & Bradac, 1994), listeners perceive different linguistic cues and form attitudes towards speakers' language which then influence the evaluation of this speaking person. Moreover, language as most visible cue for speakers' nationality might even elicit attitudes towards speakers' nationality as non-linguistic cue (Myers-Scotton, 2006). In previous research, this differentiation of attitudes has not been addressed. A final sample of N = 88 participants took part in this experimental study examining the separability of language and nationality attitudes as two distinct constructs. Implicit attitudes were measured by using an adapted version of an audio Implicit Association Test (IAT; Greenwald et al., 2002) and explicit attitudes were examined with a combination of validated and newly developed explicit measures of language and nationality attitudes. The results showed, both on the implicit and explicit level, moderate correlations between language and nationality attitudes, providing evidence for the factorial separability. However, correlations neither between implicit and explicit language attitudes nor between implicit and explicit nationality attitudes were significant supporting the conclusion that implicit and explicit measures refer to the same attitude content, but are the result of different cognitive processes.

INTRODUCTION

To form evaluations in social encounters, language as one of the most salient cue is inevitably perceived by an interlocutor (Cargile & Bradac, 2001; Kinzler, Shutts, Dejesus & Spelke, 2009). Accordingly, models on the impact of language on speaker evaluations were developed (e.g. Cargile & Bradac, 2001; Cargile et al., 1994). For instance, a first factor influencing listeners' evaluations of a French-speaking person might derive from the question 'How do you like the French language?' The answer to this question might refer to attitudes on how the perceived language sounds or for instance, on how elegant the language is perceived (Schoel et al., 2013). The language spoken not only triggers attitudes towards the language itself, but might be a cue for further inferences on the speaker, e.g. speaker's nationality, eliciting additional attitudes towards nationality groups (e.g. 'French are very relaxed persons'). In monolingual societies, language and nationality are closely linked, i.e. speaking the dominant language is a strong indicator of belonging to the national group. Hence, the differentiation between language and nationality attitudes has not been addressed in previous research on speaker evaluations. In multilingual societies, however, individuals are in contact with various languages spoken by different inhabitants. Thus, persons of different nationalities may speak the same language, and persons of the same nationality might make use of different languages in various situations, increasing the importance of the differentiation between language and nationality attitudes. The first aim of the present study is to investigate experimentally whether attitudes towards languages can be distinguished from attitudes towards speakers' nationality in a multilingual setting, namely the Grand Duchy of Luxembourg.

The Luxembourgish language context

The Grand Duchy of Luxembourg, with a population of about 563.000 inhabitants (Statec, 2015), is geographically situated between Belgium, France and Germany. Within the EU, Luxembourg features the highest proportion (45.9%) of resident foreigners (Statec, 2015). Since the implementation of the 1984 language law, Luxembourg may be termed *triglossic* country with reference to Luxembourgish, French and German as officially recognized languages (Horner & Weber, 2008). When compared to other countries, the language situation in Luxembourg is unusual in that there is a clear separation between spoken and written language use. Whereas Luxembourgish, also named *national language*, is widely used for spoken communication among native-born inhabitants, French is used as administrative and judicial language, and German plays a leading role in the local print media (Weber & Horner, 2012). The three-language policy and the clear separation between written and spoken language leads to the particular situation in Luxembourg that inhabitants' language do not necessarily coincide with speakers' nationality. Depending on the situational context, it may occur, for instance, that Luxembourgish and French citizens living in Luxembourg use either Luxembourgish or French. In speaker evaluations, this means that a Luxembourgish citizen might be evaluated differently depending on whether he or she speaks Luxembourgish or French (impact of language attitude), and two persons both speaking Luxembourgish might be evaluated differently if one is of Luxembourgish and the other one of French nationality (impact of nationality attitude). This interplay of language and nationality attitudes is reflected in theoretical frameworks of speaker evaluations, e.g. in the *Social Process Model of Language Attitudes* (Cargile et al., 1994).

THEORETICAL FRAMEWORK

The impact of attitudes on speaker evaluations

According to the Social Process Model of Language Attitudes (Cargile et al., 1994), individuals process linguistic cues and form attitudes based on these stimuli. In this context, attitudes can be described as individuals' psychological tendencies of evaluating certain targets in a favourable or unfavourable way (Eagly & Chaiken, 1993). Furthermore, they can be divided into cognitive, affective and behavioural features of response (Edwards, 1982). Transferred to the domain of language, attitudinal processes are cognitive because language can elicit distinct social categories in listeners' mind. Furthermore, the affective dimension of attitudes allows listeners to be affectively aligned towards the language spoken, even though the language is unknown to the listener. The third component of attitudes refers to behavioural consequences integrating a combination of cognitive and affective features previously composed. In the final stage of the social process model, the different attitude components are set against each other and then integrated to build evaluative outcomes (Cargile et al., 1994).

On the side of speakers' characteristics, language features (verbal and vocal) are the most salient cues in social interactions, but they are not the only behaviours transmitted by a speaker. So-called extra-linguistic cues may even form the basis for attitudes. In the same vein, Johnson (1999) mentioned that language behaviour may be the trigger for the formation of attitudes towards speakers' group membership. Since language in social encounters is the most visible cue for the nationality of the speaker (Myers-Scotton, 2006), the language spoken might even elicit attitudes containing inferences on the nationality of the speaker. Furthermore, the *Social Identity Theory* (SIT; Tajfel & Turner, 2004) provides support for the fact that linguistic features can raise the awareness of individuals' membership of a particular (national) group (Tajfel, 2010). In this way, evaluative outcomes are shaped by social comparisons focusing on the distinctiveness between their own group and other groups. Subsequently, the own in-group (e.g. national group) is evaluated more favourably than relevant out-groups to maintain a separate group identity (Tajfel & Turner, 2004). In previous research, however, the conceptual differentiation between attitudes towards languages, on the one hand, and speakers' characteristics, on the other hand, has not been clearly assigned in literature. For instance, language attitude studies in the last decades did not cover solely participants' perception of distinct language varieties, as study titles indicated, but rather referred to the assessment of speakers' competence related and solidarity traits (e.g. Giles, Henwood, Coupland, Harriman & Coupland, 1992). Thus, the assessment of personality attributes (e.g. intelligent, sincere) was often used interchangeably as measure of language attitudes (Giles & Billings, 2004).

Distinction between implicit and explicit attitudes

As theoretical frameworks of speaker evaluations imply the need for a differentiation between language attitudes and attitudes towards extra-linguistic attributes of the speaker, social cognition theories (Greenwald et al., 2002; Wilson, Lindsey & Schooler, 2000) indicate the need for a further differentiation. A large body of literature on cognitive and social psychology proposes the existence of two different types of reasoning (Evans, 2008). Accordingly, persons do not have a single attitude towards an object, but rather two attitudes, an *implicit* and an *explicit* attitude. Implicit attitudes result from automatic and unconscious processing and are not consciously accessible for persons' working memory. Explicit attitudes, on the other hand, are conscious evaluations of an object. Overall, it is unlikely that an evaluative task relies exclusively on implicit or explicit attitudes (e.g. Bargh & Williams, 2006; Conrey, Sherman, Gawronski, Hugenberg & Groom, 2005). In most cases, both

attitudes contribute to the evaluation of a person. Even when implicit and explicit are united by the aim of measuring the same attitude content, they refer to separate constructs (Greenwald & Banaji, 1995). In the same vein, results of several meta-analyses suggested that implicit and explicit attitudes refer to different processes and thus are not expected to show high correlations with each other (e.g. Hofmann, Gawronski, Gschwendner, Le & Schmitt, 2005; Nosek, Greenwald & Banaji, 2005).

On the level of measurement, traditional self-report measures of attitudes, e.g. questionnaires, largely reflect explicit attitudes, as they record the conscious reflection of a person about an attitude object. For measuring implicit attitudes, instruments therefore have to assess unconscious associations with the attitude object (Garrett, Coupland & Williams, 2003). An often-used valid implicit measure is the *Implicit Association Task* (IAT), a computerised discrimination task, first implemented by Greenwald, McGhee and Schwartz (1998). Specifically, participants are asked to sort target and attribute stimuli (e.g. positive vs. negative words) by pressing the appropriate keyboard button. The basic approach of the IAT relies on the assumption that categorising multiple stimuli is faster when producing evaluatively compatible (e.g. flower – positive) than incompatible (e.g. insect – positive) responses (Greenwald et al., 1998). A large and growing body of literature has investigated implicit associations between concepts and attributes using visual stimuli such as words and photographs. However, few studies (e.g. Campbell-Kibler, 2012; Pantos & Perkins, 2013) demonstrated the application of the IAT to language attitudes by using audio stimuli, e.g. of U.S. and Korean accented speech (Pantos & Perkins, 2013). Since their findings revealed a pro-U.S. accent bias in implicit measures but a pro-foreign accent bias on explicit measures, they demonstrated the need for a differentiation between implicit and explicit attitudes in speaker evaluations (Pantos & Perkins, 2013).

Study objectives and research questions

Combining theoretical models of language attitudes (Cargile et al., 1994) and social-cognitive approaches (Greenwald et al., 2002; Wilson et al., 2000) leads to the conclusion that both language and nationality attitudes can be further differentiated into implicit and explicit attitudes. Based on these assumptions, we propose a model (Figure 1) containing four different attitudes influencing speaker evaluations.

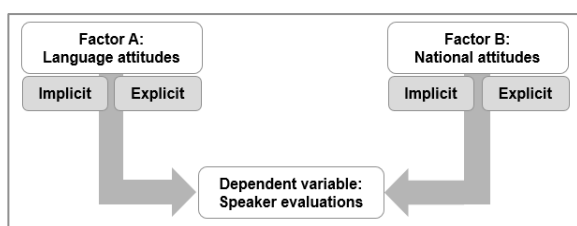


Figure 1: The hypothesized model.

Hence, the aim of this study is to test the model assumptions, i.e. the distinctness of language and nationality attitudes as well as the implicit-explicit differentiation through the investigation of two main research questions:

- *Research Question 1a:* Are listeners' *implicit* attitudes towards languages clearly distinguishable from their *implicit* attitudes towards speakers' nationality?
- *Research Question 1b:* Are listeners' *explicit* attitudes towards languages clearly distinguishable from their *explicit* attitudes towards speakers' nationality?
- *Research Question 2a:* Are listeners' *implicit* attitudes towards languages clearly distinguishable from their *explicit* attitudes towards languages?

- *Research Question 2b*: Are listeners' *implicit* attitudes towards speakers' nationality clearly distinguishable from their *explicit* attitudes towards speakers' nationality?

RESEARCH METHODOLOGY

Participants

A total of $N = 91$ participants took part in this experimental study. Participants were mainly recruited from undergraduate and graduate university programmes ($N_{\text{non-student}} = 19$). As compensation for study participation, a fee of 5€ were paid to participants. Since we were interested in Luxembourgish nationals' attitudes, we established certain inclusion criteria for participation. Participant inclusion criteria were either holding Luxembourgish citizenship or, for non-Luxembourgish, long-term residency in Luxembourg, i.e. exclusively passed through the Luxembourgish school system and holding high competences in Luxembourgish and French. Three participants did not meet the inclusion criteria, resulting in a final sample of $N = 88$ participants (58 females, $M_{\text{age}} = 22.3$), of which 95.5% held Luxembourgish citizenship. Of the final sample consisting of $N = 88$ (58 females, $M_{\text{age}} = 22.3$), almost all participants (95.5%) held Luxembourgish citizenship and went to school in Luxembourg. The remaining non-Luxembourgish persons were included due to self-report data pointing to Luxembourgish school education and high competences in Luxembourgish and French.

Task procedure

The computerized study was divided into three parts: An implicit measurement to examine both language and nationality attitudes (Task I) and two explicit measures to examine language (Task II) and nationality attitudes (Task III) respectively. Task I consisted of four connected audio IATs, of which two examined language and nationality attitudes respectively. After Task I, explicit scales to examine language attitudes (Task II) and nationality attitudes (Task III) were presented. Task III was followed by demographic questions. All tasks were created using Inquisit™ software (Draine, 1998) and each participant was provided with a laptop computer, an external mouse, and a set of headphones. Before starting the experiment, each participant signed a consent form containing the nature of the study, the warranty as to strictly scientific usage of data and the entitlement to withdraw this consent prior to the start of the study. The order of measurement does not have a strong influence on IAT results and explicit self-reports (Nosek et al., 2005) and the implicit-explicit correspondence does not vary as a function of the measurement order (Hofmann et al., 2005; Nosek et al., 2005). Thus, implicit tasks as measures of immediate reactions preceded the assessment of explicit (thoughtful) attitudes. Before the start of Task I, participants were presented with the written descriptions of four different male speaker types containing speaker's name, nationality and choice of language (see Table 1): A (Luxembourgish national speaking in Luxembourgish), B (Luxembourgish national speaking in French), C (French national speaking in Luxembourgish) and D (French national speaking in French). As an example, a short speech sample of each speaker type was played to participants to familiarise them with the four categories.

Table 1

The generation of IAT target concepts comparing four speaker types

	Luxembourgish language	French language	IAT attitude content
Luxembourgish national	A	B	language
French national	C	D	language
IAT attitude content	nationality	nationality	

Task I: Implicit Association Tests

Task I consisted of four connected audio IATs using attribute and audio stimuli. Positive and negative valence words, validated by Glock, Kneer and Kovacs (2013) were used as visual attribute stimuli using *positive* and *negative* as target attributes. The audio stimuli were audio excerpts taken from different male speech recordings generated under the four speaker conditions as described above. The four speaker types additionally served as target concepts contrasted in the four IATs. This approach allows examining separately Luxembourgish inhabitants' attitudes towards languages and speakers' nationality. The IATs were structured in five blocks. The first block served as practice phase in which participants were instructed to categorise a total of eight positive and eight negative visual attribute stimuli by pressing the appropriate computer key ('E' for upper left or 'I' for upper right of the computer screen) for a total of 20 randomised trials. The following blocks either referred to measurements of attitudes towards languages or nationality. Assignment order of the four IATs was counterbalanced for participants, so that half the participants completed alternately both IAT contents beginning with the language IAT and half saw the nationality IAT first.

In the second block, also a practice phase, participants were instructed to sort eight audio stimuli generated by two different speaker types into specified target concepts, for a total of 20 randomised trials. In the language IATs, either speaker type A and B or C and D served as contrasted target concepts. Consequently, the nationality IATs referred to comparisons of speaker type A with C or B with D. In the language IAT comparing type A and B, for instance, the audio stimuli were taken from speech recordings registered by different Luxembourgish nationals, once in Luxembourgish ('Moien ech heeschen Jemp [Hello my name is Jemp]') and once in French ('Salut je m'appelle Jos [Hello my name is Jos]'). Evaluative differences arising from this comparison can be solely attributed to a change of language and thus serve as implicit measure of language attitudes. Further audio excerpts referred to statements with respect to short presentation of the person speaking. Participants were able to sort the audio stimuli immediately on stimuli occurrence by pressing the appropriate computer key ('E' for upper left or 'I' for upper right of the computer screen). For reasons of standardisation, audio excerpts were adjusted regarding clip beginning and relative loudness using audio editing software. If incorrect sorting occurred within practice blocks, a red X appeared on the computer screen offering the possibility to correct the selection. In the third block, using a total of 40 randomised trials, the first two blocks were combined and participants were instructed to sort both visual and audio stimuli into categories referring to combinations of target and attribute stimuli. The fourth block contented a repetition of block two, but the screen position for target concepts were reversed. In the fifth block, the 40 trials from the third block were presented with reversed screen positions for target concepts, as introduced in the fourth block.

The raw data of the four IATs were transformed using *D* measures which indicate the relative strength of association between the used attribute and target concept (Greenwald, Nosek & Banaji, 2003). The *D* measure was computed as the difference between mean response latencies from two test blocks that represent the third and fifth blocks in the present study. In this study, four *D* measures were computed, two for language attitudes and two for nationality attitudes. To test study's research questions, two combined *D* measures for attitudes towards languages and speakers' nationality were used. Upon recommendations from (Greenwald et al., 2003), latencies above 3000 ms (very slow responses) and below 300 ms (very fast responses) were excluded from further analyses.

Task II: Explicit attitudes towards languages

In Task II, participants' explicit attitudes towards Luxembourgish and French were measured using the *Attitudes towards Language scale* (AToL; Schoel et al., 2013). Based on the semantic differential technique, the scale includes 15 adjective pairs using a five-point Likert scale. Participants were instructed to rate three aspects of language: Value (e.g. 1 = *ugly*, 5 = *beautiful*), Sound (e.g. 1 = *abrupt*, 5 = *flowing*), and Structure (e.g. 1 = *unstructured*, 5 = *structured*). Thorough analyses attest to the reliability and validity of this scale (Schoel et al., 2013). To present the broadest possible spectrum of adjective pairs describing contents of attitudes towards languages, the subscales were extended by three adjective pairs *impractical-practical* (Value), *tuneless-tuneful* (Sound) and static-dynamic (Structure). The revised subscales for Value ($\alpha = .77$), Sound ($\alpha = .74$) and Structure ($\alpha = .76$) even revealed high reliability scores, averaged for both language conditions. The order of assignment to AToL items (Luxembourgish vs. French) was randomised across participants.

Task III: Explicit attitudes towards speakers' nationality

Task III was designed to measure participants' attitudes towards Luxembourgish and French nationals using the *Attitudes towards Language Users Scale* (AToLU). As a basis of our scale, we used a pair of four bipolar adjectives which were proven useful in national group assessment (McAndrew et al., 2000). Based on our preliminary research, we presented eight independent raters with a pool of adjectives describing national groups. For the final scale, eight further bipolar adjectives were selected showing consistent ratings regarding their attribute valence (positive vs. negative). However, items eliciting possible ambiguity and cultural dependence (e.g. family-oriented) were excluded. A factor analysis was conducted to further analyse the factor structure of the proposed scale. According to the scree plot test (Cattell, 1966), items were aggregated to two factors explaining about half of the total variance (54.93% for the Luxembourgish and 46.10% for the French scale).

Since literature on person-related assessments is mainly based on a two-dimensional system referring to *Competence* and *Warmth* (Fiske, Cuddy, Glick & Xu, 2002), we tested if the two factors of the AToLU scale might reflect these two dimensions of warmth and competence. Ratings of eight independent raters confirmed that six of the twelve items referred to Competence (e.g. 1 = *unintelligent*, 5 = *intelligent*) and the other six items to Warmth (e.g. 1 = *unfriendly*, 5 = *friendly*). In this study, participants were instructed to indicate to what extent the items apply to the French (respectively Luxembourgish) national group. Both Competence ($\alpha = .73$) and Warmth subscale ($\alpha = .86$) proved high reliability, averaged for both national group conditions. Similar to Task II, assignment order was randomised across participants.

RESULTS

Explicit scales

Statistical power analysis

For testing whether listeners' attitudes towards languages and speakers' nationality are distinguishable constructs, we first considered expected results under the assumption that both constructs are identical. In this case, both constructs correlate perfectly given perfect reliability, and lower correlations are solely due to measurement error. Based on the reliabilities of our explicit scales, we expected a population correlation of $r = .75$ between the attitude measures in our study if both measures reflect the same construct. Given the sample of $N = 88$ participants, the 95% confidence interval for the correlation coefficient spans from $r = .64$ to $r = .83$, and a test power greater than 99%. That means that correlation coefficients within the confidence interval support the assumption of identity of constructs, whereas coefficients outside the interval imply a separability of both constructs. In terms of convergent and discriminant validity, we would expect coefficients within the confidence interval for subscales of the same attitude measurement (convergent validity), and lower coefficients for subscales of different attitude measurements (discriminant validity).

Descriptive analyses of explicit language and nationality attitudes

Based on the five-point Likert scale, high ratings on AToL and AToLU indicated a preference for the respective language or national group assessed. Several paired-samples t tests were administered to test for significance. Regarding explicit attitudes towards languages, our findings revealed a significant preference in favour of French compared with Luxembourgish in all three AToL subscales Value, Sound, and Structure (see Table 2). Regarding nationality attitudes, Luxembourgish nationals were assessed more competent than French nationals, but no significant differences were obtained for perceived warmth. Additionally, comparative values were computed as a difference between the assessment of the respective languages and national groups. Negative difference scores (D) for the scales indicated a preference for the French language and national group, respectively. To test whether the observed preferences were due to our adaptation of the AToL scale, the difference scores of the original 15-item AToL scale and adapted 18-item AToL scale were compared in a within-subject MANOVA with scale version as a within-subject factor, showing no differences between the scores ($F_{1,85} = 0.81$, $p = .37$, $\eta_p^2 = .01$). Concerning the modification of the AToL scale, a within-subject MANOVA (with difference scores of original 15-item-scale and modified 18-item scale as within subject factor) was computed. No significant results were obtained ($F_{1,85} = .81$, $p = .37$, $\eta_p^2 = .01$). To test for the impact of order of assignment, a between-subject MANOVA with order of assignment as between subject factor was conducted and revealed no significant effect of order of assignment ($F_{10,76} = 1.34$, $p = .23$, $\eta_p^2 = .15$), suggesting that language and nationality profiles were not impacted by order of language and nationality group assignment.

Table 2
Mean language and nationality ratings of explicit scales

	Luxembourgish (group)		French (group)		t_{86}	p	D
	M	SD	M	SD			
Value	3.21	0.62	4.07	0.62	9.01	< .001	-0.86
Sound	3.01	0.70	4.19	0.48	12.71	< .001	-1.18
Structure	3.45	0.68	3.66	0.67	2.08	.04	-0.21
Competence	3.43	0.65	3.27	0.53	2.17	.03	0.16
Warmth	3.12	0.81	3.29	0.73	1.67	.10	-0.17

Correlative analyses regarding the separability of explicit language and nationality attitudes

The relation between explicit language and nationality attitudes was examined via the correlation pattern between the subscales of the two explicit attitude measures. Results are described with respect to convergent and discriminant validity (Table 3). Convergent validity means that measures (e.g. of language attitudes) correlate strongly with other measures of the same concept. By contrast, discriminant validity shows that a measure is not highly correlated with measures examining theoretically different concepts. ATOL subscales showed strong intercorrelations, except for the link between Sound and Structure in the French condition ($r = .11$, $p = .31$). ATOLU subscales were strongly interrelated providing convergent validity evidence. Confirming discriminant validity, ATOL subscales were less strongly related to ATOLU subscales.

Table 3
Intercorrelations of explicit measures

	1	2	3	4	5
1 Value	–	.60**	.47**	.24*	.21*
2 Sound	.65**	–	.11	.17	.05
3 Structure	.65**	.51**	–	.09	.42**
4 Warmth	.50**	.43**	.39**	–	.49**
5 Competence	.44**	.34**	.33**	.77**	–

Note. Intercorrelations for Luxembourgish language and nationals are presented below the diagonal, intercorrelations for French language and nationals are presented above the diagonal. Intercorrelations indicating discriminant validity are in bold, intercorrelations indicating to convergent validity are in plain text. * $p < .05$, ** $p < .01$.

Implicit results

Descriptive analyses of implicit language and nationality attitudes

Combined D measures for attitudes towards languages ($D_{\text{language-}i}$)²³ and speakers' nationality ($D_{\text{nationality-}i}$) were used. All IAT measures were computed such that higher numbers indicated an implicit preference for the Luxembourgish language and national group relative to the French language and national group. One-sample t -tests reflected a relative implicit bias in favour of Luxembourgish ($M = 52.28$, $SD = 116.91$, $t_{87} = 4.20$, $p < .01$) and the Luxembourgish national group

²³ Difference scores followed by the letter e indicate explicit measures, difference scores followed by the letter i indicate implicit measures.

($M = 35.12$, $SD = 103.89$, $t_{87} = 3.17$, $p < .01$). Furthermore, a between-subjects ANOVA testing for differences due to order of assignment to IATs (language IAT first vs nationality IAT first) was not significant indicating that both Luxembourgish language ($F_{1,86} = 0.68$, $p = .41$) and national group ($F_{1,86} = 0.01$, $p = .93$) was preferred relative to French language and national group regardless of IAT order.

Correlative analyses regarding the separability of implicit language and nationality attitudes

The relationship between $D_{\text{language-i}}$ and $D_{\text{nationality-i}}$ as measures for implicit attitudes towards languages and speakers' nationality was examined using correlational analyses. Results revealed a significant modest correlation ($r = .29$, $p < .01$) which can be considered moderate correlation according to Cohen (1988).

Correlations between explicit scales and IAT results

Correlative analyses between explicit and implicit results were conducted to test the second research question. Regarding language attitudes, no significant correlations were obtained between $D_{\text{language-i}}$ and $D_{\text{value-e}}$ ($r = .01$, $p = .95$), $D_{\text{language-i}}$ and $D_{\text{sound-e}}$ ($r = -.07$, $p = .51$) and D_L and $D_{\text{structure-e}}$ ($r = .14$, $p = .19$). Regarding nationality attitudes, the correlation between the $D_{\text{nationality-i}}$ and $D_{\text{competence-e}}$ was even not significant ($r = -.10$, $p = .37$). However, the modest correlation between $D_{\text{nationality-i}}$ and $D_{\text{warmth-e}}$ reached statistical significance ($r = -.24$, $p = .03$).

DISCUSSION

In our first research question, we examined whether language attitudes are clearly distinguishable from nationality attitudes, both on implicit and explicit level. Results revealed moderate correlations between explicit language attitudes and explicit nationality attitudes and high correlations between the subscales of each explicit attitude measure. Given this correlation pattern that largely supports the convergent and discriminant validity of explicit language and nationality attitudes, our answer to the first research question is that individuals' explicit language attitudes are clearly distinct from their nationality attitudes. Interestingly, Luxembourgish nationals up-valued the French language relative to Luxembourgish on all explicit scales. This indicates that Luxembourgish nationals' responses did not underlie an in-group bias in favour of their own language, but rather pointed to the high importance of French as officially recognized language. Contrary, Luxembourgish nationals emphasised their own nationals as a more competent and adaptable social group compared with the French group. This result is consistent with the nationality concept as highly salient category eliciting feelings of belonging and a need to maintain a positive in-group identity (Tajfel, 2010). Regarding participants' implicit attitudes, a moderate positive correlation between language and nationality attitudes was obtained indicating distinctness of both constructs on the implicit level. While some scholars found that people form language attitudes without processing speakers' origin (e.g. McKenzie, 2008; Niedzielski, 1999), our conclusion is that language, whether implicitly or explicitly, elicits not only attitudes towards the language spoken, but at the same time attitudes towards speakers' nationality. Furthermore, Luxembourgish nationals' responses reflected an implicit preference for the Luxembourgish language and national group over the French language and national group. While French was explicitly rated as very pleasant, elegant and melodious, participants implicitly revealed a strong bias in favour of both the Luxembourgish language and national group. Since implicit attitudes refer to immediate reactions, neglecting social desirable responding, language or nationality concepts can be considered salient out-group categories for listeners' associative thinking.

With respect to the second research question, we examined whether implicit and explicit language attitudes and whether implicit and explicit nationality attitudes are clearly distinguishable from each other. Our findings showed that correlations neither between implicit and explicit language attitudes nor between implicit and explicit nationality attitudes were significant. The only exception was the negative correlation between an implicit preference for the Luxembourgish nationality group and an explicit bias in favour of French nationals regarding warmth ratings. This is in line with previous research, as several studies showed minimal or no relationship between explicit and implicit attitudes. For instance, meta-analyses found an explicit-implicit correspondence ranged from $r = .13$ to $r = .75$ (Lane, Banaji, Nosek & Greenwald, 2007) or even from $r = -.25$ to $r = .60$ (Hofmann et al., 2005). Substantial variability in correlations between explicit and implicit measures can be explained by the fact that participants hold self-presentational concerns regarding their explicit responses (Lane et al., 2007). Hence, spontaneous self-reporting is reduced. Furthermore, the topic of investigation – the perception of languages and national groups – might involve socially sensitive issues in multilingual societies which may have an influence on the correlation between implicit and explicit measures (Dovidio, Kawakami & Beach, 2001). Future research investigating the impact of language and nationality attitudes on speaker evaluations in multilingual contexts may thus benefit from the suggested implicit-explicit distinction. Overall, this study contributes to ascertaining the complexity of influencing factors on speaker evaluations by examining language and nationality attitudes as two separate constructs and provides valuable hints for future research in multilingual contexts.

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TRANSITIONING FROM FACE-TO-FACE TO 'VIDEO TEACHING'; SUPPORTING LECTURERS IN DEVELOPING THEIR VIDEO TEACHING SKILLS

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ABSTRACT

The research examined the support needs of a group of higher education lecturers (Tourism Team, Inholland University, Amsterdam/Diemen) to develop their 'video teaching' skills. A needs analysis was conducted including 23 interviews with staff (from director to lecturers) to establish criteria for a prototype 'video teaching' workshop. Workshop participants view micro web lectures in advance as preparation. Expert and participant feedback has been incorporated into subsequent workshop iterations. As the number of team members who had followed the workshop increased, momentum gained within the team; lecturers took initiative to develop and pre-record their own lecture content for informational and flipped classroom use. The availability of the workshop (offered from within the team), resulted in a relatively high take up rate for this voluntary activity. The team is now moving from 'video teaching' early adopters to the stage of the early majority on the technology adoption curve.

INTRODUCTION

There is a rapid and significant increase in the use of teaching through video in Higher Education (Bates, 2015; Bichsel, 2013; Hansch et al., 2015; Johnson et al., 2016; van den Brink et al., 2014). Recent research into the impact of video in Higher Education has examined the didactic effectiveness of ‘video teaching’ and the impact on student lecture attendance (Filius & Lam, 2010), student use of recorded lectures (Gorissen, 2013), the different viewing behaviour of students (De Boer, 2013), possible cost savings and improved study results (Martyn, 2009), the teacher experience of making web lectures (Preston et al., 2010), the optimum length of educational video clips (Guo, Kim, & Rubin, 2014) best practices for recording lectures (Day, 2008) and effectiveness, teaching methods, design and reflection of video based learning (Yousef, Chatti, & Schroeder, 2014).

The research discussed in this paper focuses on ‘video teaching’ which is defined as teaching via video in which the teacher plays an active role, is visible and audible, is recorded, and where the screen presence of the teacher is an important element in the didactic process. Traditionally, teaching has been based on face-to-face contact between the teacher and students in a classroom setting and teachers have been trained to teach within this context. Once the relationship transitions from face to face contact, to contact via a digital medium, a new set of teaching skills and didactic approaches are required and this fundamentally challenges the traditional and established role of the lecturer and their relationship to their students. Many of today’s lecturers, who completed their training ten or twenty years ago, have received only limited training on video teaching (Johnson et al., 2014). There are many different types of video formats that exist, each with different features and affordances. Efforts to define and categorise these formats into a logical schema are ongoing (Hansch et al., 2015; Koumi, 2014; Woolfitt, 2015).

PROBLEM DOMAIN

According to Siemens, Gašević, & Dawson (2015) ‘Education technology has gone through three distinct generations of development and now a fourth is emerging’. This fourth generation includes ‘distributed and digitally shaped technologies: adaptive learning, distributed infrastructures and competency models’. Greater emphasis will be placed on ‘the process of ‘stitching’ together distributed interactions’ with learners who control their preferred toolsets (p. 206). Video in education is one element of those ‘distributed interactions’ and is playing a role within the changing educational landscape.

This paper focuses on the challenges facing traditional lecturers in higher education as they encounter the ever increasing possibilities that technology offers them, the impact this has on their teaching and didactic approach, and how they can meet the increasing expectations of today’s technology savvy students. Each development in technology has the potential to impact pedagogical practice and the importance of addressing the lack of adequate technology training combined with the impact of technology is considered an important and current subject of recent academic research (Alsofyani, Aris, & Eynon, 2013; Guo et al., 2014; Schols, 2009; Stover & Veres, 2013). Within a group there are factors that affect the adoption of new technologies, with some adopting it early, and others waiting until technology is used in the mainstream before adopting it (Rogers, 2003).

Videoing teaching as an exercise in itself does not automatically result in better student performance. Further steps are needed to incorporate this format effectively into the structure of the course. The concept of ‘flipping the classroom’ (Bishop & Verleger, 2013), which provides lesson content in

advance of the class, can result in the lecturer finding that the 'normal' content of their class has already been delivered in video form in advance, leaving the lecturer with contact time that needs to be filled. Understanding the consequences of pre-recording lesson content, and the opportunities and challenges this presents, creates possibilities for interactive classroom activities and exercises to engage the students. The current research contributes to this subject by helping lecturers understand the process of video teaching, the subsequent consequences from a didactic perspective, and providing a form of support that will assist them in developing their video teaching.

Research context

The research was conducted within the tourism team at Inholland University of Applied Sciences, located in Diemen in The Netherlands. The 25 lecturers on the team have academic and teaching backgrounds combined with experience in the tourism industry. After some initial web lectures were recorded by the team in 2010, there was very limited further uptake of this technology. The goal of the research was to gain insight into the support needs of lecturers in the tourism team in order to construct an adequate form of support that will help them develop their video teaching skills.

THEORETICAL FRAMEWORK

The development of video use within higher education was examined through the lens of several didactic theories and models. A search was made for existing examples of material that support lecturers in developing video teaching skills. This search focused on websites of a selection of Research Universities and Universities of Applied Sciences in The Netherlands and abroad. Data was collected from a variety of contemporary academic, professional, industry and non-academic sources with a focus on peer reviewed articles.

The use of video within Higher Education can be examined from within the constructivist theory, which argues that learning occurs when the student is actively involved in the process of constructing relevant knowledge, and the more active the involvement, the more potential there is for learning at a more complex level. 'The contemporary view of learning is that people construct new knowledge and understandings based on what they already know and believe' (Bransford, Brown, & Cocking, 2000, p.10). Within this context, education can be seen as a form of dialogue at different levels between educator and student (Fransen, 2006; Laurillard, 2002) and the challenge is to find ways to use video in ways that encourage students to be actively involved in the learning process. Any media format, including video, needs to be deployed by lecturers effectively and can be used to support the effectiveness of their teaching. Biggs & Tang (2011) examine the effectiveness of teaching in the theory of constructive alignment, placing the active construction of knowledge within the perspective of constructivist theory, that emphasises alignment to establish correlation between what is taught and what is to be learned and assessed. Hattie (2009) did not find significant increase in effectiveness of teaching through audio/visual methods (television, film, video or slides). However, using interactive video methods could have positive effects on student achievement, but many other environmental variables had to be taken into consideration. Any teaching via video needs to understand, benefit from, and encourage the 'interactive' nature of video (Laurillard, 2002).

Traditionally, technology (and the associated knowledge) has been taught as a separate 'silo' of information than those of 'pedagogy' and 'content'. The (TPACK) Technological, Pedagogical and Content Knowledge model (Mishra & Koehler, 2006) integrates the separate domains of content and pedagogical knowledge, with that of technological knowledge. By integrating these subjects in teacher

training, and during teaching, a much deeper, more complex, and enriched understanding of the types of knowledge emerges. Using technology on its own is not necessarily the answer to better learning results and effective teaching. As Kereluik et al. (2013, p. 133) state, in order to have effective teaching, ‘knowing the technology is important, but knowing when and why to use it is more important’ and the TPACK model can help guide this process.

There is only so much information that a student can process at a given time and a clear understanding of this is important in order to match the learning capacity to the individual (Colvin Clark & Mayer, 2011). Understanding human cognitive architecture is essential when designing education which incorporates technology and the importance of guidance during student instruction has been outlined. Cognitive load is of specific relevance in the use of video in education. Mayer & Moreno (2003) propose a theory of multimedia learning and suggest nine ways in which cognitive overload can be reduced when teaching through multimedia, in order to ‘use words and pictures to foster meaningful learning’ (P. 43). Colvin Clark & Mayer (2011) recommend that E-learning (which includes video formats) include both words and graphics and provide evidence to support the importance of delivering information in the correct audio and visual mix, in order to create balance in the visual and audio channels of the student

Video in context

With the advent of streaming video the lesson has become ‘disconnected’ from a set place (De Boer, 2013). Video can be watched by multiple viewers, from different locations, at different times. The rise of the Khan Academy²⁴ illustrates how ‘homemade’ instructional videos can fill a specific teaching need. This content files can be instantly uploaded to YouTube, Dropbox, Skydrive or other cloud servers. Increased access to efficient and inexpensive technology has made recording a video no more complex than pressing a button and pointing. Whether we like it or not, we have entered a new stage in the ‘video age’ in which everything can be instantly filmed including students recording their own classes (Reece, 2013; Winterbottom, 2007).

This increased use of video as a teaching medium is encroaching onto traditional face-to-face teaching in Higher Education; ‘teaching with technology is inherently different from learning with it’ (Johnson et al., 2016). This affects lecturers, students, Universities and Colleges and there is a need to bridge the gap in digital competencies between lecturers and students (Jacobs, 2013). Many lecturers lack adequate knowledge, support, guidance and training to integrate video technology into their teaching, either at a practical, technical level, or at a didactic, teaching level (Stover & Veres, 2013). They may also not be convinced of potential benefits, may be afraid of this new technology, or see no need to change (Reece, 2013). The possibilities offered by new technology can appear overwhelming, challenging and unsettling to traditional lecturers. There is often limited structured support offered for lecturers to develop in this context, it mostly happens on an informal, ad-hoc manner and without an adequate theoretical foundation (Mishra & Koehler, 2006). The trend of increased video in teaching is particularly noticeable in Higher Education, where many students arrive at class with one or more mobile devices linked to the Wi-Fi of their learning institution (Johnson et al., 2016).

A gap exists between knowledge and understanding for experienced lecturers who are used to teaching in a face-to-face format (e.g. traditional lectures, workshops, coaching, tutorials) and the quickly developing new technologies which seem to offer endless possibilities, but are not easy to adapt to because they require re-imagining the teaching process (Guo et al., 2014). Due to the complexity of

²⁴ http://www.ted.com/talks/salman_khan_let_s_use_video_to_reinvent_education

the situation, academic resources, time available, underlying fear of change and uncertainty, there is sometimes limited momentum to change established and accepted practice. For many reasons, some individuals are not comfortable being videoed, are camera shy, or don't enjoy seeing themselves played back on camera. Within this context, traditional 'frontal' lectures (because of convenience, cost and accepted tradition) continue to remain a significant part of the delivery of learning (Gorissen, 2013) even as their effectiveness is called into question.

The low digital fluency of faculty is considered a challenge that is understood and can be solved (Jacobs, 2013; Johnson et al., 2014). Many lecturers in Higher Education do not come from a technological background and there is sometimes a generational gap between the technological capability of the lecturer and that of their students (Tapscott, 2009). Lecturers may have inadequate or inappropriate technological experience, and learning how to use new technology can be complicated and time consuming (Bichsel, 2013; Stover & Veres, 2013). When a lecturer starts using video to capture their teaching (whether live lecture capture, web lectures or screencasts), they teach into a camera which requires different teaching skills and techniques than face to face contact. Filius & Lam (2010) found that a majority of lecturers they researched wanted didactic support when implementing video teaching; firstly, by seeing examples made by colleagues and secondly, from ICT support.

RESEARCH QUESTION

The research question asked: What are the characteristics of support that assists lecturers in the tourism team Inholland Diemen in developing 'video teaching'? The construct 'support' was deliberately left open in the question, with the goal of defining it during the research process. The term 'video teaching' was chosen as a broad and general term to be defined during the course of the research. This main question leads to the formulation of the following sub questions based on the three phases of design research:

Pre research – development specifications

1. What are the qualities of 'video teaching' as described by the literature?
2. What different functions can 'video teaching' have within the didactic process?
3. What is the current level of experience of 'video teaching' in the tourism team?
4. What support does the tourism team need to develop their 'video teaching' skills?
5. What opportunities are there in the current tourism course to introduce 'video teaching'?

Prototype phase

1. What are the characteristics of a support prototype that assists the tourism team to develop video teaching?

Prototype evaluation phase

1. What is the expected practicality of the prototype?
2. What is the expected effectiveness of the prototype?

METHODOLOGY

A design research approach was used in which design specifications were established, a prototype was built, tested and adjusted based on certain quality criteria (Nieveen, 2007). Design research has its origins in technical science to solve a practical problem and to add knowledge about possible solutions

(van den Akker, 1999) and can be used as a tool for innovating strategy within education. The design research approach dictates that sub questions are arranged by pre-research phase and prototype phase (van den Akker, 1999). Nieveen (in Van den Akker et al., 2010) provides an overview of formative evaluation methods to use, based upon which quality criterion and at which stage of the research. Based on these guidelines, appropriate formative assessment formats were used to evaluate the different criterion of the intervention.

A survey (open and closed questions) was held within the tourism team to establish the base level of video use within the team. A group interview and a focus group were held with colleagues within the team. A card sorting exercise allowed lecturers to visualise their preferences for support, by arranging a set of cards with suggestions on the table. 13 of those interviewed were members of the tourism team which is equivalent to a 59% participation rate in the qualitative research.

Table 1
Stakeholder overview

Level	Code	Stakeholder Description
Meso	A	Member of Inholland Board of Directors (CVB) (1)
Meso	B	E-learning researcher Inholland, Web Lecture Expert (1)
Meso	C	Video Recording Technician, Inholland web lecture department (1)
Micro	D	Tourism Programme Manager, Inholland TM/HTRO (1)
Micro	E	Tourism Programme Curriculum Committee, Inholland TM/HTRO (3)
Micro	F	Education and Didactic Expert, Inholland (1)
Micro	G	Tourism Management lecturers, Inholland TM/HTRO team (15)
Micro	H	Video Teaching Practitioners, Inholland lecturers (not tourism) (2)
Nano	I	Student Web Lecture Researcher, Inholland student (not tourism) (1)

Table 2

Overview of research questions, methodology and stakeholders

Research phase	Question number	Research question (sub questions)	Research Methodology					
			Literature review	Questionnaire	In-depth interview	Focus group	Screening	Expert appraisal
Pre research phase development specifications	Main Question	What are the characteristics of support that assists lecturers in the tourism team Inholland Diemen in developing video teaching?	X	D, G	A-I	E, G	D, G	B, C, D, F, G, H
	1	What are the qualities of 'video teaching' as described by the literature?	X					
	2	What different functions can 'video teaching' have within the didactic process?	X					
	3	What is the current level of experience of 'video teaching' in the tourism team?		D, G	D, G	G		
	4	What support does the tourism team need to develop their 'video teaching' skills?	X	D, G	A-I	G		
	5	What opportunities are there in the current tourism course to introduce video teaching?			D, F, G	E, G		
Prototype phase	6	What are the characteristics of a support prototype that assists the tourism team to develop video teaching?			A-I	E, G		
Evaluation phase	7	What is the expected practicality of the prototype?					D, G	B, C, D, F, G, H
	8	What is the expected effectiveness of the prototype?					D, G	

Results from the interviews with the tourism team indicated a clear need for support in video teaching skills. This needed to be developed further which lead to establishing a set of criteria for a workshop. In the second stage of the research, design guidelines were outlined and through a series of formative evaluations, the prototype was evaluated based on its specific attributes (van den Akker et al., 2010). For the screening, expert appraisal and focus group, the interviews were recorded and then transcribed. Analysis involved highlighting quotations that answered the specific questions and contained feedback on the prototype. This feedback was then grouped into key feedback suggestions. The suggestions were then examined and incorporated into the second version of the prototype. The criteria for the prototype were compiled by carefully re-reading through the key points identified in the literature

review, the interview transcripts, and reading through the codes and themes and selecting key returning issues. These subjects were then compiled into a list of criteria at two levels, those for the format of the support, and those for the content of the support. The criteria were listed by most important first.

Screening involved members of the design team checking the prototype against a checklist of important characteristics or components. The prototype was built directly from the set of design criteria as emerged from the interviews and literature research. Feedback on the draft prototype regarding expected practicality was received from nine individuals; three web lecture experts (technician, didactic expert and member of the Research Centre for eLearning), the tourism team manager, and five members of the tourism team. Three experts were asked to comment on the expected effectiveness of the prototype. In addition, five members of the tourism team and the team manager were interviewed individually to comment on this. Data collected during the expert appraisal was incorporated into the next version of the criteria and the prototype.

Once the interviews were transcribed and member checked, the entire text was placed into one 'master document' of approximately 65,000 words. The processing of the qualitative data followed the guidelines outlined in Seidman (2006), avoiding any in-depth analysis of the interviews until they had all been transcribed. The text was read through to get a general outline of the meaning, with six questions adapted from Boeije (2012): What is happening here? What is it about? What is the problem? What is the person trying to make clear? What terms can be applied here? What other additional meanings can this have? During the analysis, key themes emerged and key phrases and relevant quotations were collected (Rabiee, 2004). These points were used as guidelines during the open coding process.

Based on Boeije (2012), sections of text in the 'master document' that were interesting or seemed relevant were colour coded and collected by axial coding into separate documents. More than 200 codes emerged from the open coding process. To ensure validity, two transcribed interviews were checked for coding by an individual not related to the research process and their analysis concurred to a high extent with that of the researcher. Each code was given a number and name, and the TPACK model was used to support the development of a coding paradigm. Each theme was linked to one of the eight knowledge categories in the TPACK model (Technological, Pedagogical, Content, TP, PC, TC, TPC, and finally Organisational/Context). These codes were initially axially coded into 21 themes, or central phenomena. In the case that there were opposites (different aspects of one theme), the codes were split into pair 1 and pair 2. The text of each theme was then compiled into 21 separate word clouds²⁵ which highlighted the 50 most frequently occurring words per theme. This enabled the large amount of text to be sorted, distilled and presented in a visual manner to assist with coding and interpretation. Based on the word cloud and feedback from the two individuals, the set of themes and codes were re-examined and selectively coded (combining, simplifying and rearranging the categories and finding connections between them) which reduced the number of themes from 21 to 7. Each of these themes was then described with a proposition, a short explanation of the key elements of the theme and supported by illustrative respondent quotations.

²⁵ www.wordle.net

RESULTS

The following seven themes emerged from the qualitative data analysis. A supporting quotation is added per category to provide context:

1. *The transition point between old and new teaching*: ‘I think [the new form of teaching] does affect [teachers]. In a way I can’t quite grasp yet. So, if as a teacher, you start thinking whether web lectures is a good idea. You need to focus on what it adds, or what it enhances, or what it replaces.’
2. *Changing interactions between lecturers and students*: ‘However, what I am a little bit afraid of is missing the interaction with the students.’
3. *Web lectures and teaching approaches*: ‘We are not actors, you know.’
4. *Opportunities for lecturers to improve*: ‘But when the teacher sees their recording, they want to improve themselves. Because of this process, teachers reflect on their own teaching.’
5. *Content selection for video lectures*: ‘And if you make web lectures, they need to be sort of general. Because if your project or your assignments change every year again.’
6. *Technology and its impact on the teaching process*: ‘It is not like it is a very easy thing to record a web lecture. And it should be made more accessible, easier. Also from a technological point of view.’
7. *The educational organisation, resources and support*: ‘If you have this static information at some point, then you need less contact time for lectures. So there is your money.’

Lecturers indicated a preference for different types of support to learn video teaching. The group prioritised workshops, training and viewing pre-recorded web lectures, handbooks, scenarios and instructional video. Peer feedback, coaching sessions, and facilitating opportunities to make web lectures were considered less important. The lecturers saw many opportunities for video teaching in the tourism curriculum. Before committing time to video teaching, it was considered important to check what video content already exists, other previously recorded web lectures or on-line clips. Staff expressed openness to trying out video teaching, though a couple of lecturers made it clear this was not something they wanted to embark on.

Criteria for the first prototype

The themes and lecturer preferences for support resulted in a set of design criteria for a series of small-scale workshops, with a series of supporting web lectures to be prepared in advance, that would address the concerns and questions raised under the seven key themes above. Feedback on the first set of criteria and expected practicality of Prototype 1 was collected from a total of nine lecturers and experts. The concept of Prototype 1 was positively received:

‘So I think that is great. A workshop with the team, practice a bit with video, maybe a flip. Get some tips, do’s and don’ts how to make it interactive. Also good for yourself, a boost, wow I did it. If you do get a workshop, then [team manager] will say everyone has to make one video. I think it really works for your own didactic. Also feedback. [...] I think it is the right format.’ (participant D)

However, three workshops were considered too complex which resulted in an adjusted Prototype 2. This outlined one workshop of two hours. The workshop was supported by five web lectures to be viewed in advance by participants, as preparation for the workshop. Each of these web lectures was designed based on criteria outlined in multimedia theory (Colvin Clark & Mayer, 2011). The web lectures (length in minutes) addressed the following subjects:

1. Introduction to workshops (07:20): Explanation of learning goals and structure
2. The truth about web lectures (09:24): Some misconceptions are addressed
3. Making friends with technology (06:35): Feeling comfortable with technology
4. Making your Power Point (10:02): practical guidelines on multimedia theory
5. Web lecture interface (10:56): Technical issues and options for the web lecture.

In the workshop format, a maximum of four lecturers would each record a five minute practice web lecture, while being watched by the other lecturers. All recordings would then be viewed back, the lecturer could reflect on their own recording and receive additional feedback from their colleagues. As of January 2016, seven workshops have been run for staff in the team and just over half the team had participated in the workshop. After each workshop, participants completed an evaluation and this feedback was integrated into the next iteration.

DISCUSSION

The research presented in this paper examined at a micro level, the needs of a specific group of lecturers, within a specific context, regarding their preferred format of support to develop their video teaching skills and to take the first steps into teaching with and through video. The workshop has gone through various iterations and has generated a rich and intimate learning environment with opportunities for critical self-reflection and professional development.

Since the research began in 2013, the general level of acceptance of this subject within this team has changed significantly. Initially there was considerable fear regarding the unknown elements of the new technology and the uncertain impact it might have on the lecturer and their relationship with their students. By participating in the video teaching workshops, the idea of recording a web lecture no longer seems strange. The discussion in the team has moved from 'how do you make a web lecture?' to 'We need to make a web lecture for that subject'. A group of established lecturers have come into contact with a teaching approach that uses technology and video recordings to create new didactic opportunities within the teaching environment.

In 2015, Inholland began a pilot to assess a version of the video recording software in which lecturers could record their own web lectures, from their own computer, without the assistance of a technician or needing to book studio space. This research has focused on the transition from face-to-face, to video teaching. Areas that can be explored further include creating didactic strategies to embed the video teaching effectively into the course structure and evaluating both the student response to these formats, and examining learning effects.

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RESEARCH IN MOTION: A DIGITAL LEARNING ENVIRONMENT TO EXPLORE RESEARCH AS PRACTICE

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ABSTRACT

Research in Motion has as a main goal to broaden and enrich the current approach to research at school, by giving pupils the possibility to explore the actual world of research (as it exists in the world) and to become interested in it. The project also aims at enabling future teachers to open the world of research for their pupils. To achieve these goals, the project has developed, by design-based research, an online learning environment based on authentic resources where pupils can explore the many dimensions of the research practice (www.onderzoekinbeweging.be). The project concept is general and can be applied to all school subjects. Digital scenarios have been developed for primary and secondary school science, and for behavioural sciences in secondary school. Trajectories for teacher education have been coupled to these scenarios, allowing student teachers first of all to discover research practices, and then to make this discovery possible for their pupils as well, not only by using the already developed material, but also by developing their own material.

INTRODUCTION

What is Research in Motion

Research in Motion is an educational website (www.onderzoekinbeweging.be) giving pupils, student teachers and teachers the possibility to explore the world of research.

The website has been developed in a two-year Belgian-Flemish project by an interdisciplinary team of educational researchers and teacher educators for primary and secondary school.

The main concern of the project was to present research, as a thing of the world, in an authentic way to pupils at school. The project goals were: (a) enriching the current conception of and approach to research at school (b) educating future teachers to a broader approach to research in the classroom.

The Research in Motion website consists of the following pages:

1. the Introductory page, displaying a short stop-motion film presenting the project's educational concept
2. the Start page, being the entrance point to three online didactic scenarios to be used in schools and teacher education programmes
3. the About Us page ('Over Ons' in Dutch), providing extended information about the project and at the same time functioning as didactic scenario for teacher education concerning practice-oriented design-based educational research
4. The Material page, where handbooks for teacher students/teachers and for teacher educators can be downloaded for all scenarios, together with all needed worksheets and other supporting material.

The four Research in Motion educational scenarios make the exploration of the research practice possible in four concrete cases: Darwin the researcher (for teaching science in elementary school), the Nobel Prize in Physics 2013 (for teaching physics in secondary school), a Ph.D. thesis in educational sciences (for teaching Social sciences and humanities in secondary school), and the project Research in Motion itself (for dealing with design-based research in teacher training). It is not the goal of Research in Motion to teach what research is or should be in general. Instead, Research in Motion is developed to allow young people to experience the diversity and complexity of research as practice in specific cases and by doing so to develop an interest in research as a thing of the world.

Why Research in Motion

In recent years, research has become an important part of school curricula in many European countries. This is a result of the fact that research skills are among the so called 21st century skills, considered to be crucial for success in today's world, particularly in higher education programmes and contemporary careers and workplaces (see for instance (Great Schools Partnership, 2014)). In Belgium (Flanders), the approach to research in the school curriculum has a strong methodological focus. Starting from science education in primary school, pupils are trained to execute research tasks following the steps of the scientific method while learning about specific topics. Through secondary school the attention shifts to being able to formally design and execute a small-scale research activity/project where all steps of the research cycle must be present. Since school year 2005-2006, a ministerial decree requires the achievement of this research competency for all pupils at the end of general secondary education (Vlaamse Regering, 2004) (see also the guidelines concerning the development of the research competency given by two Belgian-Flemish pedagogic advice services for schools (Diocesane Pedagogische Begeleidingsdienst SO Mechelen-Brussel, 2010) (Pedagogische Begeleidingsdienst Gemeenschapsonderwijs, 2013)).

While research has become part of the school curriculum in the way described above, research is at the same time a concrete practice in society, taking place every day and to which many people contribute. We refer here to contemporary research in universities, research centres and companies, but also to research that has taken place in the past, leading to the ‘scientific facts’ pupils now find in their textbooks. Lack of attention by school curricula to expose young people to research as a thing of the world, research in motion, carries risks. Not only can world-isolated school practices introduce misconceptions about research, as already stressed by several authors (see for instance (Hodson, 1998) and (Chinn & Malhotra, 2002)) but also, and maybe more importantly, they might prevent young people to discover research as a fascinating and intriguing human practice and to develop a deep interest for it. While a few teachers, often on their own initiative or in the context of educational projects, do bring their pupils in contact with researchers and research labs, this is not the norm. Educational resources are needed for teachers to bring the diverse and complex world of research into the classroom as authentic content, and to turn it into an object of attention and possible study for young people.

OPENING THE BLACK BOX OF RESEARCH

Research in Motion: educational concept

The central concept of Research in Motion is the black box of research. Pupils at school are either presented with ‘scientific facts’ (research results), or are trained to obtain so-called research skills or competencies. In the first case, research activities that have led to the presented scientific facts remain completely hidden for pupils. In the latter case, research is often presented as a ‘recipe’, a set of steps one has to follow (scientific method, research cycle). This methodological approach to research in the classroom often does not expose young people to research as a diverse and complex *practice*, involving an arrangement of people, places and things.

Inspired by the work of science sociologist Bruno Latour (Latour, 1987), we start from the observation that research is currently black-boxed at school. We follow Latour in pointing out that research has two faces like the mythical figure Janus, contradicting each other when they speak. The ‘cold’ face is the one we see when we are presented with ‘finalised’ scientific facts, working instruments or standardised procedures, that is when the black box has been closed. The ‘warm’ face is the one we see when we observe research while still in action, when discussions take place, machines are thought and assembled, and researchers move in the realm of uncertainty and confusion. School pupils (and teachers) currently only see one face of research, the cold one, by looking at the closed black box from outside. Even when mentioning the warm face of the practice of research, it is in fact often already a frozen version in terms of methods, steps or procedures that have to be followed. This project aims at making the other, warm face of research visible as well, by allowing young people to open the black box themselves in a set of concrete cases.

Our ambition is also supported by phenomenographic research that has shown that researchers are very diverse in their conceptions of research, and that these conceptions are transversal across disciplines (Brew, 2001). Therefore, not even within one school subject we do justice to the diversity of the world of research when we tell pupils what research must be and how researchers must act, feel or behave. Being aware of these results, we have chosen not to start from a specific conception of research, but to consider concrete cases where we can focus on the many aspects of research as practice.

The four Research in Motion black boxes

The following four black boxes can be opened on the Research in Motion website:

Darwin the researcher (ages 10-14 and teacher education)

Darwin is inseparably bound to evolution theory, often cited in documentaries but also in many other contexts where a form of ‘natural selection’ is thought to take place. Darwin is a ‘well-known figure’, also for school pupils, but what is less known or visible is that Darwin has been a researcher, what he concretely did, with whom he communicated and where this all happened. Darwin is well-known, but Darwin the researcher remains for many of us a black box.

Nobel Prize in Physics 2013 (ages 15-18 and teacher education)

In 2013 the Nobel Prize in Physics was awarded to F. Englert en P. Higgs for the theoretical prediction of a mechanism and of a particle, after the latter was discovered in 2012 by the LHC experiments in CERN. This scientific prize is a recognition of the existence of a particle, of the correctness of a model and of course of the researchers who developed the underlying theory. But how did it all happen that those two persons became the recipients of the prize in 2013? What and who has been involved in the research leading to this award? We probably all know about the Nobel Prize, it is very visible, but everything behind it remains for most of us a black box.

Ph.D. thesis in educational sciences (ages 15-18 and teacher education)

The moment when young researchers defend their Ph.D. ends an intense and often very complex journey that made them search in many directions. This long quest is bundled in a book or a collection of scientific articles: a Ph.D. thesis. Neatly written and well structured, with every single word well chosen, the Ph.D. thesis is at that very moment presented for an audience. All side tracks, deviations and changes, all trials together with the many interactions with other researchers disappear. While the thesis is very tangible and visible, everything behind it is hidden. We know the input (the researcher) and the output (the thesis), but the Ph.D. research process often remains a black box.

Research in Motion (teacher education)

The website Research in Motion itself is also a research result, but for the students in teacher education who use it, the research behind the scenarios, the didactic approach and the handbooks remains a black box: student teachers do not know how these learning materials have been shaped by research. Consequently, we provided the opportunity to re-open the black box of Research in Motion, and to discover how the research team arrived at an educational concept, how this was translated into concrete didactic materials, how these materials were developed, tested and improved to eventually become the final version students use in the classroom. In particular, student teachers will have the opportunity to see that this research has not been a linear process and to discover which side tracks we took.

Additionally, a fifth black box will be developed in 2016, the ‘Solvay conference 1927’, allowing pupils and student teachers to explore the discussions and tensions in the development of the quantum theory, as witnessed by the full discussion transcripts in the conference proceedings.

Research in Motion: educational approach

The development of the didactic scenarios has been based on the following principles:

1. *Authenticity*: in order to create attention for research as a thing of the world, we have worked with authentic material harvested in a variety of resources (i.e. artefacts): articles in research journals, websites and newspapers, videos and pictures of researchers and labs, emails and letters, original diagrams and drawings have been collected. Starting from these research artefacts in a broad sense, exercises for pupils and student teachers have been developed, inviting to give attention to these artefacts and by doing so discover interesting aspects of the research practice.
2. *Exploration*: since the goal of the scenarios is to create space for the development of interest, we have designed explorative exercises where pupils and student teachers have to search in a rather large amount of information and slowly discover many aspects - or dimensions - of research, in relation to time, space, actors (people and things) and activities. Exercises often involve open questions. Since different pupils will likely discover different things, sharing of experiences and classroom discussion are also part of the approach.
3. *Visualisation*: in order to allow exploration of a broad range of different resources, these have been visually organised in digital explorable charts, for instance a timeline, map or mailbox. In these visualisations one dimension of research is chosen to connect and organize the included items, like time or space. Different exercises are each based on different visualisations. Therefore, trajectories with several exercises provide a view of the research practice from different angles. This strategy is inspired by the work on the visualisation of complexity, in particular in the context of controversy mapping (for controversy mapping, see for instance: (Venturini, 2012), for the visualisations see the online controversy mapping archive (SciencesPo médialab)).

Since for student teachers, teachers and teacher educators this approach might be very different from their usual way of working in the classroom, handbooks have been developed to support them. These handbooks, freely downloadable on the Material page of the website, provide worked-out examples, collected during our try-outs, and suggestions for the organisation of the activities in the classroom.

RESEARCH IN MOTION AS A PRACTICE-ORIENTED RESEARCH PROJECT

Theoretical foundation: e-education

This project can be framed within the conception of school education as a form of education that offers ‘free time’. Instead of only focusing on predefined learning outcomes, in this view school should give young people the possibility to discover things of the world that are ‘put on the table’ by the teacher, and to develop interest for these things. Education is then e-education, lifting young people temporarily *out* of their everyday context and giving them the opportunity to explore and discover things that they do not know yet (Masschelein & Simons, 2013). In this project the thing of the world that is put on the table is research. The starting point of the project can be reformulated by saying that research is currently not put on the table at school, since the place of research in the classroom is almost exclusively bound to developing specific research related skills or competencies (in view of the knowledge economy or optimal entrance to higher education). As such, there is limited time and space for students to actually become exposed to the world of research. The main goal of this project can then be rephrased in terms of *research e-education*: research, when presented as authentic content in the

classroom, can fascinate young people to the extent that they are lifted out of their life worlds, and may start to relate in a new way to the world of research, and therefore, also to relate in a new way to themselves. This view point is supported by Michel Serres (Serres, 1997), also cited in the handbooks, who states: "Certainly, I never learned anything unless I left, nor taught someone else without inviting him to leave his nest." (p. 7), and reminds us about: "The voyage of children, that is the naked meaning of the Greek word *pedagogy*. Learning launches wandering." (p. 8)

Educational design process

The idea to develop Research in Motion has arisen from worries concerning the current practice in relation to research at school, based on the concrete experience of team members as teacher educators in Belgian Flanders. In order to broaden and deepen this perspective, the project started with a mapping of the school and teacher education policy and practice in relation to research, looking for an answer to the following research question: "Is there time available in Flemish school and teacher education for research as learning content?".

Since it was not possible within the scope of this project to carry out a mapping for all school subjects, we chose to focus on three representative subjects: physics and behavioural sciences for secondary education and 'world orientation' for primary education. The primary school subject 'world orientation' in Belgian Flanders integrates history, geography and science, and provides an initiation to basic research skills in the context of inquiry based learning. With our choice of subjects, we covered both exact and human sciences in primary and secondary education, and a meaningful slice of the research skills learning trajectory that crosses the whole Belgian-Flemish curriculum. Together with subject-specific features, we of course also examined the general curricular requirement concerning research skills and competencies in secondary education.

Our investigation involved:

1. Desk research
 - a. document study of the Belgian-Flemish curricula and official guidelines in relation to research: general research competency requirements, its subject-specific realisation and other subject-specific occurrences and opportunities for research as authentic content (Cornelissen, Tamassia, Vervaeke, Depaepe, Van De Keere, & Simons, 2014)
 - b. research literature study: research on inquiry based learning and motivation improvement, research skills and competencies, nature of science, misconceptions about science and scientists, involvement of researchers in schools
2. Field study
 - a. interviews with school teachers
 - b. interviews with teacher educators
 - c. observation of the realisation of the research competency development for science classes in one school.

In the field study we chose for qualitative methods involving in-depths interviews (and a few observations) with a limited number of teachers and teacher educators, rather than quantitative methods based on (online) questionnaires with possibly a larger number of respondents. This choice was related to the rather subtle nature of our topic of interest, difficult to render in a few sentences without engaging in a dialogue with the practitioner, as our first experiences showed. In fact, we were not only interested in how teachers (and teacher educators) realized and possibly broadened the specific curricular requirements in relation to research in their practice, but also in how they possibly found space for research as authentic learning content in another curricular context, for instance the

subject matter itself or the ‘science and society’ learning goals. The interviewed teachers and teacher educators represented the three school subjects mentioned above in several regions in Flanders.

The results of this first phase of the project provided an answer to our first question, confirming a general lack of attention to research as a thing of the world in the current school and teacher education policy and practice in Belgian Flanders. Moreover, the interviews also provided valuable insights in the concrete worries and problems faced by teachers in their everyday practice. What we learned from these interviews was taken into account in the further development of the scenarios.

The educational concept and scenarios of Research in Motion are a design-based answer to the following two research questions:

- How can we broaden research education at school in order to allow pupils to develop a better view on research as a thing of the world?
- How can we educate teachers to bring research as authentic content in the classroom?

Since the target group of the project is two-fold – pupils in schools and student teachers – a first question is how to organize the design for these two target groups. They are of course not fully independent. The interviews in fact showed that the problem of not having been exposed to the research practice, is in most cases common to pupils and their teachers. The distance between teachers and the world of research actually turns out to be a main obstacle to a more authentic approach to research in the classroom. Therefore, the material developed for pupils, allowing them to explore the research practice, can be used by future teachers as well and can become the starting point of trajectories for teacher education, where students first explore the research practice, then guide others in this discovery, and possibly develop own material concerning the world of research. As a result of these considerations, we developed scenarios for use in schools *and* in teacher education. Trajectories for teacher education were afterwards designed starting from these scenarios. In the development of the scenarios the results of the mapping were taken into account. For instance, the frequent worry of teachers, in particular of physics teachers, of not having enough time to engage in long classroom activities that are not strictly mandatory according to the curriculum, led to the modular structure of the scenarios. This structure allows for independent use of many short modules, that can be also combined to form a longer trajectory.

In what follows, we give a compact account of the development of the educational concept and of the concrete scenarios. We are well aware that this structured description incorrectly suggests linearity and well-divided phases, and does not do justice to the complexity of our project practice and to how different ‘phases’ were actually intertwined in the project. The description below can in fact also be seen as a black box. For the readers interested in opening it, we refer to the page ‘About Us’ on the Research in Motion website.

1. Desk research, literature study about research: conceptions of research, ethnographic studies of researchers and research labs
2. Brainstorming, leading to the educational concept ‘black box’ and to the educational principles: authenticity, exploration, visualisation.
3. Choice and development of three concrete scenarios for school and teacher education:
 - a. Test-case (Nobel Prize):
 - i. Artefact collection
 - ii. Artefact organisation in a visualisation (timeline on paper)
 - iii. Development of a test-set of exercises (on paper)
 - iv. Limited try-out with a mixed group of teacher students, teacher educators and teachers

- b. Case Darwin and case for behavioural sciences (first ‘announcement of a discovery concerning dyslexia’, then changed to ‘Ph.D. thesis in educational sciences’), further development of the case Nobel Prize
 - i. Artefact collection
 - ii. Artefact organisation in visualisations
 - iii. Development of exercises
 - iv. Preparation of the material for digitalization (in collaboration with a web designer)
 - v. Digital implementation of the scenarios on the website (including applications developed by the web designer)
 - vi. Try-out of the digital scenarios with teacher students, school pupils, and teachers during a professional development course.
 - vii. Try-out where teacher students develop own Research in Motion material and test it with pupils in school
 - viii. Improvement and finalisation of the scenarios
- 4. Development of the handbooks
 - a. Collection of concrete experiences and example answers during try-out
 - b. Development of general and scenario-specific chapters
 - c. Development of trajectories for teacher education
 - d. Finalisation, with separation of the versions for teacher students/teachers and for teacher educators
- 5. Development of the fourth black box (for teacher education only) based on our project practice:
 - i. Artefact collection (project application, project calendar, meeting agendas and slides, emails ...)
 - ii. Development of support information for students (glossary ‘project world’)
 - iii. Creation of the digital project agenda and digital project location map
 - iv. Development of exercises
 - v. Embedding on the website

Together with our choice to make our own research practice public with the fourth scenario, we also decided, during the development of the handbooks, to show which ideas and authors had inspired us in our research process, by giving more than just references in the general chapters. We then introduced what we called ‘white boxes’, one-page texts starting with a citation with reference and figure, each explaining one key idea in an accessible way. The following six white boxes were developed, corresponding to six key ideas in Research in Motion: interest, black box, diversity, things, visualisation (of complexity), connections.

RESULTS AND CONCLUSIONS

This project hopes to contribute to the improvement of the educational practice with an innovative vision concerning research in the classroom, developed on the basis of an investigation of the current Belgian-Flemish policy and practice. Moreover, the project has provided open educational resources allowing teachers and teacher educators to enrich their classroom practice in relation to research. Finally, the project has proposed a set of possible trajectories implementing Research in Motion in teacher education, where students (a) explore the research practice with one or more digital scenarios (b) experiment with the proposed educational approach by guiding pupils or fellow students in the discovery of the research practice (c) develop and test own material, opening more facets of the world of research for young people. One full trajectory involving all three phases has been tested with a small group of students, with positive results.

While the three scenarios currently available for the school practice mostly target the school subjects world orientation in primary school (Darwin the researcher), physics in secondary school (Nobel Prize in Physics 2013) and behavioural sciences in secondary school (Ph.D. thesis in educational sciences), the general concept of the project can be applied to any research domain or school subject. Student teachers, teachers and teacher educators can develop their own Research in Motion scenarios for school subjects that are currently not included. The general results of this project can then be used by any teacher or teacher educator interested in broadening his or her approach to research in the classroom, for primary and secondary school. Finally, the educational use of explorable digital visualisations on the Research in Motion website is by itself innovative and may be inspiring for other educational projects.

While the term research might seem to refer to a human activity, and thus by definition to something in motion, our analysis of the Belgian-Flemish school curriculum and of the school and teacher education practice has revealed that research, as much as the scientific facts resulting from it, has often been black-boxed in schools. Research has been reduced to an abstract procedural scheme, often implicitly used as the definition of what research is and should be. For research as a thing of the world, with its diversity and complexity, there is currently little time available in the classroom. As long as research in school is restricted to a methodological training with the goal of developing research skills, opportunities for the development of a deep interest in research as a diverse and complex practice will be missed (Cornelissen, Tamassia, Vervaeke, Depaepe, Van De Keere, & Simons, 2014).

This project has shown that it is possible to enrich the approach to research in school by bringing the world of research into the classroom, and by doing so open possibilities for young people to be fascinated and inspired by research and researchers. The project has explored one specific way to bring pupils in contact with the world of research, namely by focusing on the many dimensions of the research practice. Digital modular scenarios based on authentic resources and explorable visualisations have been developed, with associated trajectories for the education of future teachers. These scenarios start from black boxes of research that pupils and students can open in order to discover the diversity and complexity of the world of research. Working with the Research in Motion website allows pupils and student teachers to explore and discover research locations, communities, instruments, activities, controversies, unexpected connections, under the guidance of the teacher and without having to leave the classroom environment. The first tests of the developed educational concept and material have given positive results, showing that the scenarios do make it possible for young people to discover that the research practice is more diverse and complex than they thought. Furthermore, we have observed that working with these scenarios creates a space in the classroom where other, different things can be said about research.

We would like to conclude with a consideration concerning the interplay between fundamental and practice-oriented research in this project. The central educational concept in Research in Motion is 'opening the black box of research'. This idea was strongly inspired by the fundamental work of Bruno Latour in the sociology and philosophy of science, from whom we also borrowed the term 'black box', an idea to which we gave a new life in an educational setting and which we made concrete in our scenarios. The development of Research in Motion has only been possible thanks to the rich and never trivial interplay between, on the one hand, fundamental insights concerning research and education, and, on the other hand, engagement in a continuous dialogue with the educational practice throughout the project. This interplay was, in its turn, made possible by the diversity present in the project team, being not only interdisciplinary at the level of covered subject domains, but also fully transversal in educational research interests - crossing over from theory to practice and policy -, and sharing a deep interest for the world of research. We think this project is an example of how to go beyond the often forced dichotomy between theoretical and practice-oriented research, with the

associated formal categorisations and field polarisation, and how to engage in rich projects that are allowed to be 'just' research projects.

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456'S GOT TALENT!

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ABSTRACT

This study was set up within the context of the current reform of Flemish secondary education, a reform of a system with four tracks with an academic, technical, artistic, resp. vocational orientation and over 300 study programs, to a system with five interest domains and a reduced amount of study programs, to be chosen from Grade 9 onwards. According to matching theory, decision-making theory, social-cognitivism, contextual developmental theory, and sociology, many factors predict students' educational/vocational choice, the most influential being their abilities and interests. According to vocational developmental research, choosing an education/vocation starts in early childhood, with choice alternatives conflicting with the self-concept progressively eliminated with time, due to improvements in self-reflection skills. The aim of this study was to offer students of Grade 4, 5, and 6 of two Flemish primary schools a series of talent-oriented workshops, in order to help them develop a more accurate self-concept and thus to smoothen their transition to secondary school. Results show that, after the 16-week period of the study, (a) Grade 5 and 6 students (as compared to Grade 4 students) became pretty accurate in their self-perceptions, as shown by high student-teacher consistency in student ability ratings and a high percentage of correctly student-detected new abilities, (b) students and teachers disagreed most regarding students' linguistic abilities, creativity, bodily-kinaesthetic abilities, and philosophical skills, and (c) students rated themselves increasingly higher in terms of well-being. This seems to suggest that a talent-oriented approach might enhance students' ability awareness and well-being in school.

INTRODUCTION

Throughout their school career, students have to make many educational/vocational choices. In Flanders (i.e., the Dutch-speaking part of Belgium), many of these choices are transition-related, as our educational structure forces students to choose (a) a limited package of optional subjects in Grade 7 and 8 (next to the common core curriculum), (b) a track from Grade 9 onwards, with the four track possibilities being the academic track (offering a broad general/theoretical education), the technical track (offering technical/theoretical education), the artistic track (offering broad general education with active arts practice), and the vocational track (offering practice-oriented education aimed at a specific profession), and (c) a study program within their chosen track, from Grade 9 onwards, with over 300 study programs to choose from.

About 30% of Flemish children question their choice made when switching from Grade 6 (primary school) to Grade 7 (secondary school; Vandenberghe, Cortois, de Bilde, Verschueren, & Van Damme, 2011). Once in secondary school, about 26% of Flemish students repeat (at least) one grade (Vlaams Ministerie van Onderwijs en Vorming, 2016) and about 20% of Flemish students switch from the 'more difficult' and 'more socially desirable' academic track towards the technical, artistic, or vocational track (Duquet, Glorieux, Laurijssen, & Van Dorsselaer, 2005). This seems to suggest that making educational/vocational choices is quite difficult for many students. The present study aims to help students in making better considered choices, by offering them a series of talent-oriented workshops in Grade 4, 5, and 6.

Theoretical framework

In the literature, five theoretical perspectives on educational/vocational choices exist, that is (a) a matching perspective (e.g., Holland, 1997), (b) a decision-making perspective (e.g., Germeijs & Verschueren, 2007; Taborsky, 1994), (c) a social-cognitive perspective (e.g., Eccles, 2005; Lent, Brown, & Hackett, 1994), (d) a contextual developmental perspective (e.g., Ginzberg, Ginsburg, Axelrad, & Herma, 1951; Gottfredson, 1981; Super, 1980), and (e) a sociological perspective (e.g., Bourdieu & Passeron, 1977; Breen, & Goldthorpe, 1997). We consider these five perspectives as complimentary, as each perspective focuses on a specific piece of the complex 'choice puzzle' (for a visual summary, see Figure 1). In this paragraph, we will briefly describe how each perspective adds his piece to that complex puzzle.

According to the first perspective (i.e., the matching perspective), one is most successful and satisfied in a track (or study program) when the possibilities and demands of that track (or study program) match with one's interests and abilities (Holland, 1997). Occupational interests and abilities have been studied as predictors of educational/vocational choice for decades and several reviews have confirmed their importance (e.g., Tinsley, 2000).

According to the second perspective (i.e., the decision-making perspective), one is most successful and satisfied in a track (or study program) when the choice process proceeding that track (or study program) decision was completed in a thoughtful and successful way. Making an educational/vocational choice implies a long process in which several consecutive steps need to be taken (see upper part in Figure 1): one needs to (a) orient oneself to choosing (i.e., one needs to be aware of the need to make a decision and one needs to be motivated to engage in the career decision-making process), (b) explore oneself in terms of one's interests and abilities (see also matching perspective), (c) explore all possible choice alternatives broadly (i.e., one needs to gather general information about the alternatives), (4) explore a reduced set of choice alternatives in-depth regarding

their possibilities and demands, (5) decide, and (6) show commitment to that decision (Germeijs & Verschueren, 2007). Evidence for the importance of all steps being taken carefully has been provided by many empirical studies (e.g., Gati & Asher, 2001; Germeijs & Verschueren, 2006).

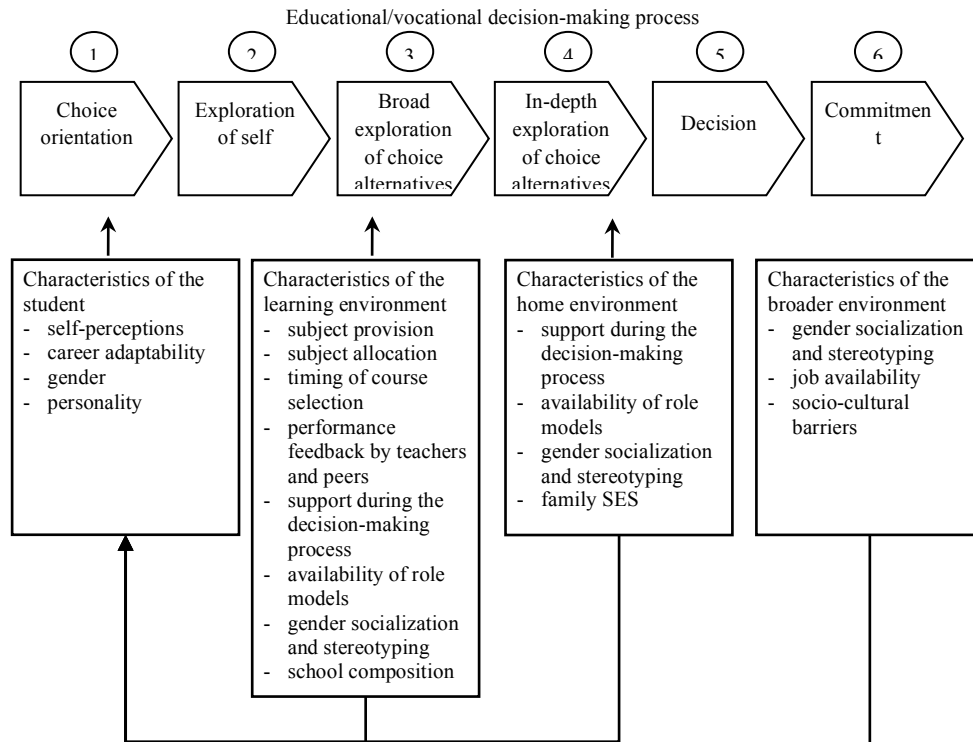


Figure 1. Theoretical framework.

According to the third perspective (i.e., the social-cognitive perspective), fourth perspective (i.e., the contextual developmental perspective), and fifth perspective (i.e., the sociological perspective), one is most successful and satisfied in a track (or study program) when the choice for that track (or study program) was made under supportive personal and environmental conditions (see bottom part in Figure 1). The following personal and environmental conditions have been detected by research to be important predictors of educational/vocational choice: self-perceptions (i.e., self-concept, self-efficacy beliefs, and self-confidence), career adaptability (i.e., general problem solving skills, strategies to deal with choices in general), personality (i.e., indecision, extraversion, conscientiousness), gender, subject provision at school, subject allocation at school, performance feedback by peers and teachers, availability of role models, gender socialization and stereotyping, support during the decision-making process (e.g., availability and quality of information regarding choice alternatives, refusal or approval of certain choice alternatives by peers and parents), timing of course selection, school composition, family SES, job availability, and lack of socio-structural barriers (e.g., Boone & Van Houtte, 2013; Korpershoek, Kuyper, Van der Werf, & Bosker, 2010, 2011; Lyn, Care, & Ainley, 2011; Lyons, 2006; Nagy, Garrett, Trautwein, Cortina, Baumert, & Eccles, 2008; Pinxten, De Fraine, Van Den Noortgate, Van Damme, & Anumendem, 2012; Sheu, Lent, Brown, Miller, Hennessy, & Duffy, 2010; Smyth, & Hannan, 2006; Van Langen, Rekers-Mombarg, & Dekkers, 2006, 2008).

According to the fourth perspective (i.e., the contextual developmental perspective) – and especially worth stressing in the context of the current study – one's educational/vocational decision-making process is a lifelong choosing process, starting already in early childhood (Hartung, Porfeli, &

Vondracek, 2005). With time, one's self-reflection skills improve, and as such, one's self-concept becomes more realistic and differentiated, allowing choice alternatives conflicting with the self-concept to be progressively eliminated, especially from age 8 onwards (Gottfredson, 1981).

Talent-oriented approach in Flemish primary education

It should therefore not come as a surprise that many primary schools in Flanders nowadays start offering talent-oriented workshops related to a variety of subjects, in order to help students better detect their interests and abilities before switching to secondary school. Several small-scale experiments have been conducted (e.g., <http://www.ark123.be/blikopeners/talente>; <http://www.aarschot.be/leven-welzijn/onderwijs/website-talente>; <http://www.houthalen-helchteren.be/presentatie-focus-op-talent>; <http://www.bs-willemtell.com/projecten/proeftuinen/>), based on the work of Aerden (2010) and Heylen (2013). These efforts are supported by the Flemish government, in the light of the planned reform of secondary education which has the intention of making student choose an interest domain instead of a track (Vlaams Parlement, 2013).

Aim of this study

The aim of this study is to offer students of Grade 4 to 6 in two schools where such talent-oriented approach did not yet exist, a series of workshops, in order to help them develop a more accurate self-concept and thus to smoothen their transition to secondary school. Focus is on students' ability in several subjects, rather than their interest in it, because recent research has proven the former to have the largest impact among Flemish Grade 8 students (Pinxten et al., 2013).

Research questions

The present study will address the following three research questions:

1. Are students in Grade 6 (in comparison to those in Grade 4 and 5) more accurate in detecting their abilities?
2. In which areas do students and teachers (dis)agree on students' ability?
3. Does students' well-being increase when applying a talent-oriented approach in class?

METHOD

Participants

This study was set up in two small primary schools in Flanders, as part of the Bachelor thesis project of Gabbano and Martens. Participants were 15 students from Grade 4 of Basisschool *[primary school]* Boseind in Neerpelt, 9 students from Grade 5 and 6 of Gemeentelijke Basisschool *[primary school]* Maasmechelen, their teachers, and their parents. Students ranged in age from 10 to 12 years.

Study design

This study was an exploratory intervention study, without controls, consisting of two main stages. In the first stage of the study (March 2015), eight talent-oriented workshops were offered to the students by Gabbano and Martens, during a two-week period. Each workshop lasted 50 to 100 minutes. Designing of these workshops was done within the multiple intelligences framework of Gardner

(1983), inspired by research done by Aerden (2010) and Heylen (2013). An overview of the workshops and their content can be found in Table 1.

In the second stage of the study (April – May 2015; three-week period), ‘regular’ classes were offered to the students by Gabbano and Martens (as part of Gabbano’s and Martens’ final pre-service internship). Many differentiation techniques were applied overall in these classes, but particular attention was paid to talent-related differentiation, integrating students’ talents detected in the first stage.

Table 1

Talent-oriented workshops as offered in the 456’s got talent intervention

Workshop	Content
Self smart	Students were asked several philosophical questions, such as ”Will you be a champion in the future?”, ”What does one need to become a champion?”, ”Can anyone become a champion in any domain?” etc. Students were stimulated to raise arguments and contra-arguments and to listen to and react upon others’ arguments and contra-arguments.
People smart	Students were given the responsibility to take care of a boiled egg as if it was their baby, for three consecutive days.
Music smart	Students were learnt the Cup-song by Anna Kendrick (https://www.youtube.com/watch?v=cmSbXsFE3I8), with the goal of recognizing, memorizing, and producing rhythmic patterns.
Body smart	Students were learnt the haka, while being stimulated to produce own moves and cries as much as possible.
Picture smart	Students were stimulated to create their own Keith Haring men and to attach these men to the walls, stairs, and doors of the school building.
Nature smart	Students were grouped and given a step-by-step plan to create a lip balm, a lava lamp, and bath salts. The workshop’s goal was to read the plan, execute the steps as indicated, observe, and conclude based on observations (scientific inquiry approach).
Logic smart	Students were given three games stimulating their reasoning and analytical skills: (a) Rummikub, (b) Lego (with a construction assignment), and (c) a game-creation game.
Word smart	Students were stimulated to create a class journal. Each student was asked to pick a last-week news fact which they found interesting or worthwhile telling something about, and to write an article about that news fact, either alone or in collaboration with a classmate.

Measures

Perceived student ability

Students’ ability was evaluated by a variety of measurements. At the start of the study (i.e., before the intervention took place), students, teacher, parents, and peers were asked to answer the following question: “*What is/are your talent(s)? What is/are the talent(s) of [this child]?*”. Answers were collected per child and visualized/summarized on a giant wall paper in the classroom. During the study, students and Gabbano/Martens rated students’ ability shown in each workshop. Rating was done on a 5-point-likert scale, with values ranging from 0 (--) to 4 (++). Averages were calculated per workshop, per rater, per grade, and overall. At the end of the study (i.e., after the intervention took place), students were asked to answer the following question: “*What is your biggest, newly-discovered talent?*”. This answer was compared with the answers given before the project (by and during the project). A student was considered to have an accurate self-perception when he/she identified an ability that (a) was not a talent mentioned before the onset of the study by either him/herself, the teacher,

his/her parents, or his/her peers, and (b) was rated with a ++-score during the study, by either him/herself or the teacher.

Student well-being

Students' well-being before, during, and after the study was evaluated by a Dutch student questionnaire developed and validated by De Lee and De Volder (2009). This questionnaire contains 28 items, to be rated on a 4-point-likert-scale, with values ranging from 0 (*never*) to 3 (*always*). Subscales measure students' (a) satisfaction in school (4 items), (b) engagement (4 items), (c) academic self-concept (6 items), (d) social relationships (6 items), and (e) perception regarding the pedagogical climate (8 items). For each subscale, scale scores were computed by averaging students' item scores. An overall well-being score was also calculated.

Data analysis procedure

Student ability averages were compared per grade, rater, and workshop, by means of a series of analyses of variance. Analyses were conducted in SPSS 20.

Students' growth in well-being throughout the study was estimated by means of a series of two-level growth curve models, with measurement occasions at level 1 and students at level 2. A stepwise sequential modelling approach was used, in which each successive model reflected an increased complexity. As a first step, a model without any predictors was fitted (Model 0) as a baseline for subsequent model comparison. In a second step, time was added to the baseline model (Model 1) in order to examine well-being growth through time. Finally, in a third step, grade dummies and time*grade dummies were added to the previous model (Model 2), in order to detect differences in well-being status at the start of the study and wellbeing growth during the study. This approach was used for the overall well-being score, as well as for the 5 scale scores. Analyses were conducted in MLwiN 2.27.

RESULTS

Question 1: Are students in Grade 6 (in comparison to those in Grade 4 and 5) more accurate in detecting their abilities?

The overall student ability mean (averaged across workshops, raters, and grades) was 3.19. Student ability means (averaged across workshops and raters) were highest in Grade 5 and Grade 6, as can be seen in Figure 2. Yet, this grade difference was not significant, ($F(22, 2) = 3.22, p = 0.06$).

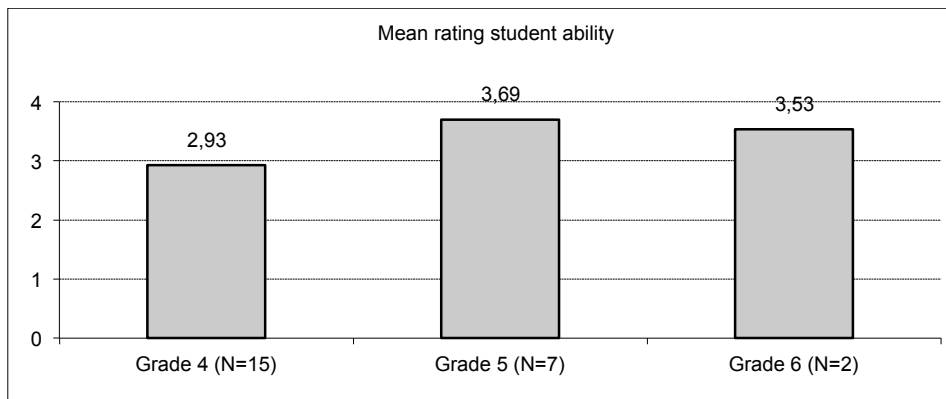


Figure 2. Student ability means by grade.

Student ability means (averaged across workshops and grades) were higher among students (3.36) than among teachers (3.04). Yet, this rater difference was not significant, $F(24, 1) = 3.40$, $p = 0.07$. The mean rater difference was largest in Grade 4 (0.40), as can be seen in Figure 3. Likewise, the percentage overlap between student and teacher ratings given throughout the workshops was smallest in Grade 4 (47.82%; as compared to 80.36% in Grade 5 and 80.00% in Grade 6) and the percentage of 'new talents' correctly detected by students was lowest in Grade 4 (42.86%; as compared to 71.43% in Grade 5 and 100.00% in Grade 6).

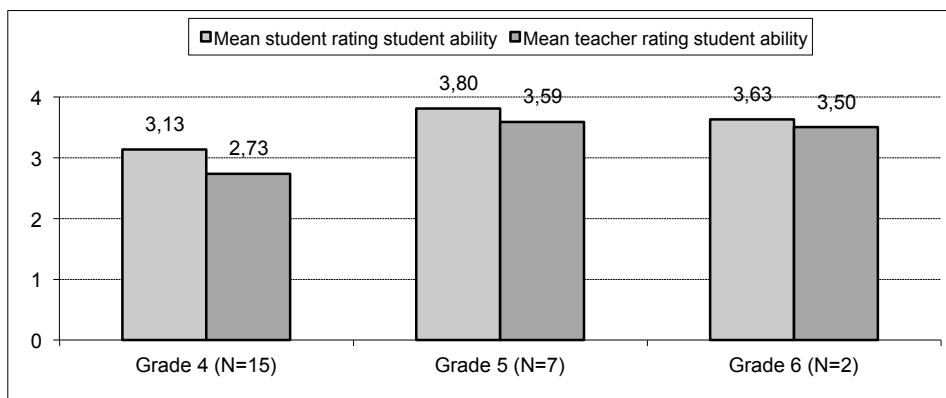


Figure 3. Student ability means by grade and rater.

Looking at students' individual scores, only 3 students (all in Grade 4) rated their ability lower than their teachers did, in at least two workshops.

Question 2: In which areas do students and teachers (dis)agree on students' ability?

Student ability means (averaged across raters and grades) were highest in the people smart workshop (3.38), nature smart workshop (3.38), and picture smart workshop (3.27), and lowest in the self smart workshop (2.67) as can be seen in Figure 4.

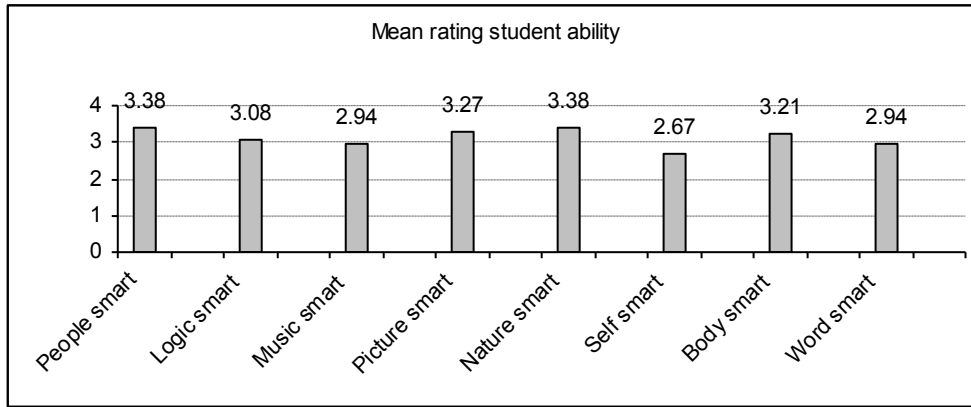


Figure 4. Student ability means by workshop

The mean rater difference was largest in the word smart workshop (0.57), picture smart workshop (0.54), body smart workshop (0.43), and self smart workshop (0.36), as shown in Figure 5.

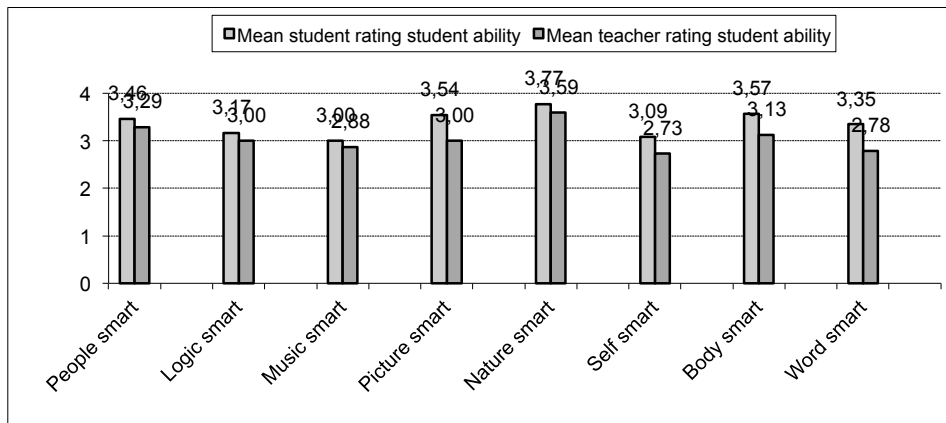


Figure 5. Student ability means by workshop and rater.

Question 3: Does students' well-being increase when applying a talent-oriented approach in class?

As can be seen in Figure 6 and Table 2, regarding overall well-being, the intercepts of students in Grade 4, Grade 5, and Grade 6 were 2.30, 2.20, and 1.57, respectively. The intercept of students in Grade 6 was significantly lower than that of students in Grade 4 ($b = -0.73$, $SE = 0.15$, $p < .01$), indicating that, at the start of the study, students in Grade 6 rated themselves significantly lower in overall well-being. Throughout the study, overall well-being scores increased significantly ($b = 0.08$, $SE = 0.03$, $p < .01$). In Grade 4, Grade 5, and Grade 6, growth per wave was estimated to be 0.05, 0.06, and 0.45, respectively. Growth in well-being scores was significantly larger in Grade 6 than in Grade 4 ($b = 0.40$, $SE = 0.10$, $p < .01$), indicating that Grade 6 students caught up in well-being ratings throughout the study and ended up at a similar level as their counterparts in Grade 4 and Grade 5.

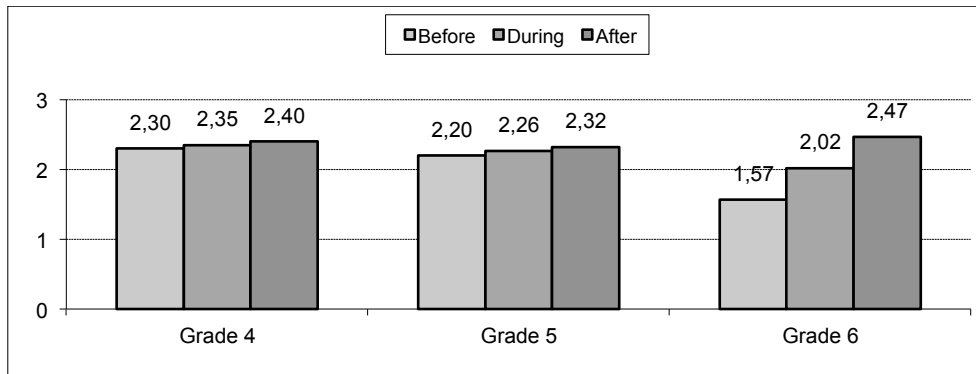


Figure 6. Estimated overall well-being scores before, during, and after the study

Table 2

Fixed effects estimates (top) and random effects estimates (bottom) for overall well-being

	Model 0		Model 1		Model 2	
	<i>b</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>b</i>	<i>SE</i>
Fixed parameters						
Intercept	2.30*	0.04	2.21*	0.05	2.30*	0.05
Time			0.08*	0.03	0.05	0.03
Grade 5					-0.10	0.09
Grade 6					-0.73*	0.15
Time * Grade 5					0.01	0.06
Time * Grade 6					0.40*	0.10
Random parameters						
Student-level variance	0.02	0.01	0.02	0.01	0.02	0.01
Time-level variance	0.05	0.01	0.04	0.01	0.03	0.01

* $p < .05$

Looking at the subscale scores (not shown in Table 2, but available from the authors upon request), growth was noticeable in satisfaction in school ($b = 0.10$, $SE = 0.05$, $p = .03$), engagement ($b = 0.10$, $SE = 0.05$, $p = .04$), academic self-concept ($b = 0.10$, $SE = 0.05$, $p = .05$), and social relationships ($b = 0.09$, $SE = 0.03$, $p < .01$), but not perception regarding the pedagogical climate ($b = 0.05$, $SE = 0.04$, $p = .23$). The pattern of low ratings increasing with time among Grade 6 students was replicated for academic self-concept ($b = 0.61$, $SE = 0.16$, $p < .01$), social relationships ($b = 0.40$, $SE = 0.11$, $p < .01$), and perception regarding the pedagogical climate ($b = 0.43$, $SE = 0.14$, $p < .01$).

CONCLUSION AND DISCUSSION

In sum, three major findings emerged from this study. First, in line with vocational developmental research (Hartung et al., 2005), we found that, in Grade 5 and 6, students are pretty accurate in their self-perceptions, as shown by high student-teacher consistency in student ability ratings. Therefore, we have reasons to believe in the added value of a talent-oriented approach in primary school. It should be stressed that both schools participating in this project, in the past, did not yet use an explicit talent-oriented approach. Within the current study, talents of students were appointed very explicitly on a giant wall paper in the classroom, and after each workshop, students were asked to reflect on what they had learnt and whether they felt they were good at the area explored during the workshop

provided. This apparently increased students' talent awareness, as a new talent area was correctly appointed by many students after the study, especially by those in Grade 5 and 6. As for future practice-based research, we advise other researchers to broaden our (limited, small-scale) study scope, by (a) offering longer and more workshop sessions, (b) providing workshop choice, in order to refine an already detected talent or to explore an area of interest not yet investigated in-depth, (c) incorporating a student talent portfolio to ease communication among students, teachers, and parents, and (d) starting already in Grade 1. What is more, we advise researchers to have these workshops offered by trained personnel who are themselves good at the skills to be taught, and to have all workshops within a domain to be offered by the same teacher. In our study, Martens offered all workshops in one school (Grade 4), and Gabbano in the other (Grade 5 and 6). Martens and Gabbano were skilled in all workshops abilities. Yet, maybe Martens was more critical in detecting talent in general, and might give lower student ratings overall, regardless of grade. This means our students in Grade 4 scored themselves higher than did their teacher, not because of lack of self-knowledge, but because of criticism and perfectionism of their teacher. To overcome this alternative explanation for our study findings, in future research, teacher effects as explained here should be minimized as much as possible, by working with across-grade and across-school workshops with one teacher offering all workshops in a certain domain.

Second, we found students and teachers to disagree most in terms of students' linguistic abilities, creativity, bodily-kinaesthetic abilities, and philosophical skills. To the best of our knowledge, we did not find research having explored such domain effects. We think our findings can be explained in two different ways. A first explanation might be that pre-service teachers (which Gabbano and Martens were when conducting the study) are just not qualified enough to rate students' abilities in these domains correctly. This might be true for creativity, sports, and (especially) philosophy, domains in which evaluation is less straightforward. If true, teacher educators should provide students in the primary school teaching program with more background on how to evaluate students in these domains correctly, with cases and good practices, not just how to evaluate students in general. A second explanation might be that our students have simply not had enough time during their primary school career so far to explore these domains in-depth, which seems a highly plausible explanation for philosophy in particular, but maybe also (to a smaller extent) for arts and sports. This means that students are less accurate in detecting their abilities in these domains because of lack of prior experience and thus overrate themselves based on one successful workshop. If so, a suggestion for future practice-based research would be to investigate the time spent on several domains during primary school, in relation to students' accuracy in talent awareness. The student-teacher disagreement in linguistic abilities needs further investigation in general.

Third, we found students to rate themselves increasingly higher in terms of well-being, over the 16-week period of the project. Our talent-oriented approach (i.e., talent-related workshops and talent-related differentiated lessons) thus seems to have enhanced students' well-being in school. Though a plausible explanation, we believe that our study design is not strong enough to support this assumption, as we lack a group of controls to compare these results with. Many other factors might have contributed to students' higher reported well-being as well, such as (a) mere exposure to a new, young, dynamic teacher, (b) the larger amount of individual support given due to possibility of co-teaching in the class, etc. We recommend other practice-based researchers to replicate our study, with a more sound design.

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LINKING COMPETENCE FORESIGHT AND SERVICE DESIGN TO SUPPORT STRATEGIC RENEWAL

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ABSTRACT

This research links two strategic processes: competence foresight and service design, which both are essential for organizations' strategic renewal. The objective of this constructive case study is to discuss the theoretical literature; concepts and processes of competence foresight and service design, then explain the construction phase of the model with linkages between these two processes and test the experiences of using this model in practice. The result of this research is the competence foresight and service design model (CFSD-model). This research highlights the starting point for service design and competence foresight: identifying the problem and the need for change. Also emphasized according to practical experience is the need for individual foresight and future frameworks as competent individuals make the future of the organizations. Change in individual thinking also foster competence foresight and service design.

INTRODUCTION

This paper links two strategic processes: competence foresight and service design. Both are essential for both public and private organizations in order to develop performance. These processes of foresight and design have not been considered together previously in literature. The reason might be in that these both processes are rather new and complicated, the practices nor research on these areas are not wide.

Globalization, technological advancements and aging of the population are the key driving forces of the future, thus organizations have to be aware of the changes and their impacts to their strategy, processes, services and competencies. The theme is currently very topical. For example, *Futures*, one of the main journals in future studies, dedicated a special issue for this theme in November 2015.

The objective of this paper is to discuss the concepts and processes of competence, competence foresight and service design, then to construct a model with linkages between these two processes and explain the experiences of the usage of this model in practice.

The need and idea to find the linkages between competence foresight and service design processes came in the beginning of a national competence foresight project our organizations took part. The project was national European Social Fund funded project Competence foresight in local government services carried out by KT Local Government Employers in 2011-2013. Lahti Region pilot organizations set its objective to find new perspectives and practices to competence foresight in the healthcare sector services and in the vocational and higher education sector. Both these sectors are undergoing structural changes and to succeed in these they have to develop their services and structures with new and innovative means.

According to the report Design for Public Good (2013, p. 6) by Design Council, design has evolved into a fully joined-up innovation methodology. There is increasing understanding in both private and public sectors of the value this adds. In the public sector design thinking is considered the way to overcome common structural flaws in service provision and policy making.

Design thinking has been highlighted also one of the key competencies of the future (The Confederation of Finnish Industries EK, 2010, pp. 20-21). Testing and demonstrating are typical strengths of the design expert. In the past, design concerned making the product aesthetically attractive to the customer. Today the design expert has the ability to envision a product, service and user experience that delights the customer on many different levels, from its usability and economic efficiency to its aesthetics. Design competence is a competitive factor even in areas where it has not played a significant role in the past. According to Recommendation 3 (Design Council, 2013, p. 78), there is need to build a strong design sector that can offer strategic and service design for public sector.

The theoretical consideration is based on competence, foresight, competence foresight and service design theories. The researchers have constructed earlier the framework for competence foresight (Siikaniemi, Saikkonen & Härkönen, 2010) and have thereby studied both competence and foresight phenomena and concepts thoroughly.

In service design approach the experts from Lahti University of Applied Sciences and their networks have been for great support. Their publication Service Design: On the Evolution of design Expertise (Kuosa & Westerlund, 2012) gathers the articles of key service design experts in Finland and Estonia.

Many of the practices in personnel and organizational development in the target organization have been developed linking both theory and practice in action research or action learning processes, thus also the stakeholders are interested in developing and learning new practices.

RESEARCH DESIGN

The research design is a constructive case study, which comprises of conceptual study, modelling and finally testing the constructed model in practice.

The constructive research approach is a research procedure for producing innovative constructions. These constructions or models are intended to solve problems faced in the real world working life and, to make a contribution to the theory of the discipline in which it is applied. The central notion of this approach, the (novel) construction, can be such as models, diagrams, processes or plans. It is characteristic of them that they are invented and developed, not discovered. (Kasanen, Lukka & Siitonen, 1993.)

The core features of the constructive research approach require that

- it focuses on real-world problems felt relevant to be solved in practice,
- produces an innovative construction meant to solve the initial real-world problem,
- includes an attempt for implementing the developed construction and thereby a test for its practical applicability,
- implies a very close involvement and co-operation between the researcher and practitioners in a team-like manner,
- in which experiential learning is expected to take place,
- is explicitly linked to prior theoretical knowledge, and
- pays particular attention to reflecting the empirical findings back to theory (Lukka, 2000, 114).

Figure 1 shows working mechanisms of the constructive research approach (Oyegoke, 2011, 580). The research process begins with identifying practical relevance problems that have research potential through theoretical literature reviews and substantiated with practical experience. This comprises epistemology, theory and technical issues which provides the philosophical stance and gives context to and informs the study. This enables the researcher to understand the topic. Both the theory-based connection and practical experience inform a better design of a construct. The construct can be validated through triangulation of different approaches depending on the work at hand. Testing, justification and validation can be empirical or theoretical, or quantitative or qualitative or both, in order to demonstrate that the solution works. The study should also cover the applicability of the solution, the constraint in its application and further studies if applicable. Both the theoretical and research contributions should be highlighted. It is important to note that this process is a dynamic and interactive process between different phases. (Oyegoke, 2011, pp. 579-580.)

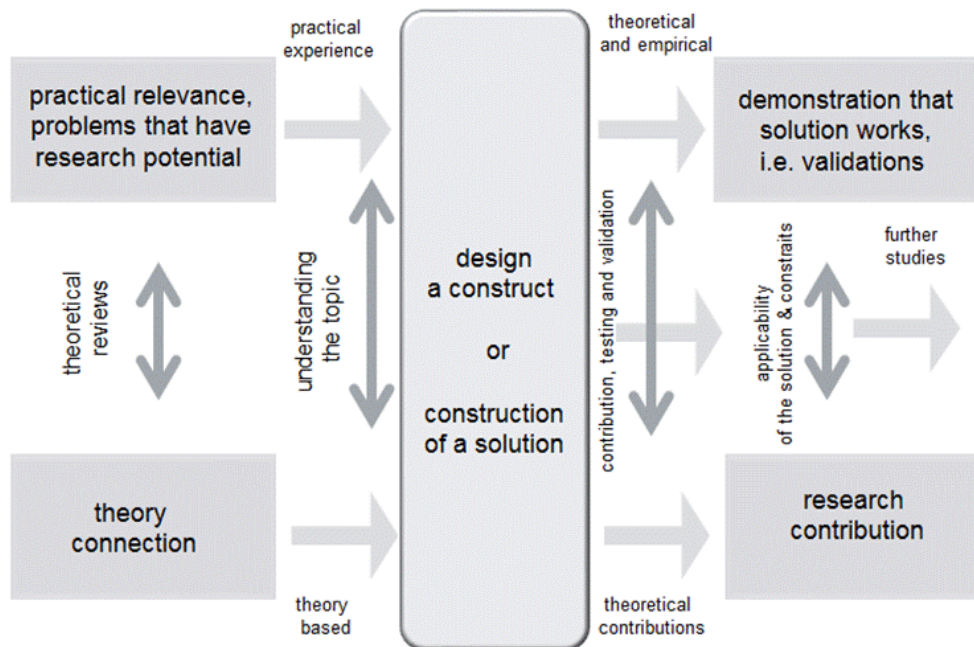


Figure 1: Constructive case research

The research team members are both researchers and practitioners in the areas of foresight, competence foresight, competence ensurance, learning and development. The team is responsible for developing and implementing organizational practices in these areas for educational organizations providing secondary vocational education and higher education. Thus the need to find the solution for the real life problem thrives motivation to the research process.

THE KEY FEATURES OF COMPETENCE, FORESIGHT, COMPETENCE FORESIGHT AND SERVICE DESIGN

This section gathers the features of the key concepts used in this paper.

Competence

Mulder, Gulikers, Biemans and Wesselink (2009, 757) state that competence is the integrated set of capabilities necessarily for task performance and problem solving in a certain profession, organization, job, role and situation. Lans, Bergevoet, Mulder and Van Woerkum (2005) have an important extension to the concept with perspectives that competences are context-bound, subject to change and interrelated. The perspectives of Lans and al. (2005) are focal when linking competence foresight and service design, because the beginning of both processes is the need for change in a special organization or service.

Foresight

Linturi (2014, p. 3) combines foresight work and learning. According to him, learning is a way to adapt and attune our activities to the changing environment. Major, Asch and Cordey-Hayes (2001) discuss foresight and the characteristics of managerial attitudes. The researchers suggest that reactive organizations have zero or low foresight knowledge, while responsive organizations have moderate knowledge and a few resultant actions. Strategic organizations have high-level foresight knowledge and foresight practices.

The focus in foresight is on long-term and medium-term time span. The emerging questions are considered extensively and from various aspects. Foresight work proceeds in phases, exploits diverse methods and promoting interaction throughout the process. The core of the process is that information in the value chain transforms into activities through deeper understanding. (Siikaniemi, Saikkonen and Härkönen 2010, p. 18.)

The purpose of foresight is to identify the factors affecting the future, to find insights, to build mutual understanding and to make decisions on the future objectives. (Siikaniemi, Saikkonen and Härkönen 2010.)

The results of foresight are needed for practical purposes in organizations. These are management, strategies, policies, planning, design, roadmapping, action and decision-making (Malaska and Holstius, 2009, pp. 86-87).

Fuller and Loogma (2009) discuss the social constructionist perspective of foresight methodology and suggest that foresight is both a social construction and a mechanism for social construction. This perspective is significant, since many activities in the foresight process require human sources, participation and networking (Hiltunen, 2007; Kaivo-oja, Seppälä and Katko, 2004).

Competence Foresight

In this article the definition of competence foresight is as follows: Competence foresight begins with identifying focal future change factors, and it results in the management of changes of the organization's and individual's competences. Widely comprehended, competence foresight creates knowledge and understanding both regionally and nationally for the development of curricula and qualifications systems. The theory basis for competence foresight is based on the competence foresight framework developed by Siikaniemi, Saikkonen and Härkönen (2010, p. 23).

The main dimensions that define the competence foresight process are time-span, context, dynamics and networks. Concerning timespan, it is important to decide how far in the future our perspective is when the issue or phenomenon is examined. The competence foresight process can focus, for example, on the future of individual, organization, working life or qualification system. This paper concentrates on individual and organization points of views.

Competence foresight for an individual's point of view examines context: organization, job and task. Also the loss of the competence of an individual from organization due to retirement or change of employer has to be examined. It is important to highlight that an individual needs competence at work and also for individual development. Competence foresight emphasizes the role of learning of individuals; thus, maintaining and supporting the motivation on an individual is central. People are

more likely to carry out things in which they have been involved in from the beginning. Therefore, the bottom-up approach is a more natural way to implement competence foresight.

Competence foresight is related to competence management and strategic human resource management in the organization. The most important objects of the competence foresight work in organizations are finding and defining core competences and dynamic competences. The significance of dynamic competence is often underutilized in the processes of producing innovations and improving the competitive advantage of an organization.

Foresight for strategy implementation and innovation implementation is needed in organizations. Strategy implementation requires competence foresight that specifies pathways leading to common vision of the future. This kind of foresight should promote priority setting in the organization.

Service Design

In literature the processes of service design and strategic design aim at the same objectives: to develop holistic solutions to complex problems. Literature often states that strategic design focuses in more large scale challenges, whereas service design focuses often to change minor problems.

According to Steinberg (2009) design requires the integration of multiple deep knowledge sets; visualization of complex multidimensional problems; and the ability to synthesize conflicting views, data points, and opinions in hopes of developing a holistic understanding so that we can create better and more complete answers to our problems. He continues that strategic design helps us ask the right questions and shape decision-making towards more complete and holistic solutions.

Strategic design is a means to achieve social innovation, particularly where the class of challenges is complex, systemic in nature, and where the solution will require invention rather than adaptation (Boyer, Cook and Steinberg 2013, 14).

In this paper, we have chosen to use the concept 'service design', because the concept is the nearest to the Finnish concept 'palvelumuotoilu' which we use in our everyday development work.

Stefan Moritz (2005, 7) has defined service design as a new holistic, multi-disciplinary, integrative field. It helps to either innovate or improve services to make them more useful, usable, desirable for clients, as well as more efficient and effective for organizations. Moritz (2005, 33) has defined four levels of design. First is the design of features (product, service or space), second is the design of client experience, third is the design of processes and systems and fourth level is the design of strategy, philosophy, policy or ideology. He sums up that Service Design is the design of the overall experience of a service as well as the design of the process and strategy to provide that service (Moritz 2005, 39). Service design can be considered from the customer's point of view or from the supplier's point of view. Many of service design literature today focus only on the customer's point of view and the tools that are used in the service design processes. The linkage between service design processes, as well as strategy planning and implementation processes and other management processes stay often in minor role.

The main objectives of using service design is often forgotten and the only point is customer satisfaction. From the service provider's and owner's view also quality and financial efficiency perspectives of the service have to be considered and not only customer satisfaction perspective. As Kuure and Miettinen (2013) assert service design is a human centred approach to service development.

It aims to ensure that service interfaces are useful, usable and desirable from the customer's point of view and effective, efficient and distinctive from the supplier's point of view.

Sääskilahti, Kuure, Lindström and Kallio (2012, 45) have found that the following key factors must always be considered in service design processes. The researchers have listed the factors according to Miettinen (2011), Mager (2009) and Moritz (2005):

1. Understanding the development challenge;
2. Collaborating with the clients, other stakeholders and the users;
3. Iterating throughout the process, i.e. creating ideas, prototyping, evaluating, improving and visualizing, and
4. Implementing the new service and maintaining and developing the services after implementation.

In recent years policymakers have noticed the advantages of design. Whicher (2014, 4) asserts that design is an approach to problem-solving that can be used across private and public sectors to drive innovation in products, services, society and even policy-making by putting people first. A European wide research has been accomplished where they have constructed 'Design Innovation Ecosystem'. The nine components in the model are: Design users, Design support, Design promotion, Design actors, Design education, Design research, Design sector, Design funding and Design policy. The model highlights multidisciplinary research connecting design to other domains. Whicher (2014, pp. 4-5.) This paper and research also promotes multidisciplinary research.

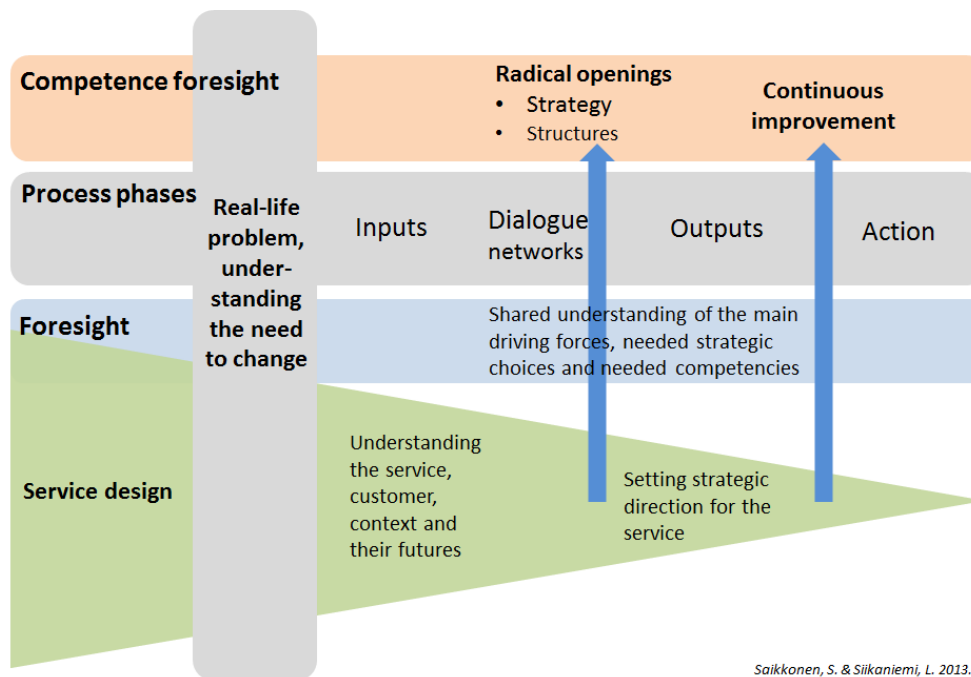
The linkages between service design and other processes in organization's performance are highlighted neither in practice nor research. In this paper we have accomplished to demonstrate the linkages between service design process and competence foresight process both in theoretical and practical discussions and visualizations.

MODELLING THE LINKAGES BETWEEN COMPETENCE FORESIGHT AND SERVICE DESIGN PROCESSES

The main objective of this constructive case study is to construct a model where the linkages between competence foresight and service design processes are visualized. The construction of the model is based on theoretical contributions and was built as part of the real life processes at Päijät-Häme Social and Health Care Group (PHSOTEY) and the ICT service unit at Lahti Region Educational Consortium.

Developing competitiveness of the organizations was set as the goal of service design process. The tools specified for achieving this objective were foresight work, ensuring competences and strengthening change management tools. In workshops efforts were made to establish the link between service design and competence foresight in more detail. As a result the interfaces between foresight, competence foresight and service design processes were established (Figure 2).

The figure shows the key phases of foresight and service design processes: inputs, dialogue, networks and outputs. The service design process produces inputs for the competence foresight process. The phases of foresight process is the basis for both service design and competence foresight processes.



Saikkonen, S. & Siikaniemi, L. 2013.

Figure 2: The CFSD-model

The main points of the model in Figure 2 are the following. *The starting point* for service design and competence foresight is identifying the problem and the need for change. Challenges to foster change might be the following: resources are inadequate for producing services in the current manner, or the service fails to fulfil the needs either today or in the future.

The inputs to the process include written and oral sources, as well as an understanding of the service and customer. Engaging in *dialogue and operating in networks-phase* produce understanding and common meaning for the required changes. Using these as inputs, the service design process builds a *service strategy*, which is used as the basis for planning the service's operating models, products, premises, systems and customer experiences. These are the *outputs of the service design process*.

The competence foresight process receives its inputs either 1) simultaneously with the service design process, providing the opportunity to produce radical openings for competence foresight that provide further inputs, for example for the strategy, or 2) as continuous improvement after the service strategy has been formulated. In which case the strategy and processes outline more detailed inputs for the competence foresight process.

Testing the model of competence foresight and service design (CFSD)

As stated earlier, the next step in the constructive case study is testing the conceptual model of competence foresight and service design (CFSD). The model was tested in two phases. First, in group interviews and workshops while the model was developed. Second, in the process of defining competence profiles to support re-organization of ICT Services in an educational organization. The real-life problem in the beginning of the process was that the services provided and the organizational structure of ICT Services did not meet the needs of the changes in educational processes. To tackle that challenge, a service design learning process was undertaken where new services were designed simultaneously with defining the competencies needed to produce those services.

Various sources served as inputs in the process: mapping service packages of the future, descriptions of future-oriented ICT service competencies that enable future services and dialogue with the customer to understand the need of the customer, foresight in mind.

The ICT service competencies were defined in a cooperative process involving the staff in the ICT service unit to the development work from early on. Extensive communication was undertaken from the beginning: the goals of the process were elaborated on, timeline and steps in the process were explained and the expectations for engagement of the entire staff were made clear. The first draft of competencies was done by managers. Feedback was sought throughout the organization and the competencies were discussed in teams. Based on feedback, the competence profiles were revised by the managers. The final profiles were inserted into the human resources information system, where the staff filled in the profiles. Results were discussed in group discussions in connection with the ongoing service design and strategy implementation process. Thus, competencies are linked concretely to the implementation of the strategy.

There were several critical success factors in the process of defining competences and service design. First, a lot of effort was put into explaining why the process was initiated and why it is important to look at ICT competences from the services point of view rather than traditional technology-driven point of view. Second, staff was actively involved in the process. This built understanding of why the transformation of the organization was needed and helped the staff understand why the new competence profiles were very different from the previous ones, which focused mainly on technical skills.

In conclusion, drafting the competence profiles in a cooperative process, based on the model of competence foresight and service design, enabled the organization to view the future of the organization from new perspectives. The managers and staff had to envision the future of educational processes and their role in future ICT services in advance and to realise that future services cannot be produced in the same way and with the same competencies as currently. A real change in designing future services based on understanding the customer's future needs is required.

CONCLUSIONS

The purpose of this constructive case study was to construct a model where the linkages between competence foresight and service design processes are visualized. The CFSD-model was constructed by implementing constructive research approach (see Figure 1).

The research process begun with identifying practical relevance problems through theoretical literature reviews and with practical experience of the researchers. The benefit of the construct is that the researchers have strong theory-based connection and practical experience in the areas of competence and foresight to inform a better design of the construct. The theory and practice of service design was supported by the specialists at Lahti University of Applied Sciences. The construct was also tested to cover the applicability of the model.

The CFSD-model has been used to visualize the two fuzzy concepts and processes to stakeholders who are not specialists in competence ensurance or competence foresight issues. The both processes require to succeed human sources, participation, networking and courage to create the future.

The study outlines in detail the interfaces between foresight, competence foresight and service design processes. The starting point for service design and competence foresight is identifying the problem and the need for change. The key phases of foresight and service design processes are: inputs, dialogue, networks and outputs. The service design process produces inputs for the competence foresight process. Service design and foresight processes feed inputs, both radical openings and continuous improvement (see Figure 2), to support the strategic renewal of the organisation. Competence foresight is the tool to turn these inputs into action.

In service design theory and practice today, focus is mainly on understanding the customer experience. This research highlights the starting point of service design and competence foresight to identify the real-life problem and the need for change. The inputs to the process include written and oral sources, as well as an understanding of the service and customer. Engaging in dialogue and operating in networks produce understanding and common meaning for the required changes. Using these as inputs, the service design process builds a service strategy, which is used as the basis for planning the service's operating models, products, premises, systems and customer experiences. These are the outputs of the service design process. Also, people need to connect the change drivers to their daily environment. Otherwise service design and foresight processes do not induce change into practices.

The benefits of the model is to support organizations in their strategic design. The researchers also highlight the need for individual foresight and individual future frameworks. After all, competent individuals design and make the future of the organizations. Change in individual thinking links competence foresight and service design - foresight insight do not materialize in strategic renewal if individuals cannot see them in their own personal context.

In future the CFSD-model requires simplification and more practical testing. Further research also requires multidisciplinary approach as the challenges and real-life problems the model aims to solve are also holistic. The use of the model develops understanding of the linkages between strategy and competence insurance. The use of the model provides also excellent opportunities of work-based learning for practitioners promoting strategic renewal of their organization.

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REFLECTING ABOUT THE NATURE OF SCIENCE THROUGH PHILOSOPHICAL DIALOGUE

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ABSTRACT

To increase the scientific literacy among students and to stimulate their critical reflection about science, educating about the Nature of Science (NoS) is crucial. NoS entails a focus on the central epistemological underpinnings of science, such as its realm and limits, its levels of uncertainty, its biases and the reasons for its reliability. Following the principles of design-based research we developed a teaching method to increase the understanding of NoS among (student) science teachers and to increase their didactic skills to address NoS in the science class. In our approach, the philosophical dialogue is used to elicit reflection about NoS. Observations and interviews of student teachers and teacher educators during and after the intervention show that the philosophical dialogue is promising as it helps to uncover preconceptions about science by making thinking explicit. However, mastering the philosophical dialogue takes time.

INTRODUCTION

Though we often hear the words “scientific proof” or “scientific certainty” in advertisements, journals or news broadcasts alike, the scientific reality is often much more nuanced. However, in order to understand these nuances a thorough understanding of the scientific process and its epistemological underpinnings is necessary. There is a need for school students to know about the ‘nature of science’ (NoS). NoS entails the epistemological underpinning of scientific knowledge, its levels of uncertainty, its realm and limits, its biases and the reasons for its reliability (N. G. Lederman, 2006). Explicit attention for NoS positively influences the conceptual understanding of science (Clough, 1997; Khishfe & Abd-El-Khalick, 2002), the critical sense and scientific literacy of students (Miller, 1998). Understanding the nature of science helps to go against misconceptions about science such as: “I don’t drink milk, because I heard a scientist on television say it isn’t healthy.” or “Since we cannot be 100% certain about every aspect of the theory of evolution, it must be wrong”.

In this paper we investigate how to elicit explicit reflection about the NoS by implementing the method of the ‘philosophical dialogue’. We focus on three research questions:

1. What is the nature of science?
2. What can be the merit of philosophical dialogue for NoS-education?
3. Which learning material allows addressing the nature of science in teacher training?
4. What is the attitude of students and teacher trainers with regard to NoS in teacher training?
5. Which context variables such as classroom organization and student characteristics influence the success of this approach?

Section 2 answers question 1, sections 3 tackles question 2 and question 3 till 5 are answered in sections 4 and 5. Finally the discussion is presented in section 6.

WHAT IS THE NATURE OF SCIENCE?

There are three aspects to science:

- a. Science is in part the body of knowledge of scientific facts, laws, theories,... This aspect of science is addressed explicitly in all science classes and receives the most attention.
- b. Science is also in part the scientific method of questioning, hypothesising, testing, and concluding (and repeating). Recently this aspect of science is receiving increasingly more attention in the classroom, through hands-on experiments, group projects,...
- c. The third, and often forgotten, aspect of science involves knowing about the characteristics of scientific knowledge (N. Lederman & Abd-El-Khalick, 2002). The latter is referred to as the nature of science (NoS). NoS is often only addressed implicitly within the classroom. This is unfortunate as this lack of attention to NoS gives rise to a number of misconceptions about science and impedes the development of students critical thinking skills (Abd-El-Khalick, Bell, & Lederman, 1998; Akerson & Donnelly, 2010; N. G. Lederman, 2006).

NoS consists of many aspects, below a non-exhaustive list is presented:

- **Tentativeness** Scientific knowledge can and will change as new insights are obtained. Theories are adapted, laws are made more precise, a different classification scheme reveals new underlying principles,...
- **Empirically based** Empirical observations are a fundamental part of science.

- **No roadmap** There is no universal roadmap to doing science. This is true across different disciplines, a biologist approaches a question differently than a physicist, but also throughout history. New techniques are needed to advance science.
- **Observation \neq interpretation** Observations are made by our senses, from these observations hypotheses are formulated adding an interpretation to the observation. The same observation, looked at with a different theory in mind, may lead to different interpretations.
- **Creativity** Formulating research questions, setting up a research design, formulating hypothesis, development of new research equipment,... all require the creativity of scientists.
- **Objectivity** While scientists strive for objectivity, science is still a human endeavour bringing subjectivity along with it. The choices a researcher faces are always answered from his point of view.
- **Historical and cultural context** Science is performed at a given moment in time, in a certain cultural context. This context will affect the choices and the execution of the research.
- **Social** Science is a group effort. Even research that is done by a single researcher only becomes part of the body of scientific knowledge after it has been shared (e.g. through a publication in a peer reviewed journal).
- **Technology** Science and technology are in constant interaction with each other. Advancements in one lead to advancements in the other and vice versa.
- **Ethics** While the applications that follow from scientific discoveries can have a positive or negative influence on the world/humanity, the scientific knowledge as such is neither good nor bad.

A PHILOSOPHICAL REFLECTION-METHOD TO DISCUSS NOS

As a matter of fact, each science lesson can be a lesson about NoS if attention is paid to the way scientific discovery takes place, the importance of observation and the relation between science and technology. Research of Akerson points out that explicit attention is needed for students to make connections between the science activity they are carrying out and the central aspects of NoS. If this does not happen, they will not get insight in the way science works (Akerson & Donnelly, 2010). To facilitate the way of teaching about NoS and reflection about NoS a specific way of asking questions and a specific method to stimulate discussion is proposed in this publication. The method is called philosophical dialogue and can be integrated within classic contextualized or decontextualized NoS-activities (Schjelderup, 2009). In a philosophical dialogue, a group of students discusses about a thought-provoking question by exploring the coherence and relevance of arguments. Dialogue is guided by the teacher who takes the Socratic stance, which means that no answers are given by the teacher, but only questions are asked to the participants (Wenning, Holbrook, & Stankevitz, 2006). This way, students are stimulated to develop their own thoughts and ideas (Lipman, 1991, 2003). Success of philosophical dialogue depends on the appropriate use of specific question categories by the teacher.

The method proposed in this publication consists of different steps (figure 1). It starts with a stimulus which can be contextualised or decontextualized and sparks reflection about the NoS. The stimulus is concretely realized in specifically designed learning material. The stimulus makes it possible to come up with a specific philosophical problem or question. In fact, philosophical dialogue always starts with such a philosophical problem or question. In the method proposed in this article the question arises naturally from the stimulus. Examples of such questions are: Is creativity important for a scientist? What is the difference between observation and interpretation? Can a scientist ever be sure? Are

scientists' results subjective? These questions can drive an exploration into the realm of NoS. The questions can be formulated by the teacher, but also by students.

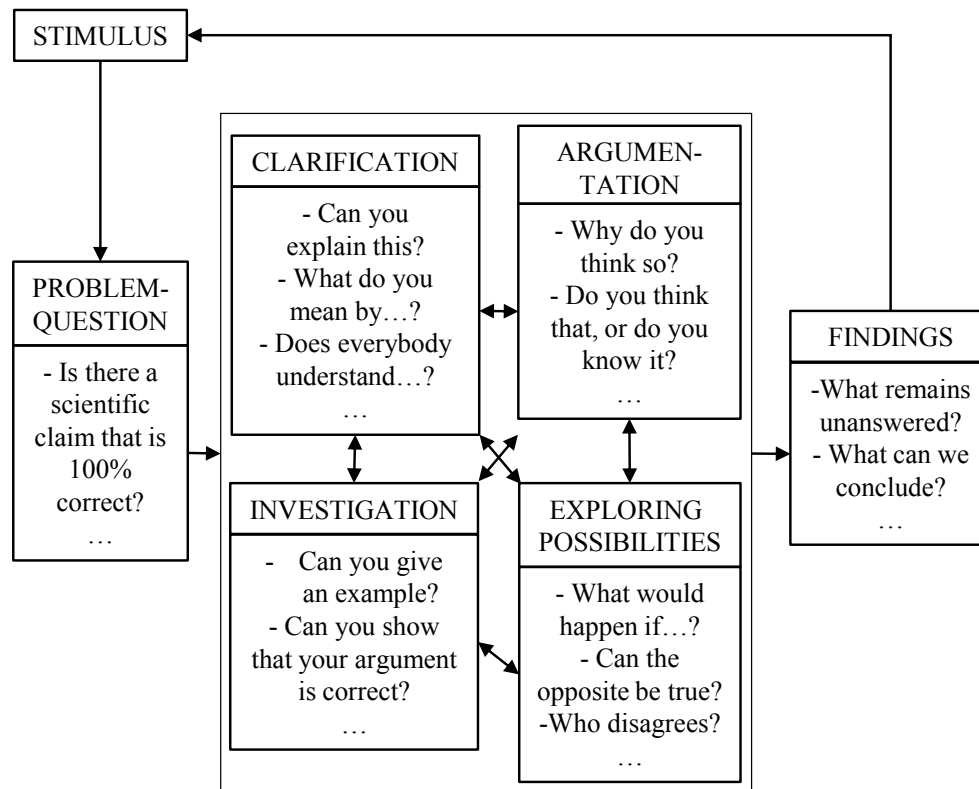
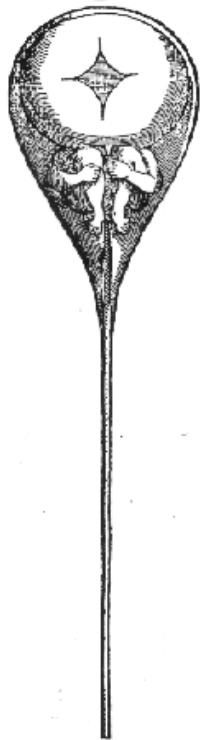


Figure 1: Distinct steps of the reflection method with examples of relevant questions

After probing the question, students explore possible or hypothetical answers. The teacher plays an important role during this exploration by asking different kind of questions. The aim of this dialogue is to explore the relevant assumptions and ideas of the students, in order to stimulate reflection about the NoS. The questions and the dialogue itself do not follow a strictly linear pattern (figure 2), but at least 4 categories can be distinguished.

1. Through questions such as 'What would happen if...?', or 'Can the opposite be true?' students are stimulated to explore different answers and hypotheses with regard to the central question.
2. Through questions such as 'What do you mean by...?', or 'Can you explain...?' students are stimulated to clarify the concepts they are using. Key concepts to be explored can entail the meanings of truth, science, interpretation, etc.
3. Through questions such as 'Why do you think so?' or 'Are you sure of this...?' students are stimulated to make arguments to buttress the answers they give. By asking for examples and by exploring the logical coherence of the arguments students explore and investigate the reliability of their arguments and answers. After the relevant ideas have been explored in the community of dialogue through different cycles of argumentation, clarification and investigation, the findings of the students can be listed.
4. The teacher can try to summarize the ideas, and tries to come to a conclusion. The findings will seldom have a final character: a new cycle of reflection can then start and the new list of questions becomes the beginning of a new investigation. It is also relevant to pose the following question by the end of a reflection cycle: 'Which questions are still on the table?'

This question stimulates students to get insight into the fact that science is not dominated by one certain method, and that different options are possible.



Facilitator: Can a scientist see without making an interpretation? (Problem)

Student 1: No, a scientist who sees a homunculus in a sperm cell shows that scientists are always interpreting and can never just see.

Facilitator: What do you mean with interpretation? Can you give a definition? (Clarification)

Student 1: Interpreting means that you explain what you see.

Facilitator: Does everyone agree that a scientist is always interpreting? (hypothesis formulation)

Student 2: I disagree. I think that only bad scientists don't make the difference between thinking and perceiving.

Facilitator: Why do you think so? (Argumentation)

Student 2: Because a scientist can only know something if he watches the world without prejudices.

Facilitator: Can you give an example? (Investigation)

Student 2: For a long time people thought that fossils were ancient monsters. Only by leaving the prejudice that there can be monsters, scientists were able to discover the truth about fossils.

Facilitator: Does everyone agree?

...

Figure 2: Example of a short philosophical dialogue elicited following the steps of the reflection model based on philosophical dialogue. The stimulus is the drawing by the 17th century Jan Hartsoeker of a sperm cell containing a small man, a homunculus.

RESEARCH DESIGN

To assess the applicability of the proposed method, a design-based research approach was followed (Plomp & Nieveen, 2007). This means that an initial didactical design is built up in collaboration with science education experts. In a second stage of the research the interventions are tested out in several classes through several cycles. After every cycle conclusions are drawn to improve the design of the intervention and to provide a (preliminary) assessment with regard to the impact of the approach. In a final stage the developed method is tested on a larger group of respondents, allowing for quantitative assessment.

In this study the initial didactical design was tested in two cycles on teacher students in pre-service training (bachelor degree in primary or secondary education). In the first cycle two classes of Belgian university colleges (UCLL and Vives) were involved. These classes had 8 and 41 students. The intervention consisted of a series of exercises aimed to elicit/bring forth students' insight in NoS. These exercises were:

- "Dressing up a scientist" – the students were asked what feature makes a scientist.

- “Dinosaur” – the students were presented with a picture of some bones and were asked to construct the dinosaur from which these bones originated. This led to a discussion on the tentativeness of science, the social and historical context in which science happens, the creativity which is needed in science, and the difference between interpretation and observation.
- “Wolves” – a movie fragment is shown where someone hears a sound in the woods and concludes that there are wolves around. This exercise also led to a discussion on the tentativeness of science and the subjectivity that is inherent in science.
- “Black box” – the students are presented with a sealed container and have to figure out what is inside (without opening the container). They formulate some hypotheses and perform basic experiments. They can however never know what is truly inside the container.

In the second cycle a total of three classes were involved. These classes came from three Belgian university colleges (Odisee, UCLL and Vives) and had 14, 8 and 26 students respectively. Again a series of exercises was used to teach involved students about NoS. These exercises included the first two exercises of the first cycle and one additional exercise.

- “Particles of matter” – Students are presented with different theories on the constituents of matter as they have been conceptualized over the course of history (ranging from models of Empedocles to work done at the LHC concerning the Higgs Boson). This exercise led to a discussion on the tentativeness of science, the social and historical context in which science happens, the creativity which is needed in science and the empirical nature of science.
- “Classification” – Students are presented with a number of beads (with different colours and different sizes, with and without holes), and are asked to classify them. This exercise leads to a discussion on the subjectivity which is present in science, the lack of roadmap to doing science and the therefore needed creativity.

RESULTS

Although the final research cycle is not yet completed (including the quantitative assessment), the already performed research cycles allow us to pinpoint some interesting observations concerning research questions 3 to 5.

Learning material

The use of questions and dialogue stimulates engagement and motivates students to keep looking for an answer. Two consecutive exercises tackling the same NoS issue, though, can lead to saturation among some students, decreasing their engagement. Exercises (the wolves) that do not allow students to connect with their existing knowledge of science were appreciated less by both students and teacher trainers.

Attitude of students and teacher trainers

Most students were engaged during the interventions because, as they reported, the presented approach was novel and encouraged them to think. One student reports: “*You learn to think, deeper and further than usual.*” Some students expressed frustration. “Blackbox” in particular was reported by many students as frustrating. A common remark on the post-intervention questionnaire was: “*It was unfortunate that the boxes could not be opened.*”

Most students feel they are, after an intervention of two hours, not yet prepared to teach NoS, nor do they feel prepared to use philosophical dialogue as a didactic tool. On the question ‘Do you have the feeling that you could teach NoS?’ a student responded: *“Not yet. Maybe after a few sessions. I have to practice more on keeping the conversation going.”*

In the classes of pre-service secondary education teachers, male students were more engaged than female students. The discussions in all-male subgroups (the students were divided into smaller groups to work on specific assignments) were of a higher philosophical complexity than in the all-female subgroups.

Context variables

Some teacher educators reported that a frontal class configuration (i.e. where the teacher stands in front of rows of students) does not allow a fruitful discussion. A circular configuration, where the teacher sits in a circle together with the students, is experienced as allowing more discussion.

Background knowledge of both students and teacher has an impact on the quality of the dialogue and on the direction in which it goes. When the exercises used to initiate the NoS discussion (stimulus) are within the interests and closely tied to the background knowledge of the students, they were more engaged and able to draw from their background knowledge, enriching the discussion with apt examples. The facilitator (teacher trainer or student during assignments in smaller groups) must be able to follow the train of thought of the participants in the discussion group. Additionally, the facilitator must be able to steer the discussion in a direction interesting for NoS reflection. The presented didactic approach may not lead to the confirmation of misconceptions. Hence, experience and adequate background knowledge are necessary.

DISCUSSION

Introducing NoS in science education is challenging, but a challenge worth being undertaken in order to develop a deeper understanding of science in the new generation of citizens. In the study presented in this article, we have focused on an approach based on philosophical dialogue. This approach is currently being tested with the target group of pre-service teacher students for primary and secondary education. Our experience with the first research cycles has shown that the approach, meant to encourage discussion on NoS, really triggers students to think and engages them in fruitful discussions. A quantitative measure of gained NoS insight in students has not yet been performed, since this is the goal of the final research cycle which is now starting. Qualitative observation during the first cycles has pointed to a series of contextual factors appearing to enhance discussion on the specific NoS issue being considered. In particular, coupling between background knowledge of both students and teacher and the used stimulus, classroom configuration, and female-male differences have been identified as possible relevant external factors during the first phase of our tests. These should at the moment be considered only as first indications. Further research is needed to investigate new research questions arising from these observations.

Concerning the structure of the learning material used as NoS stimulus, our first results point to the choice of one more elaborate exercise over two smaller exercises as the most effective in inducing NoS reflection on a specific NoS aspect. Learning to lead a philosophical dialogue to achieve reflection on NoS is clearly not an easy task for teacher students. In order to allow transfer of the dialogic method from teacher training to the classroom, more practice in leading a philosophical

dialogue is needed for students. Additionally, it is clear from our results that time is needed for students to develop insight in NoS.

We conclude that addressing NoS is necessary both in the classroom and in pre-service teacher training, and that in the latter enough time should be foreseen for students both for developing NoS insight and to master the needed dialogic techniques. However, it is important to stress that the link between NoS assignments and science must at all times be clear to students and pupils, in order to make sure that the discussions are experienced as a worthwhile lesson rather than a game or entertainment. Philosophical dialogue is an interesting and worthwhile addition to the classical attempts to teach about NoS. In fact, philosophical dialogue may be considered as a part of the practice of science, for instance when discussing hypotheses that can be tested, and its introduction in the science classroom allows for deeper science learning and literacy.

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ANONYMOUS APPLICATION PROCESSES

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ABSTRACT

For some groups it is difficult to get a job interview, least to get a job - they are discriminated against (e. g. women, ethnic minorities, older workers, disabled persons). Some research projects (Aslund/Skans 2007, Bertrand/Mullainathan 2004, Krause et al 2012) have shown that anonymous job application processes (AAP) may lead to a decrease in such discrimination and thus increase the chance to get a job interview. This research led to our practice project in which we are currently building a (pan-european) platform. Candidates may register and fill in information that really matter in job relations. In a later stage, this candidate profile can be matched with the vacancies that companies need to fill. This paper takes a look at the situation at the labour market, shows how application processes work and where discrimination may occur. We will shortly investigate political measures and then propose our idea.

INTRODUCTION

Jobseeking and filling vacancies are supposed to be dependant on supply and demand and they “meet” at the labour market. There is indeed a lot of labour connected to the processes of applying for jobs on the one side and on recruiting suitable candidates on the other side. An online survey from YouGov in 2014 revealed that an (accumulated) 78% of applicants invest up to 3 hours per application and they write up to 40 of them. And although most of application processes are happening online, the amount of work also for recruiting companies – including posting the ads, communication with applicants, matching the application to the job requirements, interviewing the applicants etc. – is very high. As is the risk of a wrong decision in hiring – for example hiring an inadequate candidate or rejecting an adequate candidate (cf. Kanning 2002).

In Germany, one million job vacancies on average are reported each year. Job seekers and hiring companies are forced to find each other by a) documenting their work and life experiences in their CV and writing motivational letters that explain why they are suited for the job and why they are desparately longing to work for just that company (candidates) and by b) trying to press the complex combination of tasks of the job, candidates’ requirements in the areas of professional, personal, methodic and social competences as well as a detailed description of the best company and their ideas and values into a one-page-ad. The effect of this practice is about a few billion²⁶ euros each year for the german national economy as estimated by Ernst & Young in 2011.

APPLICATION PROCESSES

Generally, we can identify two streams of application processes: a) the traditional way, where candidates apply for job openings and b) a new trend of recruiting where companies more or less “apply” or “headhunt” candidates that have special talents. We shall take a look at both of them, but focus on the traditional way.

Traditional way

A very simplified process of job application as is common in most countries (Kanning 2012) is presented in Figure 1:



Figure 1: Simplified job application process (candidate’s view)

Candidates search (and find) a job opening that they find attractive and feel themselves suited for. They compose an application and submit it to the hiring company. After a period of time, they are either invited to a job interview or they are refused. As a last step (for now), they receive a letter of acceptance or of refusal.

²⁶ 3.000 medium-sized businesses estimated a sales loss due to the shortage of qualified employees of about 30 billion euros.

On the side of the hiring company, we have a similar process – again very simplified – depicted in Figure 2.



Figure 2: Simplified job application process (HR view)

We should keep in mind that we are – as mentioned above – in a market with supply and demand. Companies “supply” the job and meet the demand of many candidates who submit their applications. The logical choice is to select who is suited best for the job but with maybe several hundred of applications the selection has to be fast²⁷.

New recruiting trends

As already mentioned, there is a trend for the so-called “active sourcing”, which in short means that companies are actively searching for candidates on special (CV-) databases (e.g. LinkedIn). Usually these positions require special talents and/or training and due to several big (global) trends like digitalization and demographic change, there is a higher demand at companies than there are candidates able to fill the positions. The candidates are approached or headhunted via these databases or by headhunting agents. This trend reflects the ongoing “War for talents” among companies and whole economies (Dannhäuser 2015).

Discrimination during application processes

Due to the lack of time on the side of hiring companies, a lot of bad or wrong decisions are being taken by HR staff. Those mistakes are the alpha- and the beta-mistake²⁸ of hiring processes: a) candidates that are unsuited for the job get accepted and b) candidates that are suited for the job are rejected. Often, these mistakes can be linked to discrimination. In order to not accidentally misjudge the HR staff, we have to keep in mind that this happens under a lot of (time) pressure and that we can roughly discriminate between two forms of discrimination: a) statistical discrimination and b) prejudice-based discrimination. While the statistical discrimination applies the lack of information about an individual to salient characteristics of groups that the individual belongs to, e. g. young people often lack affect control, the prejudice-based discrimination is based on personal preferences, e. g. someone does not like blue shirts.

²⁷ Hesse/Schrader (2014) estimate an average of 1,5-2 minutes time to judge and select.

²⁸ Derived from the terms of empirical research when deciding on whether hypotheses are true or false.

Table 1

General aspects of statistical discrimination (cf. e.g. Akman, Gülpinar, Huesmann, Grell 2005)

Who is discriminated against?	What are the prejudices?
People with names that sound different from „normal“ national names	Low work ethic,
Senior/older job seekers (>45)	No drive anymore
Women with child	Not flexible, not willing to work overtime
Young women	May want a family and be long gone for maternity leave
Different sexual orientation/identity	Personal preference of hiring manager
Health problems / challenged persons	Less performant
Different religion / ideology	Personal preference of hiring manager

Table 1 lists a few groups that are often discriminated against with the common prejudices of the group they belong to. Although this is true for Germany, other countries have found corresponding results, e.g. America (Bertrand, Sendhil 2004, Darity, Mason 1998), Sweden (Åslund, Nordström Skans 2012) or the Netherlands (Bog, Kranendonk 2011).

In reference to the differentiation between a traditional way and the new trend, it could come to mind that any kind of discrimination can only be found in the traditional way of application processes, but the basic propositions are true for both ways. The main difference is that recruiters on CV databases may discriminate without any ‘applicant’ may notice that he or she has been discriminated against.

Political measures against discrimination

Of course, politics have recognized these discriminations and thus passed laws to ensure certain standards of equality.

We will take a short look at some selected countries and their actions²⁹:

- *Germany*: Allgemeines Gleichstellungsgesetz (General Equalisation Act) (2006) This act prohibits discrimination of applicants in regard of their race or ethnic heritage, gender, religion or ideology, disability, age or sexual orientation. However, affirmative action, i. e. the positive discrimination to level out disadvantages due to group affiliations, is allowed.
- *France*: Loi du 31 mars 2006 pour l'égalité des chances (Law of the 31. March 2006 for the equality of chances) Installed due to the revoltes in French suburbs, this law was primarily (but not restricted only to) targeted to young immigrants and youth from socio-economic lower levels. Generally, all kinds of inequality of treatment in the matters of access to employment, housing, goods and services, care and social services as well as education and training are prohibited. An agency (Defender of Rights) has been installed and can be called to by victims of discrimination.
- *Sweden*: Prohibiting of Discrimination Act (2003). "The purpose of this Act is to counteract discrimination that has a connection with the following grounds of discrimination: ethnic background, religion or other belief, sexual orientation or disability", (Ministry of Justice, Sweden, 2003) The acts of discrimination that are prohibited in Sweden are a) direct discrimination, b) indirect discrimination, c) harassment and d) instructions to discriminate.
- *Netherlands*: Equal Treatment Act (1994) This act prohibits direct discrimination against persons on the grounds of religion, belief, political opinion, race, sex, nationality, heterosexual or homosexual orientation or civil status. Nevertheless, Affirmative Action is allowed in special cases, mostly to protect or support minorities.
- *USA*: Civil Rights Act (1964). Title VII of the Civil Rights Act "prohibits employment discrimination based on race, color, religion, sex, or national origin" (U.S. Equal Employment Opportunity Commission (EEOC)).
- *Canada*: Ontario Human Rights Code (1962). Already two years before the USA passed the Civil Rights Act, Canada prohibits actions that discriminate against people based on a protected ground in a protected social area, among which we also find 'employment'.

As we can see, equality and anti-discrimination is an important topic and is widely recognised by politics worldwide. Nevertheless, there are a few differences, e. g. in the way that discrimination is defined or the time those directives have become the law. Yet, what has been passed as law and which is the legal base shows the intentions and the theory of anti-discrimination ideas. In practice, there are measures to counter them. For example, it is common use in Germany to submit your application with a) a cover letter, b) CV with professional photo and c) relevant reports and certificates³⁰ (cf. Hesse, Schrader 2014). With the information in these documents, the attributes that carry the possibility of discrimination (cf. Table 1) like age, gender, name etc. are freely given. As a result, a candidate with an affiliation to one or more of those groups who gets rejected, will be officially rejected on professional reasons, since the hiring company does not risk to be sued for the reason of discrimination. However, some companies offer an 'honest' feedback on the phone that a candidate is e.g. too old.

²⁹ This list cannot be complete for several reasons: every country has not one but many laws and acts against discrimination, so that the ones mentioned are the most important for that country. The highlighted countries were selected due to some unique features and/or ideas and to bring to mind that countries that are close to one another have different ways to express their social values on discrimination.

³⁰ This actually refers to the common use, which may vary over time, for certain career steps and/or job sectors, e.g. a lot of candidates add a "third page" stating their motivation and work preferences.

Taking into account all the arguments above, we may draw a preliminary conclusion: In the labour market we have job seekers and hiring companies and both sides agree that the recruiting process is exhausting and difficult. However, there is a certain amount of vacancies to be filled and yet a large potential of possible workers has none or little opportunity to get those jobs – they are discriminated against, even though politics try their best to install laws and acts of equal treatment. At this point, we want to suggest one measure that we believe may be one solution to that complex problem: anonymous application processes.

ANONYMOUS APPLICATIONS

The recruiting process of anonymous applications is the same as the usual application project as mentioned above. The difference lies in the second step ‘view applications’ (cf. Fig. 2). The discriminating information are taken out of the applicants’ documents, which means that the HR employee can base his or her decision on the qualifications and former working experiences of the applicants. However, that may be not enough information to take a decision to invite the applicant to an interview and there will hardly be enough time to invite everyone to an interview. We suggest to integrate one or more of the following aspects.

Additional information replacing personal data

If you are missing personal data and do not have a picture or any other personal information in front of you – what can you rely on if you are to judge if a person is qualified for the job? An overview of numerous job opening ads of various companies among different industries and a short own research among HR managers about the hiring criteria has led to the identification of the following aspects that we would suggest to include in AAPs.

Grades, degrees and certificates

Already used in the application processes are the grades, degrees and certificates of applicants. This may be an indicator for achievement motivation and gives an overview of strengths, skills and knowledge of applicants. In order to be anonymous, the relevant personal information needs to be blackened.

Professional experience

As for the aforementioned aspects, the same is true for professional experience in the form of job references. In those documents, HR employees find the details of work experiences of applicants and also how the performed tasks have been conducted³¹.

Personality indicators

Some companies already use tests in their application processes. The use of personality tests like the NEO-PI-R (Costa, McCrae 1985) require of course the authorized approval of applicants.

³¹ In Germany, HR departments have developed some kind of code within the references, due to jurisdiction stating that no negative statement are allowed in job references. That is why also negative aspects are exalted, e. g. are mentions of ‘effort’ an indicator that there was effort but it was fruitless.

Company culture / candidate-fit

What is missing in job opening ads but is a crucial point according to HR employees, is if the candidate fits into the company. The company values and cultures are described, e. g. at the company website, but the fit is often only estimated by gut feeling during interviews (cf. Bklich, Jeff, Carless 2012). We suggest to put this step already into the steps before the interview via tests.

Chances and reservations of AAP

Most people say that AAP only leads to a delay in the rejection. This is true in parts. There are studies showing that once you get to the second step – the interview – the discrimination rate decreases (Darity, Mason 1998).

Candidates are voicing an acceptance of AAP in Germany, to be precise about 13,2 percent of applicants in 2010 and 18,2 percent of applicants in 2011. While in 2010 11,7 percent of candidates thought that anonymous applications would increase their chances in the application process, in 2011 this number rose to 16,6 percent (Laumer et al. 2012). For us, this indicates a trend and an opportunity for anonymous application processes.

A pilot project from the Federal Anti-Discrimination Agency (Antidiskriminierungsstelle) in Germany showed that companies are a bit more hesitant. Although the participating companies reported that they were able to find hidden potentials among candidates, they did not have a comparison group to judge, if they would not have found those candidates anyway (Kruse, Rinne, Zimmermann 2012). Other reasons for their reservation are a) a higher effort to anonymise the application documents³², b) anonymization leads to less applications and c) anonymization is incompatible with affirmative action.

We may object these reservations by stating that a) the anonymization could be outsourced to a third party³³, which b) would not affect the amount of applications and c) measures for affirmative action could be implemented in the process, if the hiring company reveals the criteria.

OUR PROJECT

Our research and practice is concerned with the question what the predictors are that are important to match a vacancy with the competences and qualifications of candidates. So far we have identified a) a few personality indicators (“Big five”), b) the grade(s) and degrees of candidates, c) professional experience (in years) as well as d) the company-culture-/person-fit. Whereas some of these factors seem to be more easily assessable, it is quite difficult to create an account that delivers all information necessary and at the same time be as anonymous as possible to increase fairness. Another objection is that the assessment of all of these factors is not only certainly taking its time to establish and validate, but also takes a lot of time for each individual to complete.

³² If not conducted automatically and a posteriori, the anonymized personal data has to be separated from the reports at first, then put back together later. Also, every hint for personal data has to be erased or blackened.

³³ This will indeed result in additional costs, which should still be lower than to do this task within the company.

Our Vision

We thrive to bring AAP to marketable and competitive success. Having backgrounds – among others – in adult education, we know of the positive effects of work for the mental wellbeing of individuals. Also we firmly believe that the success of this project may help build win-win-win-situation for a) the candidates that can finally get a job, b) the hiring enterprises for filling their vacancies with well-suited persons, c) the national economy by lowering transfer payment and raising income tax as well as sinking national economy indexes like unemployment rate.

Our Mission

Part of our mission is to stand against the trend of recruiting by recommendation and the hyped self-portrayal application by offering an attractive, manageable and fair alternative. Another part is to support hiring managers and companies to make better, more precise selection of candidates by fading out those attributes that offer no value to the judging process.

Since we are in a pre-study and conceptual phase, we can only report what we intend to do and how. First, we are currently building a knowledge base, collecting existing research on the topic of anonymous job application processes: how they work, what the effects are and how they are accepted by candidates and companies. Furthermore, we are going through the different legal aspects in various countries, we take a look at various best practice projects and companies that already work with AAP and we examine the trends of labour markets.

In the next weeks, we will conduct a few smaller pilot studies in that area (e. g. structured interviews with staff managers/employers, questionnaires for job-seekers) and we are thinking about monitoring the success rate of people that have a whole anonymous profile versus those that have a partially or non-anonymous profile.

CONCLUSION

Anonymous application processes are a possibility to reduce discrimination and thus giving equal chances to groups that have disadvantages in getting jobs. Although politics around the world are concerned with this problem and also have passed laws to counter discrimination, companies have found ways to annul the statutes without breaking the law.

When looking to and comparing with other countries on the one hand and the rising demand of applicants, we believe that AAPs should have good chances of becoming a default way of applying for open positions. The processes we have in mind – taking into account the additional information replacing personal data – are also enabling the use of both traditional application processes and the recruiting trends of active sourcing. Still, we are aware that we are acting in diverse areas of conflict, stretching from politics to business administration to national economies to further education and that we are challenging established traditions and norms. But as already mentioned in our vision and mission, we believe that equal chances are worth our efforts.

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HOW TO OPTIMIZE THE HONOURS EDUCATION IN A UNIVERSITY OF APPLIED SCIENCES IN THE NETHERLANDS

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ABSTRACT

Over the last years, an increasing number of Dutch universities of applied sciences have developed honours programmes for the more motivated and talented students wanting to do more than the regular bachelors programme. Honours programmes differs from regular Bachelor degree programmes, but it is less clear where precisely the emphasis should lie. This study seeks to gain insight into the factors that honours education must meet in order to provide students with a good education. In an empirical study conducted at Saxion University of Applied Sciences in the form of a questionnaire in 2014 and 2015, we identified the factors that are important for providing a high quality of honours education. The study showed that high demands and the quality of the selection procedure appear to be decisive factors in the level of reflective thinking of students achieved and student satisfaction.

INTRODUCTION

Honours education is becoming a more common element of higher education in the Netherlands. The honours education offers students at many universities of applied sciences (in Dutch: *hogescholen*) a new challenge in their education. However, precisely what effect it is having on the students themselves, their lecturers and their learning environment is often as yet unclear (Lappia, 2015, Wolfensberger & Pilot, 2014). Besides that, most of the research done in honours education is explorative and small of scale (Theme periodical *Tijdschrift voor Hoger Onderwijs*, 2014). Honours education differs from regular Bachelor degree programmes. But where exactly should the emphasis of these courses lie? This longitudinal study seeks to gain insight into the criteria that honours education must meet in order to provide students with satisfactory education. An empirical study carried out at Saxion University of Applied Sciences since 2011 identified the factors that are required to achieve this, based on two questionnaires in 2014 and 2015. The results of the 2014 questionnaire are already published in the Conference proceedings of 2014 (Truijen, 't Mannetje, Banis, & Gellevij, 2015). Parts of this article are similar to the previous proceeding, but this article is extended with the new results and insights based on the questionnaire of 2015 and the comparison of the results of both years.

CHARACTERISTICS OF HONOURS EDUCATION

This study focuses on the factors that must be in place in order to provide good honours education. The selection and operationalisation of these factors is based on their relevance for the specific educational context of this study, namely higher education in the Netherlands, in which honours education is still comparatively new. We therefore sought first to identify the factors that could potentially be of importance in this context, using a literature-based study.

Firstly, literature on the subject of honours education argues that a careful selection of honours students is a key factor determining a good standard of honours education. An evaluation of honours programmes (Van Eijl, Wolfensberger, Schreve-Brinkman & Pilot, 2007) found evidence of a negative image occasionally being associated with the selection of honours students. A selection process can have a stigmatising effect (Van Eijl, Wolfensberger, Schreve-Brinkman & Pilot, 2007). It is therefore crucial to plan such procedures carefully. Not only must the right students be selected, but all the students must be properly dealt with and given the sense that the selection process is both clear and fair. Greenberg (1987) argues that the quality of a selection process is determined by whether this procedure is honest and fair. Fairness also implies transparency and equal treatment of the students. In our study, based on the literature we expect that the *quality of the selection process* is a decisive factor for good honours education.

Secondly, Van Eijl, Wientjes, Wolfensberger and Pilot (2005) state that honours education should be substantively different from regular Bachelor degree programmes, both in terms of the teaching methods used and in terms of their content. Maker and Nielson (1996), for example, indicate that talented students want 'open-ended' assignments, and Clark and Zubizarreta (2008) also argue that the didactic approach applied to these students should be substantively different. This study defines 'being substantively different' as *distinctive from the Bachelor degree programme* and we assume that the degree to which honours education is distinctively different from the Bachelor degree programme influences its quality. Moreover, as well as wanting different teaching methods, talented students also want a wide diversity of teaching methods (Van Eijl, Pilot & Wolfensberger, 2010). This diversity in teaching methods motivates students to develop different learning and working strategies and ensures that honours education offers a varied programme. Moreover, in common with Van Eijl, Pilot and

Wolfensberger (2010), this study assumes that *diversity in teaching methods* influences honours education.

Relevant literature also assumes that the assignments given to students enrolled in honours education must be vocationally-based (Maker & Nielson, 1996). These may be either assignments derived from the world of work or assignments whose results can be directly used in work-based environments (Van Eijl, Pilot & Wolfensberger, 2010; Schutte, Weistra & Wolfensberger, 2010). This study assumes that the degree of *vocational or practical orientation in the assignments* is another factor defining good honours education. We also assume, based on relevant literature, that good honours education must embrace *complex activities* (Maker & Nielson, 1996). Scager (2013) states that students can be challenged to achieve at their top by a combination of: (1) assignments that stimulate high order thinking and creativity and (2) self-directed learning methods like problem based learning.

Literature on the subject also shows that it is important to establish a community within honours education (e.g. Van Ginkel, Van Eijl & Pilot, 2014; Van Eijl, Pilot & Wolfensberger, 2010; Clark & Zubizarreta, 2008). The study identified *degree of community* as another characteristic of good honours education, together with *a focus on communication* within the group. Other decisive factors identified were *autonomy*, *the quality of feedback* and *high demands*. Wolfensberger (2004) then indicates that honours students require a degree of autonomy. Other studies also emphasise the importance of freedom of choice for honours students (Wolfensberger, 2004; Wind, 2009; Schutte, Weistra & Wolfensberger, 2010; Scager, 2008; Sternberg in: Van Eijl, Pilot & Wolfensberger, 2010). This freedom of choice or autonomy should not, however, result in complete freedom. Even excellent students need structure and deadlines (Wind, 2009). Next, literature shows that it is important for honours students to get regular feedback from their tutors (Seifert, Pascarella, Colangelo & Assouline, 2007; Van Eijl, Pilot & Wolfensberger, 2010). If students are given useful and targeted feedback both about end products and about the process itself, they can develop themselves more effectively (Van Eijl, Pilot & Wolfensberger, 2010). Although honours students often enjoy working together, according to Maker and Nielson (1996) they nevertheless like to be given individual feedback (both positive and negative). Feedback need not however by definition be given by lecturers. Peer feedback (Van Eijl, Wientjes, Wolfensberger & Pilot, 2005; Seifert, Pascarella, Colangelo & Assouline, 2007) and feedback given by people from the work-related area itself (Van Eijl, Pilot & Wolfensberger, 2010) are also considered good and meaningful forms of feedback. It is however important for lecturers to continue regularly giving feedback (Seifert, Pascarella, Colangelo & Assouline, 2007; Van Eijl, Pilot & Wolfensberger, 2010). This can have an incentivising effect, both on students and on their lecturers. Finally, honours students also differ from regular Bachelor degree programme students in their need for a challenge (Wolfensberger, 2004). This means that lecturers must have clear criteria in mind governing what they expect of their students. Tomlinson et al (2003) point to the importance of encouraging students to work at the next development level up. This means that they work at a slightly higher level than they are able to do independently, and are supervised, assisted and encouraged to become increasingly self-reliant. Honours students differ in this from the 'average student' in that they need a higher rate of progress, less repetition and a greater intellectual challenge (Scager, 2008). The demands that can be made of these students are therefore higher.

In sum, it can be concluded, building on the relevant literature, that the following aspects must be addressed for honours education: quality of the selection process, distinctiveness from the Bachelor degree programme, diversity in the teaching methods, practical assignments, complex activities, community, a focus on communication within the group, autonomy, high quality feedback and high demands.

Research model

Good honours education is defined in this study on the basis of the profile of the Reflective Professional towards which the honours programmes (HPs) at Saxion University are designed to lead. The ability to reflect is an important skill within this process. Kember, Leung, Jones and Loke (2000) make a distinction between different levels of reflection. The constructs used in this study for measuring good honours education are derived from Kember's (2000) 'levels of reflection'. Kember et al (2000) have identified four constructs that cover reflective thinking. These comprise: habitual action, understanding, reflection and critical reflection. Habitual action is 'that which has been learnt before and through frequent use becomes an activity that is performed automatically or with little conscious thought' (p.383). Drawing on Mezirow (1991), Kember et al (2000, p.384) define understanding as thoughtful action, that 'makes use of existing knowledge, without attempting to appraise that knowledge, so learning remains within pre-existing meaning schemes and perspectives. Reflection involves 'the critique of assumptions about the content or process of problem solving. The critique of premises or presuppositions pertains to problem posing as distinct from problem solving. Problem posing involves making a taken for granted situation problematic, raising questions regarding its validity (Mezirow, 1991, p.105 as quoted by Kember, et al, 2000, p384). Finally, critical reflection involves the testing of premises. This is a profound level of reflection and Kember et al (2000) argue that it is unlikely to be observed frequently. To explore the relationship between the characteristics of honours education and levels of reflective thinking of students we decided to measure the three highest levels of reflection: understanding, reflection and critical reflection. Moreover, the student satisfaction with his or her honours programme is also included in this study. Level of satisfaction is an important performance indicator in higher professional education. This study is consequently based on two output variables for defining good honours education: (1) student level of reflection and (2) the student level of satisfaction.

Based on the above, we completed the research model (fig 1, see below) for the study and the questionnaire (see below). It was assumed in doing so that if honours education satisfied these characteristics, students would think in a more reflective way and would value honours education more highly.

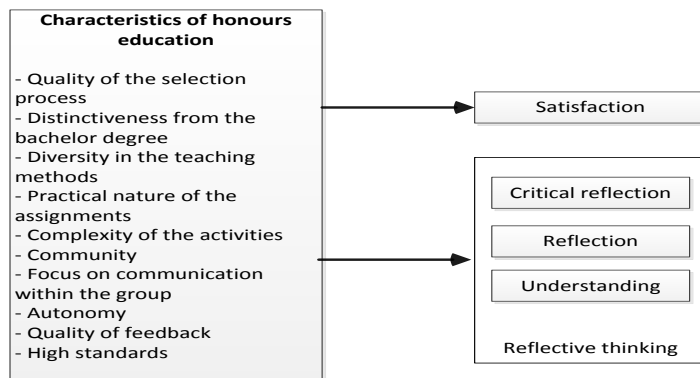


Figure 1: Relationship between the characteristics of honours education and the level of reflective thinking and satisfaction

Method

This study uses a questionnaire to gather information. This survey was carried out at Saxion University of Applied Sciences, and covered all honours programmes: Innovation and Business Creation, Natural Leadership, Changing Cities: People, Places and Choices, Liberal Arts & Science, Marketing & International Management: From Good to Great, Creativity in Finance & Management, Health Care & Social Work, and Teacher Leader. In the spring of 2014 a total of 131 out of the 193 honours students enrolled at Saxion University of Applied Sciences took part (a response rate of 68%). In 2015 a total of 100 out of the 257 honours students took part (a response rate of 39%).

Development of instruments

The questionnaire was compiled with the help of a previous questionnaire based on two earlier surveys carried out in 2012 and 2013. The characteristics of honours education and levels of reflective thinking were operationalised through items combined with possible answers ranked on a five-point Likert scale, ranging from 'strongly disagree' (1) to 'strongly agree' (5). An example of an item relating to the factor 'quality of the selection process' is: *'The selection process for my honours programme gave me the opportunity to prove myself'*. A factor analysis was used to help refine and make more specific the scales used in the 2012 and 2013 measurements. In order to determine the quality of the scales used in the 2014 and 2015 measurements, we analysed their reliability based on Cronbach's alpha. This showed that the scales used in this survey were reliable ($\alpha > .70$).

Control variables

Research has shown that gender and previous education influencing educational effectiveness. These variables were therefore included in this study as control variables. Gender and previous education were obtained from self-reports.

Analysis

We developed a cross-level model to describe the relationships between characteristics of honours education and levels of reflective thinking and satisfaction. By means of regression analysis, we subsequently gained insight into the characteristics of honours education that determine the level of reflective thinking and satisfaction.

Results

Correlation analyses

We assumed a positive correlation between the characteristics of honours education, the level of reflective thinking and student satisfaction to honours education. Correlations between the variables used were established as a first step in our analysis. The variables in our study do appear to correlate with each other, but not that much to have multi-correlation.

Relationship between the characteristics of honours education and levels of reflective thinking, and satisfaction

Which characteristics lead to high levels of reflection and satisfaction? Table 1 and table 2 show the relationships that are statistically significant.

Table 1

Results of the regression analysis relationship between the characteristics of honours education – levels of reflective thinking and satisfaction 2014

	Satisfaction	Understanding	Reflection	Critical reflection
<i>Control variables</i>				
Gender (0 = male, 1 = female)	-.30*	-.09	-.06	-.10
Previous education (0 = other, 1= basic vocational programme (vmbo), 2= senior general secondary education (havo) and 3= pre-university education (vwo))	-.11	-.00	-.03	-.06
<i>HP characteristics</i>				
Quality of the selection process	.27**	.11	.04	-.02
Distinctiveness from the Bachelor degree prog.	-.09	.21*	.15	.13
Diversity in the teaching methods	.19	-.27*	.02	-.01
Practical nature of the assignments	.07	.26**	.20**	.13
Community	.20	-.21	-.02	.20
Focus on communication within the group	-.19	.04	.07	-.05
Autonomy	-.02	.09	-.01	.09
Complexity of the activities	.10	.23*	.21*	.10
Quality of the feedback	.14	-.09	.19*	.17
High demands	.20	.47**	.08	.15
R2	.29	.33	.36	.22

** $P \leq .01$ and * $P \leq .05$, values are not standardised (β)

Table 2

Results of the regression analysis relationship between the characteristics of honours education – levels of reflective thinking and satisfaction 2015

	Satisfaction	Understanding	Reflection	Critical reflection
<i>Control variables</i>				
Gender (0 = male, 1 = female)	-.39	-.19	-.04	-.25
Previous education (0 = other, 1= basic vocational programme (vmbo), 2= senior general secondary education (havo) and 3= pre-university education (vwo))	-.02	-.02	-.04	.02
<i>HP characteristics</i>				
Quality of the selection process	.41*	.25*	.15	.17
Distinctiveness from the Bachelor degree prog.	.13	-.15	.00	.12
Diversity in the teaching methods	.41**	-.31**	.12	-.10
Practical nature of the assignments	.13	.09	.06	-.10
Community	.17	-.16	.11	.11
Focus on communication within the group	-.24	-.25**	.07	.09
Autonomy	.12	-.08	.09	.11
Complexity of the activities	.03	.12	.03	.06
Quality of the feedback	.36	.01	-.07	-.09
High demands	.02	.39***	.25	.24*
R2	.43	.41	.31	.24

** $P \leq .01$ and * $P \leq .05$, values are not standardised (β)

Level of reflective thinking: Level 1 Understanding – The first level of reflective thinking we measured was understanding. At this level, a student understands what he or she is doing, but does not refer it to other situations. The analyses of 2014 show that distinctiveness from the Bachelor degree programme ($\beta = .21$, $p \leq .05$), the practical nature of the assignments ($\beta = .26$, $p \leq .01$), the complexity of the activities ($\beta = .23$, $p \leq .05$) and high demands ($\beta = .47$, $p \leq .01$) all have a significant positive effect on understanding. This survey shows that the degree to which honours education is distinct from

the Bachelor degree programme, the practical nature of the assignments in honours education, the complexity of the activities and the degree to which high demands are set for students are important for student understanding in honours education. However, the analysis also shows that there is a significant negative effect between the diversity of teaching methods and understanding ($\beta = -.27, p \leq .05$). A high level of diversity in teaching methods therefore does not appear to have a positive effect on level 1 of reflective learning. On the contrary, the more diversity there is in teaching methods, the lower the students score on understanding.

The analyses of 2015 show that quality of the selection procedure ($\beta = .25, p \leq .05$), diversity in teaching methods ($\beta = .31, p \leq .01$) and high demands ($\beta = .39, p \leq .01$) all have a significant positive effect on understanding. However, the analysis also shows that there is a significant negative effect between focus on communication within the group and understanding ($\beta = -.25, p \leq .01$).

Level of reflective thinking: Level 2 Reflection - The second level of reflective thinking we measured is reflection. At this level, a student evaluates his or her own actions and looks for better ways to carry out his or her tasks. The analyses of 2014 again show that work-related assignments ($\beta = .20, p \leq .01$) and complexity of the activities ($\beta = .21, p \leq .05$) have a significant positive effect on reflection. The same applies to the quality of the feedback ($\beta = .19, p \leq .05$). This study shows that the degree to which the assignments in honours education are work-related, the activities complex and the quality of the feedback good, is important for allowing students to be reflective. None of the characteristics seems to have a significant positive effect on reflection in the measurement of 2015.

Level of reflective thinking: Level 3 Critical reflection - The third (and highest) level of reflective learning that we measured is critical reflection. At this level, a student challenges assumptions and is capable of changing his/her perspective. The analyses of 2014 show that none of the characteristics has a significantly positive effect on critical reflection. The analyses of 2015 show a significant positive effect of high demands on reflection ($\beta = .24, p \leq .05$).

Satisfaction - The regression analysis of 2014 shows that there is one characteristic of honours education that has a statistically significant positive effect on students' satisfaction, and that is the quality of the selection process ($\beta = .27, p \leq .01$). In other words, the better the quality of the selection process for students in honours education, the greater the appreciation felt towards honours education. The analysis of 2015 shows a statistically significant positive effect of quality of the selection ($\beta = .41, p \leq .05$) and diversity in teaching methods ($\beta = .41, p \leq .01$).

Comparison 2014 and 2015

When we compare the results of 2014 and 2015, the image as shown in table 3 arises.

Table 3
Comparison affective factors 2014 and 2015

Comparison affective factors 2014 and 2015		
	2014	2015
Appreciation	Positive Quality of the selection procedure	Positive Quality of selection procedure
Understanding	Positive High demands Distinctive from the bachelor Practical focus assignments Complexity of activities	Diverse teaching methods Positive High demands Quality of selection procedure Diverse teaching methods
Reflection	Negative Diverse teaching methods Positive Quality of feedback Practical focus assignments Complexity of activities	Negative Attention for communication within the group
Critical reflection		Positive High demands

As shown in table 3 there are some differences and some similarities between the two years. Quality of the selection procedure has a positive effect on appreciation in both years. Also high demands has a positive effect on the first level of reflective thinking, understanding, in both years. High demands has due to the results of 2015 also a positive effect on the highest level of reflective thinking, critical reflection. It's remarkable that diversity in teaching methods has a negative effect on understanding in 2014 and a positive effect in 2015.

Conclusion

This study was carried out in response to the introduction of honours programmes in higher education in the Netherlands. The description of the structure and content of honours education in the Netherlands is still very limited and research on the subject has not fully identified the characteristics of good honours education or its envisaged effects. We are therefore justified in asking precisely what the characteristics of good honours education are. We focused on this question in the study by exploring the effect of the characteristics on honours education by means of a questionnaire. What conclusions, then, can we now draw regarding the development of honours education?

What stimulates reflective learning?

The results of the questionnaire in 2014 indicate that the first level of reflective thinking (understanding) is positively influenced by the following characteristics of honours education: High demands, distinctiveness from the Bachelor degree programme, the practical nature of the assignments and complexity of the activities. The second level of reflective learning (reflection) is also positively influenced by the factors practical nature of the assignments and complexity of the activities. This level is also positively influenced by the quality of the feedback in honours education.

Next to that, the results of 2015 underscore the positive effect of high demands on the first level of reflective learning, understanding. These results also show a positive effect of quality of the selection procedure and diversity in teaching methods. Finally, there is also a positive effect of high demands on the highest level of reflective learning, critical reflection.

When we compare the results of 2014 and 2015, we can conclude that high demands are important for the level of reflective learning. That implies that honours students have to be challenged in their

programs. This can be endorsed by the results of Van der Rijst and Wolfensberger (2014). They found out that being high demanding is one of the main values of honours education. It's recommended to deepen how to do this in further research.

What stimulates appreciation?

The quality of the selection procedure proved to have a positive effect on the appreciation in both years. Remarkable is the fact that diversity in teaching methods had a negative effect on understanding in 2014 and a positive effect on appreciation in 2015. Further research might give insight in the probable reasons for this. Based on this research we recommend to have a careful selection procedure.

Reflections on the study

The purpose of our research was to gain insight into what characterises good honours education. The questionnaire we developed appeared to be reliable and yielded insights into the characteristics of good honours education. But it is remarkable that the results of 2014 and 2015 differ a lot. There are only two factors that have a positive effect in both years and there is also one factor that has a positive effect in one year and a negative in the other year. The longitudinal design of this study doesn't give an unambiguously view on factors that influence honours education yet. When we speak to the students in an informal way, they give us indications of possible declarations for this. It would be useful to organise (group) interviews to deepen this indications and to find out why the results of both years are that different. Maybe some of the following limitations of this study will also give indications of possible declarations. First of all, we relied on self-reports to gather our data. The concepts used in this study in the analyses were measured, using the reports of the students. The issue here is not the fact that these are the perceptions of students, since it can be argued that, in this setting, students are first-hand, and therefore reliable, observers. However, the concepts were subject to internal correlation, which raises the problem of common method biases for this study. In future research, different sources for measuring concepts should be used, to reduce common method bias. For instance, for future research, it is recommended that data be collected from multiple sources, from both the lecturer and student, or more objective data be used, such as final assessments. At the time the questionnaire was given out, it was not yet sufficiently clear what criteria the students would be assessed against, so that it was also not possible to use those data in this study. Secondly, the results can be further generalised by having the questionnaire distributed at other universities of applied sciences or in more years at Saxion. At Saxion University of Applied Sciences, this was done by sending the questionnaire to students representing all the (substantially different) honours programmes. Finally, when this study was begun, empirical literature on the subject contained little information on the characteristics of good honours education in higher professional education in the Netherlands. In order to identify what makes for good honours education, we therefore examined the educational characteristics that *could* influence the quality of honours education. Other characteristics that were not examined may of course also have an influence. However, the model used and the results of this study have at least brought into sharper focus the characteristics that are necessary for good honours education.

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AN EDUCATIONAL GAME TO IMPROVE LEARNING IN NURSING

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ABSTRACT

Innovative e-learning systems aim at motivating and engaging the learners in the process of learning. New trends on gamification inspire the transformation and evolution of e-learning systems to utilize educational games. The educational games are type of e-learning system concentrating on improving the learning process through motivating the learners and enhancing the degree of user engagement in acquiring domain specific knowledge and skills. Besides, the collaboration of educators is essentially required to assure achieving expected learning objectives and pedagogical significance through deploying the solutions. The educators may specifically contribute in the process of quality verification of game content and evaluating the game effectiveness in learning. This paper presents an ontology-based educational system consisting of knowledge based features and discusses its transformation to educational game. In particular, the paper elaborates the design and development of the educational game for nursing group in Germany.

INTRODUCTION

Using games in education is not a new idea. In general, the main purpose of games in education is increasing the engagement of the learners and transforming them from inactive to active learners. Active learners are whom enjoy the time and an hour is passing like some minuets. They are in “flow” state where they accomplish the motivating challenges (Csikszentmihalyi, 1990). The e-learning systems, particularly educational games aim at immersing the learners in the system towards obtaining knowledge, developing their skills and (re)learn. The human computer interaction (HCI) placed the user in the center to provide the system for the needs of the end-user and to pursue them to engage with what they need from the system. In this way, the educational games are kind of e-learning system focusing in the same time on enjoying and learning more through a user-centered perspective.

European healthcare sector suffers shortages of qualified staff (European Commission, 2008). Especially those societies in Europe who are within the demographic change with a low birth rate and at the same time an increase of elderly people are facing the problem of finding qualified care personnel. Healthcare sector needs to hire new graduates who are the largest available source of recruitment (Welding, 2011). There is an essential need, therefore, to train more numbers of nurses who enjoy their job, perform it in a good quality and stay in it for a long term.

This paper presents the work-in-progress on the design and development of innovative e-learning platform, including educational game for nursing students using the nursing education system of Germany. In the next sections, we firstly discuss the background on the emergence of e-learning and the trends on educational games. Secondly, we reviewed the state of the art gamification frameworks. Thirdly, the contribution of the authors in establishing *Wissenspflege* system is elaborated, and fourthly the *Wissenspflege* game is introduced. Finally, we summarize the key points and outline the future research agenda.

LEARNING, E-LEARNING AND GAMIFICATION

Dewey (1897) stated that “education must be conceived as a continuing reconstruction of experience”. Education is the process of training, learning and assessment and in a spiral form, improvement and relearning by receiving feedback on knowledge level (Kolb & Kolb, 2005). Learning in particular refers to “the process whereby knowledge is created through the transformation of experience” (Kolb D. , 1984). In other words, learning is the cognitive process of acquiring knowledge building elements through combination of grasping and transformation of experiences.

The learning environment distinguished to learner-centered, knowledge-centered, assessment-centered, and community-centered. The focus of learner-centered environments is placed on the knowledge, skills, attitudes that learners bring to the educational setting (Darling-Hammond & Bransford, 2007), while the focus of knowledge-centered environment is on knowledge that should be learned and the ways and patterns in which learners may find their ways to learn this knowledge. Assessment-centered environments supply learners by providing feedback on the level of knowledge. In point of view of the learner, this feedback shows the knowledge gap and in point of view of educational institutions, feedback reflects their weakness and strengths in designing, implementing and carrying out the learning element (Darling-Hammond & Bransford, 2007). Community-centered environments concentrates on where the learning process will happen like classroom, school and also online environments (Darling-Hammond & Bransford, 2007). In general, learner-centeredness identifies “who” should learn knowledge, knowledge-centeredness specifies “what” should be

learned/taught, community-centeredness distinguishes “where” knowledge will be taught (Darling-Hammond & Bransford, 2007), and assessment-centeredness focuses on “what kind of evidence there is for student learning” (Edgar, 2012).

Learning system utilized web since 1990s, however, learning changed evolutionary with the web life. In this way learning at web or online learning can be distinguished to three phases:

- E-Learning 1.0: it refers to “Read-only Web”. In this phase the learning objects have been shared with the learners and they had access to the learning objects “anybody, anytime and anywhere” (Adorni, et al., 2010). It was a one-way communication, means there was a way for the teacher, who uploads learning objects, to the students and no way back.
- E-Learning 2.0: it refers to “Read-Write Web”. At the beginning of the 21 century, the communication becomes two-way. Not only teachers can upload the learning objects but also they can assess the knowledge level of their students, receive their exercises, and students can also communicate with the teachers and classmate. The students engage in a collaborative environment and it pursued students to continue.
- E-Learning 3.0: due to providing an environment for exchange among teachers and students, the web collects considerable amount of data and it is called “Web of Data” (Bizer, Heath, & Berners-Lee, 2009). There is semantic meaning between these data which varies depending on quality, level of abstraction and representation of data. Defining, analyzing, and semantics the semantic of data to provide more smart results for the users is the role of E-Learning 3.0. While the focus of E-Learning 1.0 and 2.0 is placed on end-user, E-Learning 3.0 utilizes (virtual) machines to analyze metadata (Lamberti, Gatteschi, Demartini, Andrea , & Montuschi, 2014).

The key factor of effective learning is to be engaged, motivated, supported and interested learners (de Freitas, 2006). One of the effective solutions for engaging the learners in the digital world is “Gamification”. The most common context for applying gamification is education or serious learning (Hamari, Koivisto, & Sarsa, 2014). A successful game design elements motivate the learner accept the challenge, play the game and gain fun and continue. Fogg's Behavior Change Model (FBM) is on the premise that motivation, ability and trigger should meet each other in an action point, then the target behavior will happens (Fogg, 2009). Gamification therefore can be taken into account as a motivator, facilitator and trigger. In this way, the challenges defined by game mechanics should meet properly the skill(s) and ability of the learner, then the learner is in “flow” state (Csikszentmihalyi, 1990) and get so involved in the challenge actively, deeply and interestingly.

Salen and Zimmerman defined games as “a system in which players engage in artificial conflict, defined by rules that result in a quantifiable outcome” (Salen & Zimmerman, 2004). Deterding et al. stressed on the contextual features of gamification as “the use of game design elements in non-game contexts” (Deterding, Dixon, Khaled, & Nacke, 2011). Robson et al. elaborated the contextual understanding of gamification as “application of lessons from the gaming domain to change behaviors in non-game situations” (Robson, Plangger, Kietzmann, McCarthy, & Pitt, 2015). Educational games for learning are particularly defined as applications developing based on games elements and mechanics to create engaging and immersive learning experiences (de Freitas, 2006). There are specified learning goals, outcomes and experiences behind educational games (de Freitas, 2006). The educational games are utilized towards developing and enhancing skills and/or knowledge of learners. Gartner (2014) distinguished between turning the lessons into game that simulation of the lessons plays an important role and building a game as a competition tool for engaging student in the topic by points, badges and so on.

The educational games are successful in “deeply engage the player, easily generating these immersive and deep absorption states (flow)” (Fernández-Manjón, Moreno Ger, Martinez-Ortiz, & Freire). Despite, the high level of success of educational games, there are some challenges which require cross-disciplinary investigation and multi-dimensional focus to analyze the problems and propose solution. Three dimensions are identified as barriers of educational games; namely, (i) socio-cultural dimension which discusses the acceptance of educational game as part of the curriculum instead of just playing, (ii) educational dimension which addresses the skills of teachers to deal with new methods of teaching and examines whether educational games meet the goals defined in the curriculum, and finally (iii) technological dimension which considers the cost of game development and the lack of advanced programming techniques i.e. technological risk constraints (Fernández-Manjón, Moreno Ger, Martinez-Ortiz, & Freire).

GAMIFICATION FRAMEWORKS

Nowadays, several game development frameworks exist for assisting game designers and developers to create a game. The five distinguished frameworks, namely Mechanics, Dynamics, Aesthetics (MDA), Design, Play and Experience (DPE), 4-D, Six “I’s” and P-III are discussed below:

- The MDA-framework is built based on three main components; Mechanics, Dynamics, Aesthetics. Mechanics describes the rules of the game, while Dynamics describes the run-time behavior of the Mechanics. Aesthetics answers to the question of “what makes a game fun?” The MDA-framework discusses that the perspective of game designer and player are different. The designer approach is from mechanics to aesthetics, whereas the player approach is from aesthetics to mechanics (Hunicke, LeBlanc, & Zubeck, 2004).
- DPE-framework is created as an expansion of the MDA framework to address the iterative design process in game development. The DPE framework defines Design, Play and Experience similar to the aforementioned MDA components. The DPE framework was expanded in four layers of learning, storytelling, gameplay and user experience, where the three main components of Design, Play and Experience are elaborated as sub-components (Winn, 2008).
- 4-Dimensional Framework discusses Context, Learning specification, Pedagogic consideration and Mode of representation. Context dimension identifies “where play/learning takes place”, such as classroom, outdoors. Learning specification defines clearly “attributes of the particular learner or learner group”, such as learner profile, pathways, learning background. Mode of representation refers to the internal representation of the game or simulation. And finally Pedagogic consideration considers essential features to assure proper modeling and integration of the learning process into the game context (de Freitas & Oliver, How can exploratory learning with games and simulations within the curriculum be most effectively evaluated?, 2006).
- Six “I’s” is specifically for the designer of educational games. The first I, Identity, stands for “unique individual with the environment”. The second I, Immersion, considers the cognitive processes that “are engaged in the content, and thus are intrinsically motivated to succeed in the challenge of the game’s goal”. Third I, Interactivity, should be taken into account because of the significant effect of team working and interact with each other and learning. The fourth I is Increased Complexity which refers to the difficulty or complexity of the game that should meet the ability of the players. In educational games the subject matter should challenge student to the extent of their ability within the time. The fifth I reflects Informed Teaching, which means the feedback process in the educational game. The sixth I is Instructional feature which is the main goal of the game to impart specific knowledge and skills (Annetta, 2010).

- P-III Framework has four pillars, namely Player-Centered Design, Iterative Development, Interdisciplinary Teamwork, and Integration of Play and Learning. The first pillar reflects the involvement of the target group (player) not only at the end phase for testing the game, but also through the design process (i.e. collaborative design). The second pillar holds iterative and incremental approaches to the process of design and development of a game. In particular it defines an evolutionary and iterative cycle which consists of three main phases namely Concept Design, Game Design and Game Development. The third pillar is the team of designing and developing a game who provides different expertise in particular software engineers, visual artists, game designers, psychologists, educators, software project managers and other specialists depending on the game context. The fourth pillar is establishing “learning principles that are suitable for use in digital game design” (Vanden Abeele, et al., 2012).

The aforementioned frameworks put the learner at the center and state that the target group should be involved in the process of design and development. I’s Framework specified the characteristics that should be taken into account by the game designer team. Moreover, MDA Framework defined the game designer/developer activities besides consideration of the importance of Aesthetics of the player. DPE Framework extended MDA Framework by adding four layers of activity and elaboration of instructional details. At the end, the main goal of educational game which is learning should not be missed through the process of design and development. Although all frameworks consider this issue, their particular approach to integrate educational processes in the game development lifecycle is different.

WISSENSPFLEGE SYSTEM

*Wissenspflege*³⁴ system is an e-learning platform for nursing students and teachers specifically in the context of nursing education and training in Germany. *Wissenspflege* provides four main components, namely, Assessment Center (AC), Collaboration Center (CC), User Center (UC) and Recommendation Center (RC). Figure 1 shows the main components (centers) of *Wissenspflege*.

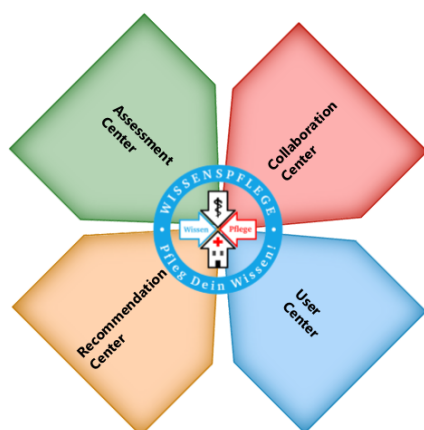


Figure 1: Four centers of Wissenspflege platform

AC aims at assessing the knowledge level and identifying the knowledge gaps of the nursing students, which will be supplied by RC to recommend appropriate on-line resources (e-books) for further

³⁴ The term is translated “Knowledge of Care” in English.

learning based on the knowledge gaps. CC provides a mechanism for exchange and transfer of experiences among teachers and students. The components aim at facilitating collaborative learning through sharing experiences of teachers, lessons learned of students, and also sharing classmates' reviews on the students' exercises. The general concept of CC is discussed more in (Khobreh, Nasiri, & Fathi, 2014). UC is user monitoring dashboard which provides meta-information on the progress of students, and also notification of new activities that should be accomplished by students and teachers.

Wissenspflege Curriculum Ontology and Data Banks

Wissenspflege data layer consists of four data banks, namely, *Profile Bank*, *Experience Bank*, *Test Bank*, *Resource Bank* and one ontological knowledge base, i.e. *Curriculum Ontology*. Figure 2 shows the relation between the *Wissenspflege* components and Data layer.

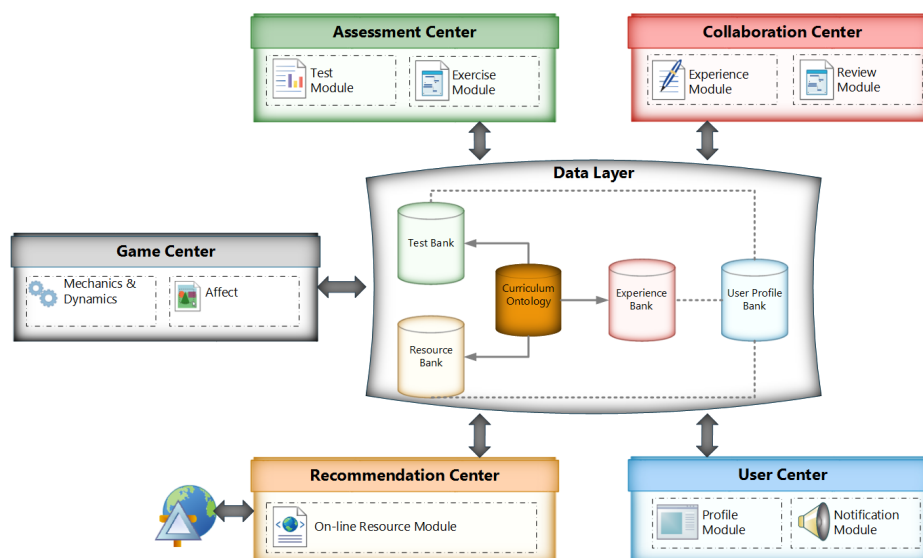


Figure 1: Wissenspflege Data Layer and AC, CC, UC, RC and GC

The Profile Bank is the storage of users' data, including registration information, test results, user progress, user assigned test packages, and user exercises. The Curriculum Ontology developed based on the nursing curriculum provided by North Rhine-Westphalia state (Ute Oelke, 2003). The Curriculum Ontology identifies the structure of Test Bank, Resource Bank and Experience Bank. Notably, the systematic approach for ontology engineering towards establishing the semantic representation of knowledge objects was discussed in the previous publication of the authors (Khobreh, et al., 2016). Each node of the Curriculum Ontology represents a knowledge element that should be taught in the nursing schools located in the North Rhine-Westphalia state. In this way, for each element, there is at least one question and one online resource stored in Test Bank and Resource Bank, respectively. Furthermore, the teacher and/or the student can add their experiences and lessons learned to each. The data related to the experience is stored in Experience Bank.

AC communicates with Test Bank and Profile Bank. The new test/exercise package is generated from Test Bank, while the test results of the student are stored in her/his profile in the Profile Bank. CC exchanges with Profile Bank and Experience Bank. The new experience added by teacher and/or student is stored in the Experience Bank, and the record of this activity stored in the Profile Bank. In addition, the record of the review(s) received by the student for review and her/his comments are



stored in the student's profile in the Profile Bank. UC only interacts with the Profile Bank. The report of the student progress is provided through analyzing the pertained data stored in the Profile Bank. And also the notification message are provided from the new assigned test(s) and review(s) stored in Profile Bank by AC and CC. RC communicates with Resource Bank and utilizes web crawling engines for acquiring online resources and recommending the appropriate online learning content and resources. Besides, RC uses the data stored in the Profile Bank to identify the knowledge gap of the student in special learning fields using the instruction of North Rhine-Westphalia state (Ute Oelke, 2003) and accordingly recommends appropriate material(s) for further education and training.


Wissenspflege Modules


Table 1 describes the four components, the modules of the components and also the role of teacher and/or student in interaction with the modules.

Table 1

Wissenspflege Main Components, their Modules and Active Roles

Wissenspflege Main Component	Module	Active Role
Assessment Center (AC)  <p>Besides learning and teaching, one of the main pillars of education is assessing knowledge of the learner. AC takes this role in <i>Wissenspflege</i> platform and provides mechanisms for assessing knowledge of the student, analyzing the knowledge level of the user and finally identifying knowledge gaps. AC consists of two main modules; test and exercise.</p>	<p>Test Module provides an environment to generate a test package from the questions stored in the Test Bank and to send the test package to the student(s), who are selected from the class list. The test package is corrected by the AC and teacher will receive the results of the students. The question type is multiple choices.</p> <p>Exercise Module provides an environment to generate an exercise package just for preparation and exercise.</p>	<p>Teacher initiates the test package, shares it with the students, and receives their results. Moreover, the teacher can add new questions to the Test Bank and can enrich the Test Bank.</p> <p>Student receives the test package. She/he has a certain time to answer the test and to return the answers to the teacher. Student receives the test results from AC, however, the teacher can send her/his comments on the test to the student.</p> <p>Student generates an exercise package and answers to the questions.</p>
Collaboration Center (CC) 	<p>Experience Module provides an environment to share experiences of a specific event in relation to teaching knowledge at school. Besides the experiences added by teacher, CC gives the opportunity to the</p>	<p>Teacher shares experience (good/best practices, success or failure stories) with the students. Moreover, teacher should evaluate the shared lessons learned by the student.</p>

Wissenspflege Main Component	Module	Active Role
<p>One of the persuasive technologies for increasing the engagement of the students is learning in a collaborative environment. CC provides a center for students and teacher to work collaboratively. CC has two main modules; experience and review.</p>	<p>student(s) to share the lessons learned, however, the lesson firstly should be evaluated and confirmed by the teacher and then the verified and approved lessons learned as the experience will be shared with the others.</p>	<p>Student shares her/his lessons learned, modified the lessons based on the comments of the teacher and finally share with the others after receiving permission from teacher.</p>
	<p>Review Module provides an environment to share the answered exercise, which is done in Exercise Module of AC, with the classmates and receive their feedback on the answer(s). The review method is double peer-review, in which the student who shares exercise package and who receives it are anonymous. In this way, both students feel free to communicate each other.</p>	<p>Student shares the exercise with three anonymous reviewers and consequently, receives the comments of the reviewers on the exercise package. Moreover, the student as a reviewer receives some exercise for review.</p>
<p>User Center (UC)</p> 	<p>Profile Module provides an environment to monitor the student progress. The actions are performed by the user are recorded and shown to the user.</p>	<p>Teacher monitors the progress of her/his students in a certain time period.</p>
<p>Sending feedback to users is taken into account as persuasive technology that encourages the users to continue and not to give up. UC provides the report of the student progress for student her/himself and her/his teacher. Besides reporting the progress, UC notifies the users about new activities that should be accomplished. The main goal of UC is sending feedback and notification to the user to keep them active.</p>	<p>Notification Module provides an environment to notify the new activity that should be done by the user. This module receives its input from AC and CC. Whenever a new test package and/ or new exercise for review is sent to a student, UC notifies the student.</p>	<p>Student monitors her/his progress and also see what she /he has done in selected time period.</p>
		<p>Teacher is notified of a test result of a student.</p>
		<p>Student receives notification of a new test package assigned by the teacher and/or new exercise sent for review by the classmate(s).</p>

Wissenspflege Main Component		Module	Active Role
Recommendation (RC)  <p>RC recommends resources for students based on their knowledge gaps, which are analyzed by AC.</p>	Center	On-line Resource Module provides an environment to recommend the relevant on-line resource(s) and/or learning materials to the students for further learning based the knowledge gap that is analyzed by AC. The web crawling of RC is based on the Curriculum Ontology nodes that the students have a knowledge gap in.	Student receives the recommended online resources such as e-book and also ranks the recommended materials. Teacher sorts the relevant on-line resources by teacher considering educational appropriateness and quality.

As described in Table 1, each of the *Wissenspflege* components consists of the module(s) that interact with the modules of the other components and interacts with data layer of *Wissenspflege* (cf. Figure 2). The *Wissenspflege* architecture is designed modular to assure the system flexibility in response to essential modifications and system evolution over time. In this way, a single module can be modified, changed and even deleted without large effect on the other modules of the system. This modular approach is also applied to the Graphical User Interface (GUI) of *Wissenspflege* system. Figure 3 illustrates the modules of the main components of *Wissenspflege*.

WISSENSPFLEGE GAME

We used a combined approach for modeling and realization of Wissenspfle game using DPE Framework as the basis for, and I's frameworks were taken into account through the process of design and development, especially Identity, Immersion, and Informal teaching to approach Instructional.

The project entitled "Transformation to *Wissenspflege* Game (TWG)" has been defined to restructure, redesigned and (re)developed the *Wissenspflege* modules towards *Wissenspflege* game. As described earlier, *Wissenspflege* platform has four main components to provide assessment of knowledge level, collaboration with the other classmates and teacher, monitoring the progress of learning and recommendation learning materials. The TWG project began with transferring the assessment of knowledge level from e-learning platform to the game. In this way, the Game Center (GC) as a new component has been established that interacts with the modules of AC, RC and UC. Regardless of being in the game or not, the logic layer of assessing the knowledge level and analyzing the knowledge gap of the student is supplied by AC and the result is stored in Profile Bank. GC analyzes the result, and represents them in a form of scores, i.e. badges for a user and Leaderboard for the group of users. In this way, GC interacts with Profile Bank and all the respected data will be stored there.



Figure 2: Four Screen-shoots from Wissenspflege game

Figure 2 shows how GC added to the *Wissenspflege* platform. The Game Center consists of two modules of (i) Mechanics and Dynamics, and (ii) Affect. Mechanics and Dynamics includes a scoring system to collect the player points, badges system to analyze the progress of the player and provide the new badge to him/her, and also Leaderboard to present the place of the player in comparison with the other classmates. The Affect module is not only for selecting the avatar and but also the help system exists in each page which provides a visual instructor i.e. storyteller who gives instructions and directs the users on each page. Figure 3 shows the storyteller on the *Test* page, who describes how the game is running and how the learner should collect the points.

CONCLUSION & OUTLOOK

This paper presents the work-in-progress on developing a knowledge-based system for supporting education and learning in the context of nursing. The *Wissenspflege* provides a number of services to supply knowledge assessment and recommendation of learning content to the learners. Besides, it engages users not only by providing knowledge sharing mechanisms, but also by motivating and engaging on serious gaming.

The next phase of TWG project is designing a collaborative learning environment where students can communicate and play with each other and also with their teacher(s). The focus of this phase is placed on developing a game module in GC to interact with CC.

Despite the advantages, the maturity and technology readiness level of the system should be taken into account to assure usability of the system in various user settings, interoperability with existing nursing online learning systems, and quality of learning content. The future work is planned to verify the system through pilot-testing with large number of users and collecting feedback for improving the

system performance and usability. In addition, the learnability of the system can be reinforced using machine learning approaches for understanding contextual parameters such as meaning, syntax, time, location and provision of personalized feedback to the end user.

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COMING OF AGE: DIGITAL NATIVES ON THE ROAD TO BECOMING DIGITAL LEARNERS

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ABSTRACT

This paper presents findings from a mixed-method action research study the objective of which was to examine the use of Web 2.0 technologies in the higher education classroom to promote self-regulation, information-seeking and exchange, and collaborative learning. The research was carried out with 1st year (n=85) business degree students. Qualitative analysis, through observation, discussion, student feedback and class evaluation suggests that students, at least at the outset of higher education, are far from ready to shoulder the responsibility for their own learning. Quantitative results, using the Participant Perception Inventory-Internet versus Traditional Learning (PPI-IvT) (Lee & Tsai, 2011), instrument show that statistically there are few differences perceived between the two classroom situations and significant differences ($p < .05$) are found only in regard to information-seeking & exchange and, collaborative learning. These findings suggest that today's digital natives are not digital learners and that for them to evolve in education's changing paradigm will call for scaffolding and educator accompaniment. Recommendations are made for educators interested in the inclusion of digital technologies in their course design and delivery.

BACKGROUND

Toffler's world of "Future Shock" (1979) predicted the increasing isolation of individuals due to an information overload. Some thirty-five years later, in the connected world of the 21st century, we are indeed witness to an information overload; one which, in certain situations, engenders isolation but on the other hand, opens the way to collaboration at hitherto unprecedented levels. The root of this information overload, the World Wide Web, has evolved to become an interactive space better known as Web 2.0. This evolution is best qualified as both social and cultural and is not far from the vision of Tim Berners Lee when he first brought the WWW to fruition. (Le Deuff, 2007). The main difference, at least from an educative point of view, is that the Web is no longer just a repository for documents but has now offers room for exchange, discussion and even co-creation.

As the ground on which one stands starts to shift and, as familiar landmarks are replaced with new ones, paradigms change; leading to questions and exploration. Education is but one area in which this is occurring. A recent report (Ernest & Young, 2012) highlighted the fact that "Digital technologies have transformed media, retail, entertainment and many other industries — higher education is next. Campuses will remain, but digital technologies will transform the way education is delivered and accessed, and the way 'value' is created by higher education providers, public and private alike" (p. 4). The accompanying uncertainty is already being felt. One element behind this transformation is the change seen in higher education students who are now frequently referred to as "digital natives".

The term digital natives was first coined by Prensky (2001) to describe today's students who, having grown up in a digital world, he qualified as "native speakers of the digital language" (p. 1). This may well be appropriate but calls for some qualification. As with any language, is not because one speaks it that one is necessarily fluent nor an expert in using it. In the case of education this suggests that today's higher education students, although comfortable in the use of digital technology due to their having grown up immersed in it (Helsper & Eynon, 2010), may yet have to discover how to leverage these competencies for the purpose of learning. Leading us to believe that digital natives are far from being digital learners and leaving us with the question of how best to help them move along this path.

For educators of today, the underlying imperative remains— how can learning be improved? One way of examining this is by looking at the actual learning experience and the students' perception thereof. This research project has taken up the challenge of looking at the use of Web 2.0 tools in a pedagogically informed manner in today's higher education classroom to influence the learning experience and impact the learning outcomes in a positive manner. The use of such tools has been examined through the lenses of self-regulation, information-seeking and exchange, and collaborative learning. A brief review of the theoretical underpinnings of the research is provided below followed by details about the current project.

THEORETICAL FRAMEWORK

This research draws on two well-researched concepts; that of self-regulation (Bandura, 1991; Zimmerman, 1989) and that of collaborative learning. Recent research has looked both at the relationship between the two constructs (De Corte, 2012; Järvelä, Näykki, Laru, & Luokkanen, 2007; Leinonen, Järvelä, & Häkkinen, 2005; Li, Ingram-El Helou, & Gillet, 2012) as well as the use of innovative pedagogy to reinforce collaboration through the development of self-regulation skills (Fisher, Bruhn, Gräsel, & Mandl, 2002; Järvelä, et al., 2007; Leinonen & Järvelä, 2006). Pedagogy which in some instances relies on digital technologies as a means to reach an end. The use of digital

technology, whether the basic learning management system (LMS), any other platform allowing for synchronous and asynchronous learning, quizzes and other on-line forms of evaluation, videos and other visual materials, all moving in the direction of blended or even distance learning, change both the time and distance factors associated with learning. In other words, students can be expected to be more accountable and better organised in their learning and opening new horizons for peer exchange and collaborative learning.

Zimmerman (1989), drawing on the seminal work of Bandura (1986, 1991), saw self-regulation strategies as “actions and processes directed at acquiring information or skills that involve agency, purpose or instrumentality perceptions by learners” (p. 329). Self-regulated learners can be described as active participants in their learning (Boekaerts & Pintrich, 2000). Zimmermann (1989) developed a three-phase model to represent the phases that a student would go through in the process of self-regulation. Based on this, Dabbagh and Kitsantas (2012) went on to describe the students’ learning environment using a three-stage framework which allows for the inclusion of social media in the equation. The authors have taken this one step further suggesting that the digital technologies available today allow for social interaction to go past interaction to information exchange as well as adding the dimension of co-creation and co-construction to that of collaboration and put forth three slightly different levels. A comparison of these is presented in Table 1.0.

Table 1
Framework Comparison (Charlesworth & Sarrasin, 2014)

	Zimmerman (2000)	Dabbagh and Kitsantas (2012)	Charlesworth and Sarrasin (2014)
	<i>Phase</i>	<i>Stage</i>	<i>Level</i>
1	Forethought	Personal information management	Organization and searching
2	Performance or volitional control	Social interaction and collaboration	Information exchange
3	Self-reflection	Information aggregation and management	Co-creation and co-construction of knowledge

Collaborative learning has been examined at both the individual and the group levels (Pierre Dillenbourg, 1999; P Dillenbourg, Baker, Blaye, & O'Malley, 1996; Roschelle, 1996) and the availability of information has naturally open the way to increased collaboration in the classroom (Cristol, 2014). Current technology allows educators to call on students to go past simple collaboration to knowledge building. With this in mind a proposed model for the integration of self-regulation, information seeking and exchange and collaborative learning is shown in Figure 1. This model suggests that today’s higher education students, familiar with digital technology, are capable of using it for purposes of organisation and information searching purposes but as they move towards information-exchange and collaboration they no longer have the required skills to leverage the technology for their learning on their own.

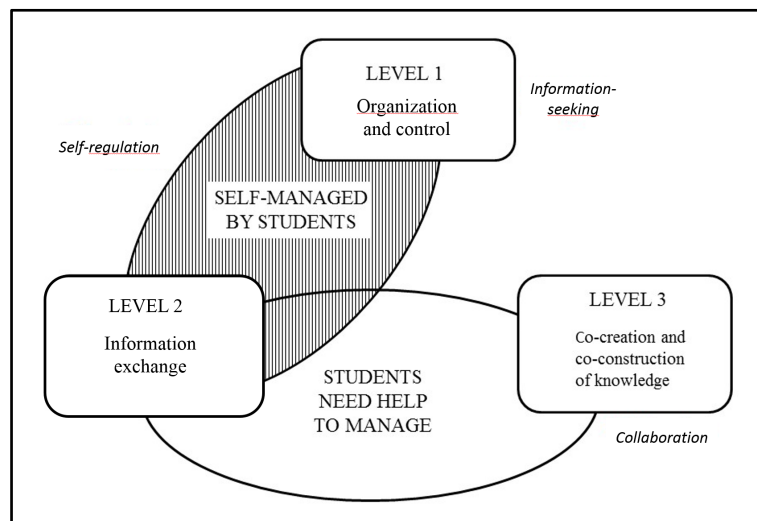


Figure 1: Integration of self-regulation, information seeking & exchange and collaborative learning

The central research goal of this project, one of applied research, has been the development of specific classroom interventions that integrate Web 2.0 technologies with the aim of positively impacting the learning experience through the development of self-regulation, information-seeking and exchange, and the promotion of collaborative learning. This calls for innovative pedagogies and the “layering of digital tools over outdated pedagogies” (Stephani, 2014, p. 13). With this in mind, the research questions addressed in this paper are:

1. Can digital technology be successfully used to develop self-regulation, information-seeking and exchange, and increase collaborative learning?
2. Do students perceive a difference between the traditional and a more web-based classroom with respect to self-regulation, information-seeking and exchange, and collaboration?

RESEARCH DESIGN

A complementarity mixed-method study (Greene, Caracelli, & Graham, 1989) carried out through action research was used to conduct this project. The project itself has its origins in the authors' classrooms and was thus firmly grounded in practice. The research presented here took place at an institute of higher education with 1st year bachelor students (n=85) having a ratio of approximately 3:2 male-female, aged between 18 and 22 and the course, taught by one of the researchers, was that of first year marketing.

Following Dick's (1993) recommendation for action research, the following steps provided the framework adhered to:

1. Intention: the redesign of an existing course in order to include synchronous and asynchronous collaborative activities calling for the use of Web 2.0 tools. The course redesign was along the lines of a flipped classroom (Lebrun, 2007; Mazur, 1997; Saulnier, 2008)
2. Action: the field stage which included observation and discussion, evaluation of student involvement in the various activities and the active participation of the lecturer both in and out of the classroom.
3. Review: both informal and formal student feedback combined with the distribution of a quantitative instrument looking at the student's perception related to their experience of self-regulation, information-seeking and, collaboration with regard to the course in question.

Qualitative classroom observation took place throughout the semester and was backed up by (1) the recording of individual / class reactions (2) a documented open discussion held with the students during class time. In-class observation as well as student participation in the various synchronous/asynchronous in- and out-of-class assignments which were in line with the proposed model and all related to self-regulation, information-seeking and exchange, and collaborative learning. Methods of analysis included a synthesis and evaluation of the qualitative observation, class discussion and researcher notes.

The use of the PPI-IvT instrument (Lee & Tsai, 2011) allowed for the collection of quantitative data. The instrument itself is a self-report questionnaire consisting of 21 items divided equally amongst the categories of self-regulation, information-seeking and exchange, and collaboration and which compares student perceptions of the Web 2.0 to the traditional classroom. The Web 2.0 classroom was that of the researcher. Students were free to make the comparison with a “generic” traditional classroom based on the classes that they were attending during the semester in question.

RESULTS

Qualitative

Initial findings from the redesigned course were surprising in that, contrary to the researchers' expectations, student acceptance of the innovations made in the course design and delivery was quite low and engagement did not go past that what was required. In terms of the proposed model we can confirm that students require increasing scaffolding as they progress through the three levels and that they may in fact need more help even in the basic organization and searching tasks that was expected. Despite good results on a number of tasks it became clear as the semester progressed that the students were quite dependant on the lecturer for guidance and not at ease with taking on increased responsibility for their learning despite the ease of access to the information needed. Collaboration did not go past that what was required and when it came to proposing new ways of looking at things the students tended to default back to asking the lecturer to provide an answer.

Quantitative

Of the 21 items on the PPI-IvT (Lee & Tsai, 2011) instrument, only seven showed statistically significant results ($p < .05$) between the two classroom settings. None of the items related to self-regulation showed a significant difference. This in itself was surprising as the onus for the learning had shifted considerably onto the students and they had no choice but to actively participate and schedule a number of tasks throughout the semester. It was expected that the Web 2.0 class would encourage self-regulation skills but in the eyes of the students this was not the case.

Four of the statistically significant items were related to collaboration. These are shown in Table 2. A synthesis of the four suggested that students did indeed perceive a difference in the manner in which they exchanged and shared their learning experiences with their peers. The activities that encouraged such exchange were not activities initiated by the students but rather activities that were imposed by the educator-cum-researcher in the course design. The students were scaffolded in their endeavours. These items indicate that students perceive their ability to share and thus indirectly collaborate in the learning experience as higher in the Web 2.0 classroom as compared to the traditional classroom.

With respect to information-seeking, three of the seven items examined showed a statistically significant difference. These are shown below in Table 2.0. What stands out here is, however, the fact that the significance on two of these items is negative meaning that students did not feel that the use of digital technology in the classroom was an advantage but on the contrary that they went further in their search for information in the traditional classroom. Given the large variety of Web 2.0 based tools to accomplish such tasks this result suggests that today's digital natives are not that well-versed in using the Web for learning.

Table 2
Selected paired t-test results "Collaboration" (n=85)

LEARNING ASPECT	Mean	SD	<i>t</i>	df	p-value
<i>Collaboration</i>					
Share class notes or learning materials with peers	.628	1.346	.145	85	.000
Provide feedback to ideas suggested by peers	.267	1.231	.133	85	.024
Share my learning experiences with peers	.279	1.204	.130	85	.017
Make good use of learning information provided by my peers	.244	1.246	.134	85	.037

Table 3
Selected paired t-test results "Information-seeking and exchange" (n=85)

LEARNING ASPECT	Mean	SD	<i>t</i>	df	p-value
<i>Information-seeking</i>					
Try different searching approaches for finding new learning materials	-.267	1.459	.157	85	.047
Organize and synthesize the searched materials	-.233	1.214	.131	85	.040
Share the learning materials with others	.326	1.287	.139	85	.011

CONCLUSIONS

These results are for the first iteration of a course redesign and are expected to evolve as future iterations will take them into account in the ongoing review of the course. The results are not without interest and it is safe to say that the pedagogy itself, the type of tasks and interactions programmed throughout the semester as well as the manner in which student engagement is sought will impact the manner in which students perceive the learning environment and the skills that they develop as they go through their education.

It is also painfully clear that enthusiastic and motivated lecturers coupled with innovative pedagogy

are not enough. Not only is it of paramount importance that course objectives, instructional methods, and the tools and methods used to support learning are aligned (Biggs, 1999; Lebrun, 2007), but it is even more important that the link between learning, skills, the competencies to be acquired, and evaluation are clearly set out and discussed at length and in depth with the students right at the outset of the course. In conclusion, changing paradigms call for both scaffolding and lecturer accompaniment all around.

This paper has presented preliminary research which confirms that as learning paradigms evolve so do student expectations and, that educators are finding themselves in relatively uncharted waters. The findings presented here should encourage educators to make change and to reflect on how best to implement such change in order that it positively impact the learning environment. It is hoped that more and more educators will realise that there is potential in use of digital technologies and that it is not only the students who need to learn how to leverage their know-how of these technologies but also the educators who need to leverage these technologies to get make the most of the learning experience for the students.

The onus remains, however, on the educator to explain and scaffold changes in course design and delivery in order that students respond positively. Today's higher education students may be "digital natives" but this research supports the idea that they are not well versed in using such tools for learning and cannot at this time be considered digital learners.

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TESTING MUSIC READING WITH EYE TRACKING IN THREE EUROPEAN COUNTRIES

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ABSTRACT

In our research we examined 10-14 years old students' music reading skills with eye tracking analysis in different music schools in Luxembourg, Germany and Hungary. Our aims were to explore certain music reading strategies, reveal the characteristics of expert sight-readers and also to find text characteristics. During the examination students got six different musical examples (three for rhythm reading, three for singing from Zoltán Kodály) that appeared on a computer's screen, and after one minute silent reading they performed them. The results suggest that the knowledge of musical patterns strongly influences not only the duration and accuracy of a musical performance, but the fixation counts, and also gender differences were revealed. Our further aim is examining the relationship between the development of reading and music reading skills.

EYE-TRACKING IN EDUCATION

Eye-tracking is becoming a popular methodological tool that is used in a wide variety of different research fields - from commercial usability to scientific psychology, education or vision research. This research technology enables us to learn more about the development of students' cognitive competences and to get guidelines for their effective development in the area of teaching reading, visual education, music, and mathematics and gives suggestions about how to utilize research results for the better understanding and development of the students' cognitive, learning, reading, information processing and problem-solving strategies. Eye tracking is used by linguistic researchers to investigate human language development, language skills, and reading behaviour. According to previous research in connection with eye-tracking, experienced music readers read more units ahead, that could be called 'chunking' process. Orifessional readers' eyes fix on the structurally important functions, such as certain chords or phrases, and then they glide towards the less important details. The perception of visual information occurs almost entirely during fixations and little information is picked up during saccades.

In music reading, fixations comprise about 90% of music-reading time, the average fixation duration has been reported to lie between 200 and 400 ms, though this is subject to variance between individuals as well as music-reading tasks. Sloboda (1974) proposed that eye-voice span in reading research could be named as eye-hand span in instrumental music reading. During reading a normal eye-voice span usually is five to seven words, in music reading it is normally five to seven notes and the distance could be larger (two bars) (Sloboda, 1974).

MUSIC READING SKILLS

According to Singer (1983) between 1880 and 1970 thousands of research studies have been dealing with reading, however in the same period with the music reading is less than 250. The standard system of Western musical notation forms one of the bases of musical literacy and consists of unique symbols for every element of musical grammar that are taught in general and specialized musical education. The ability to read and notate music facilitates musical understanding. Music literacy may be defined as the ability to translate notation into vocal sound (reading) and sound into notation (notating) and allows students to be independent, well-rounded musicians (Ester, 2010). According to Waters et al. (1997) expert musicians develop an efficient encoding mechanism for identifying patterns of notes rather than reading the score note by note. Improving musical memory could also enhance the efficiency of music reading. As memory research predicts, context is a critical factor when moving information from the sensory register to working memory and for the eventual encoding to and retrieval from longterm memory (Ester, 2010). According to Sloboda's (1974) the ability to read ahead while singing unrehearsed music is a condition for successful sight-reading.

In McPherson's theoretical model (1997) music reading and sight reading are distinguished aspects of musical performance beside improvisation, playing from memory and playing from ear. Erősné's model of basic musical skills (1992) does include features of music reading, such as melody, chord, and rhythm reading, but on a higher reading skill level we should complete the model with tone and dynamic reading, as well.

Table 1
Erősné's model of basic musical skills (1992)

	Hearing	Conveyance	Reading	Writing
Melody	Melody - hearing	Melody - conveyance	Melody - reading	Melody - writing
Harmony	Chord - hearing	Chord - conveyance	Chord - reading	Chord - writing
Rhythm	Rhythm - hearing	Rhythm - conveyance	Rhythm - reading	Rhythm - writing
Tone	Tone - hearing	Tone - conveyance	Tone - reading	Tone - writing
Dynamics	Dynamic - hearing	Dynamic - conveyance	Dynamic - reading	Dynamic - writing

The knowledge of musical styles, improvisation, music memory (Lehmann and Ericsson, 1996), a person's technical skill by sight playing with many subskills can be components of music reading and also it can contain the skill of anticipation, that is, the preliminary imagining the length of the upcoming musical surfaces within the process of performing music. According to Gromko (2004) music sight-reading involves audiation of tonal and rhythmic patterns, comprehension of a graphic notation system with both spatial and textual qualities, and a highly coordinated kinesthetic action in performance. Some other components of music reading skill; the knowledge of musical syntax and grammar, the knowledge of tonal patterns, the ability to identify notes during the process of sight reading, individual's ability to inner-hear or audiate, sight-singing practice, the knowledge of musical styles, improvisation, music memory (Lehmann & Ericsson, 1996) and person's technical skills with many sub-skills, such as hand-eye coordination, independence of fingers, weight controls of the fingering, and agility count.

INFLUENCE OF TEXT CHARACTERISTICS

Awareness about text structure and the expectations engendered by certain common features of text may be useful aids for readers, helping them to invoke relevant background information and schemas to facilitate their construction of meaning-based representation. Knowledge about the organization of texts increases throughout childhood, as does the ability to generate well-structured coherent stories. Perfetti (1994) proposed that possible source of comprehension failure is inadequate knowledge about text structures and genres, which may arise because of insufficient reading experience. Instruction in expository text structure aids reading comprehension, and that could be a useful support in the field of music teaching, as well.

Comprehension arises from a series of cognitive processes and activities, including word decoding, lexical access, syntactic processing, inference generation, reading strategies and post-reading activities. These contributes to a reader's ability to connect the meaning of the musical text into a coherently connected mental representation of the overall meaning of the composition. Students read the text for different purposes, and reading purposes could be also closely associated with the text genre.

METACOGNITIVE MUSIC READING STRATEGIES

However there is a great deal of evidence for the importance of reading strategies, until a few number deal with them in the field of music. Teaching reading strategies is also the task of solfege or music teachers, with the help of them students could become successful music readers. Flavell (1979) proposed a formal model of metacognitive monitoring which included four classes of phenomena and their relationships. The four classes were (a) metacognitive knowledge, (b) metacognitive experiences, (c) tasks and goals, and (d) strategies or actions.

Different texts need the use of different strategies, which are not revealed yet. In music we can distinguish music reading comprehension strategies that are also important for many musicians who consider themselves to be skilled readers. Metacognitive reading strategies are classified into three groups of planning (pre-reading), monitoring (during reading), and evaluating (post-reading) strategies and each group has a variety of strategies that require readers' metacognitive processing.

MOTIVATION AND ENGAGEMENT IN MUSIC READING

Music concepts, like Kodály's method can be particularly useful not only in teaching students how to read but also to increase their curiosity and enjoyment for reading music. To enhance students' interest and desire to learn music reading, the teacher should encourage the students' personal choice of compositions and collaborative discussion and enjoyable interaction with peers.

Several pre-reading activities also could be motivating, melodic contour, body or handsigns, visual icons can help to build children's understanding of pitch placement and create curiosity for seeing how familiar sounds will look on the staff. Later more realistic, but challenging tasks, teaching interesting texts, the use of reading strategies, coherence among strategies and methods applied during music instruction increase reading motivation (Józsa and Steklács, 2012).

THE KODÁLY CONCEPT

According to the Kodály concept musical training should be an integral part of the general curriculum. Musical literacy, the ability to read and write music could be as important as general literacy. Research studies show that there is a positive transfer effect of musical training to several other areas of the elementary school curriculum - such as grammar, spelling, reading, arithmetics and physical education (Barkóczi & Pléh, 1982). In spite of its importance, with music literacy - music reading - deals only a few researches.

One of Kodály's most strongly held convictions was that the ability to read and write musical notation is fundamental to the development of musicality (Király, 2012). Just as literacy culture cannot exist without reading and writing a language, so music culture cannot exist without reading and writing music. Zoltán Kodály composed reading and singing exercises needed for practicing from primary to professional levels, and he claimed that music reading and writing (like the alphabet) can be learnt by anyone. In music education primarily Solfege lessons build on the pedagogical compositions of Kodály. These works not only improve music reading and writing, musical memory or intonation, but they introduce students to the common musical activities, to the group or choir singing.

ABOUT THE RESEARCH

Our researches were conducted in music schools of three different countries, Germany, Hungary and Luxembourg. The participants (N=53) were music school students between the ages of 10-14. The sample consist of 33 girls and 20 boys.

Table 1

Participants of the research

	Luxembourg n=19		Germany n=16		Hungary n=18		
	boys	girls	boys	girls	boys	girls	
10 years	9	5	3	5	6	5	33
14 years	3	2	2	6	5	2	20

The participating students study different musical instruments, 55% of students' study wind instruments, most of them (32%) play brass instruments, and pianists are 16% of the sample. Only 14% of the students play different string instruments.

Apparatus

Eye movements during playing were recorded by a Tobii T120 eye tracker with Tobii Studio 2.2.7. Software. The infrared cameras tracing the position of the participants' pupils were integrated into the body of the same computer monitor from which the stimuli were presented. The eye movement tracking device made video and audio recordings, as well.

Stimulus materials

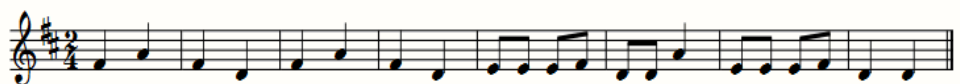
In our research the participant students got 3-3 increasingly complex tasks, three rhythm exercises and three melodies composed by Zoltán Kodály. After half minute studying and reading silently the music score on the computer screen, students should perform them. The first three scores contain only rhythm tasks in different metres. One rhythm and all melody tasks for students were eight-bar exercises and resemble the style of a period. Albert Siklós (1912) considers periods those eight-bar units in which their content or thematic occur varying in the second phrase of the period. Eight-bar, period-like songs are common in every music book that contains usually four two-bar motifs and two four-bar half-periods. Timing is essential in music and much of the musical information is coded in the meter and the rhythm. The stimulus rhythmic exercises were created for the experiment, considering the novice participants can read them according to music school curriculum. Example of the rhythmic exercise:



The second rhythm exercise is more complex and longer (16 bars), and includes several rhythmic patterns. The third rhythm task includes ties, repetition, and various dotted rhythmic values.



The melodies were from Zoltán Kodály 333 reading exercises, all with different time signatures. The eight-bar melodies were composed in different pentatonic scales (do, sol and la pentatons). The melodies were previously unknown to the participants, providing an authentic sight-reading task in each measurement. The melodies only contained quarter and semiquarter notes, they contain smaller intervals and they are primarily stepwise, to ease the recognition of the notes.



We divided our musical examples into special areas of interests (AOIs) that are examined in a more detailed way for identifying the important structural elements (certain melodic elements, intervals, scales etc. and rhythm patterns) of a particular type of musical text.

RESULTS

During fixation perception of the music reading occurs. The results of rhythm reading of the first musical example, the means of total fixation duration are similar in students of the three countries. After analysing all recordings the mean of total fixation duration during silent reading is 27s while for the same musical example in loud reading that is 16.91 s. That means a thorough reviewing, and mapping the difficulties help in the process of music reading.

Table 2

Means and sums of Total Fixation Duration (s)

	Kodály silent reading			Kodály loud reading		
	N	total fixation dur.mean	Total fix.duration sum (s)	N	total fixation dur.mean	Total fix.dur. sum (s)
Luxembourg	8	26,26	210,1	8	18,6	148,76
Germany	8	25,47	203,77	8	16,87	134,97
Hungary	11	24,47	269,13	11	17,41	191,54

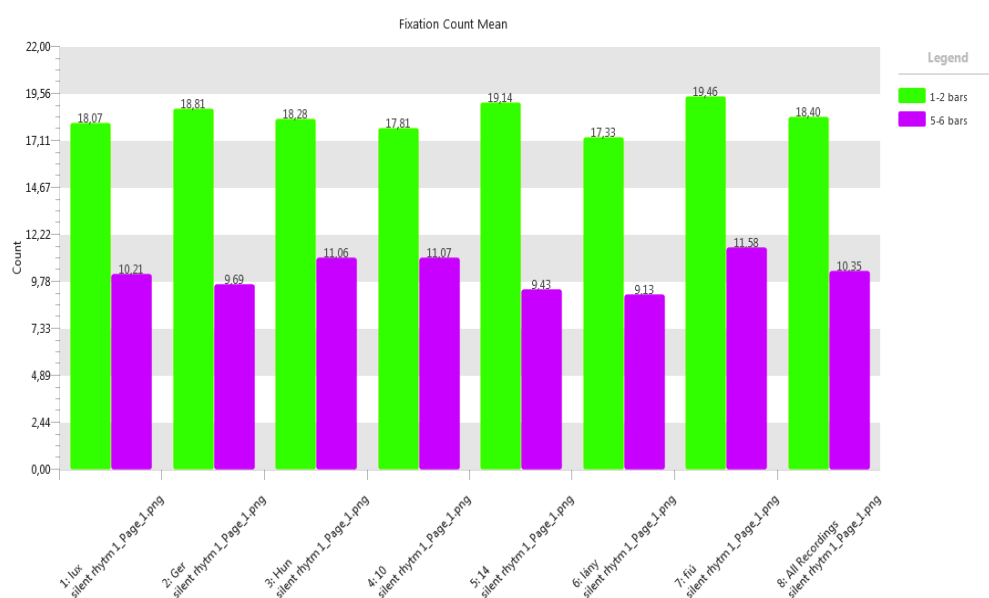
We divided the examples into specific research areas. Interestingly the fixation time on the initial time- and key signature is very low (6 ms).

Effects of musical structure

We divided the rhythmic tasks and Kodály's composition into specific research areas (AOIs), namely into two four-bar half periods and also four two-bar musical motifs. In the first rhythmic exercise we found that the fixation counts means of all participants on the first two bars was almost twice longer, than on the second four bars, which have a similar and familiar form, metrical structure and melody. All selected groups show similar results in the three countries. The collected data reveals the significance of the knowledge and understanding of musical structures, and also the knowledge of musical styles. Melodies with good musical forms or structures enhance and facilitate music reading.

Table 3

Total fixation duration mean of two selected areas of the musical period



Results of heat maps

A number of conclusions in connection with music reading can be drawn on the basis of the thermal images of the eye movement tool. On the thermal images we can see where the eyes fixate the longest, these parts highlighted in red, and also where students looked rarely; these areas are shown in green colour. The importance of this research is that those areas in different music materials could be discoverable where students have difficulties during music reading. With the help of heat maps the effectiveness of different music books for educational purposes could be also examined. The heat map of all students' silent reading of rhythmic exercises, reveals the cognitive process of music reading, how students become more familiar with the rhythmic elements of the task towards the end of it. The eye fixates the longest period in the beginning of the music score, and also fixates on the more complex rhythms and intervals, however the meter and the different key signatures get less attention.



Individual differences can be found on the base of heat maps. The following example shows a ten-year old music student's reading process. As the separated fixations reveal, the musical notes are perceived individually, and get less attention toward the end.



The next example is the heat map of a pentatonic song of all students. We can see that fixations usually occur in the middle of the bars there are less attention on barlines. The bigger intervals, for example perfect fifth or fourth, mean longer fixation duration.



CONCLUSION

With the analysis of reading music notation we could learn more about the reading process in general, as during the silent and loud music reading visual symbols based on conventions are decoded. The level of experience, the prior knowledge, the level of process automation and continuity have major roles during the music reading process. In our research we examined students music reading skills from three different European countries. However they study music with different methodology (Kodály or Dalcrose methods) we can not find significant differences between the gained results; it suggests that there could be 'universal' indicators and factors in music reading development. With the help of heatmaps and recording we discriminate several elements of musical syntax (intervals and rhythmic patterns) that are difficult for students, we also find examples for reading strategies and how music memory works in students. Eye-voice span (3-4 notes) are also observed.

Our further aim is on the base of our results to create an online adaptive measurement that could test musical skills in theirs complexity and which is relevant to the practical needs of modern day music education.

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MOOC - MASSIVE OPEN ONLINE COURSE AS A TOOL FOR NURSES AND NURSING STUDENTS FOR PRACTISING MEDICATION CALCULATION

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ABSTRACT

In health care the medication safety is a part of quality of care and patient safety. Especially there is a lack of medication calculation skills among nurses and nurse students worldwide. The most important thing is that students can understand the mathematic operations and apply them to practice. The ways of learning have also changed, the on-line learning is popular and the technology makes it potential reality. MOOC, Massive Open Online Course and other scalable platforms have become popular. For these reasons Satakunta University of Applied Sciences and Helsinki Metropolia University of Applied Sciences have co-produced MOOC Clinical Calculation course for global needs. The course consists of 24 clinical cases with video, interactive tutoring and self-assessment per case. The course is intended for new nursing students or nurses who want to revise their existing skills and it is in active use in both UAS:s.

INTRODUCTION

In Finland the statistics from announced danger situations show that over 40 percent is concerning medication (e.g. wrong dose). There is a lack of medication calculation skills among nurses and nurse students worldwide (Sulosaari et al. 2012, Anselmi et al. 2007, Harne-Britner et al. 2006). Research about nurses' mathematical skills has been made in Ireland, Great Britain and United States. These studies show that nurses get right answers under 60 % of all the mathematical calculations made. (Fleming et al. 2014, McMullan et al. 2010.) The results of the calculations of nursing students in Finland were 74 % correct (Sulosaari 2015). Nurses make errors in decimal places, solution concentrations and unit conversions (e.g. from mg to microgram). The basic calculation operations as division and units of concentration are the most difficult issues (Grandell-Niemi 2006.) The most important thing is that the students and the nurses understand the mathematical operations and apply them in practice. According to Metsälä and Vaherkoski (2014) nurse's lack of mathematical knowledge was connected with errors in medication administration. In Australia the computer aided calculation program improved the nurses' calculation skills and their confidence to mathematical and drug calculation skills (Sherriff et al. 2012).

The ways of learning have also changed, e-learning and simulation have replaced the traditional ways of learning, students learn by cases from practice. MOOC, Massive Open Online Course and other scalable platforms have become popular. The first MOOC course is considered to be opened in 2008. (Daniel and Uvalić-Trumbić 2014, Bellack 2012.) According to Allen and Seaman (2008) the student satisfaction with online learning compared to traditional classroom learning is at least on the same level.

THE MEDICATION CALCULATION MOOC

Satakunta University of Applied Sciences and Helsinki Metropolia University of Applied Sciences co-produced MOOC Clinical Calculation course (1 ECTS credit) for global needs. The course consists of 24 clinical cases with video, interactive tutoring and self-assessment per case. The course covers the mathematics behind medical calculations to the extent necessary for nurses. The course is intended for new nursing students or nurses who want to revise their existing skills. The cases include e.g. calculating pills, sufficiency of insulin, amount of antibiotics and i.v. fluids, giving anesthetics and resuscitation drugs and childrens' medicines.

Clinical Calculations

Learn and revise clinical calculations for nurses

★★★★★ 0 ratings, 301 students enrolled

Instructed by Satakunta UAS & Metropolia UAS [Health & Fitness / General Health](#)



Figure 1: A clip from the front page of the Mooc medication calculation course.

The case videos are meant to be used as primary learning materials. The videos are scripted and produced as a stand-alone documentary clips about specific topic. Everything happens in real environment and is explained in details. The student is encouraged at first to watch the video in order to get an overview on the topic, and after that revising the video using the “pause” function when needed. There is always a summary in the end of the video for a fast revision/check.

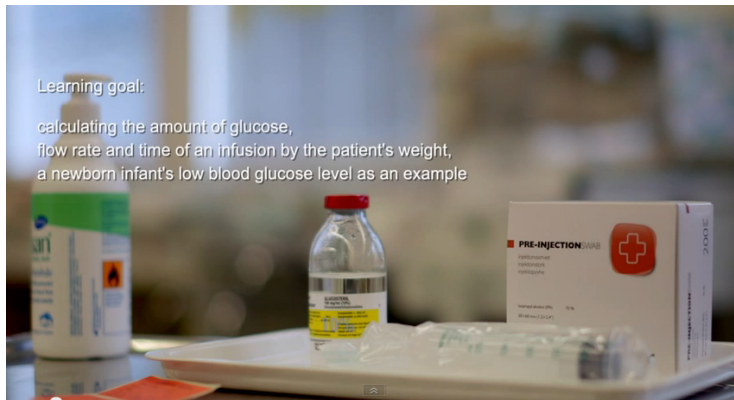


Figure 2: The learning outcomes of the topic are shown at first.

The idea of the interactive tutoring is to enable students' questions and professional answers that are readable, easy to find and well produced. Students ask the questions in the chat site and teachers answer the questions in the official tutoring page (outside the chat). Also co-learners can answer the questions in the chat site, because teaching the others is the best way to learn. The idea of the official tutoring pages is that students don't have to read all the discussions through in order to find answers to their questions. Furthermore, the students can always trust the content in the official tutoring page. Instructors don't evaluate or hide wrong comments in chat.



Figure 3: The calculation operations are shown in many ways; the student is calculating to the paper and the calculation formula is shown again on the screen.

THE PRODUCING PROCESS OF THE MEDICATION CALCULATION MOOC

Producing this kind of course includes a process: ensuring the finance, making the cases including the appropriate mathematical problem solving and strategies to solve the problem, making the video manuscript from the cases, finding the actors and preparing and implementing the video settings. Because these cases are based on real situations, it's important to ensure that everything seems authentic (environment, equipment, medicines).

When making this course we had a multidisciplinary team. Throughout the process and especially in designing the cases and scripting the videos, we were peer-reviewing in order to make the best final product. It is also important that the teachers are present in video shootings, that the idea of the authentic environment, patient care and mathematical correctness is ensured. The actors were casted from our students and colleagues and the videos were shot in our practice classrooms in both UAS. Essential is to create a positive flow by everybody's supportive spirit.

The bottlenecks of MOOC can be the ability to implement the course as a part of the curriculum fluently. Marketing the course to the hospital employers as a tool for personnel to update their skills is demanding. It is essential to understand, that watching the videos demands basic mathematical skills from the student. That's why the instructions for watching the videos are important.

THE DEVELOPMENT PROCESS OF THE MEDICATION CALCULATION MOOC

The development process of the course consists of following steps, the responsible person(s) are mentioned in parentheses.

1. Defining the goals of the course, i.e. curriculum (teachers)
2. Pedagogical design (teachers)
3. Manuscript for videos and extensive content (teachers and av-team)
4. Cinematography and audio production (av-team)
5. Post-production (av-team)
6. Web platform (openEdX & Udemy) productions (web-team)
7. Piloting (teachers)
8. Release (product lead)
9. Operative use / teaching (teachers)
10. Maintenance (all).

Each step was done before moving to the next one. In productions the returns into previous step are usually needed. However, returning two steps or more, will ruin the budget and the schedule. In our case this was avoided with careful planning.

According to Margaryan et al. (2015) most MOOCs are well-packaged but their instructional design quality is low. In future the designers should take into consideration the range of motivations for learner participation, which may not be identical across cultures (White et al. 2014).

THE STUDENTS' SELF-ASSESSMENT AND EXPERIENCES OF THE MOOC

A key part of this course is a self-assessment of learning: students are provided a real-time information about their progress in relation to the overall objective of the course. In addition, the students can get personalised recommendations on the materials that might be useful to read through before going into more challenging topics.

At Helsinki Metropolia University of Applied Sciences lecturer, math teacher, Jani Hannula has used Clinical Calculation Mooc course as a part of his flipped learning classroom approach. He made an action study (Hannula 2016) with the experimental group (N=60) and the control group (N = 179).

In the experimental group the educational clips were found important for some students but some students reported that the the clips had no effect on their learning. Students' comments regarding online videos were divided in four classes:

1. usefulness of the videos (useful, useless)
2. evoked affects (positive and negative)
3. content and the execution of the videos (positive and negative comments about the content, pace, understanding the mathematics, support material)
4. linking to real life (positive comments concerning the practical aspect)

What comes to learning outcomes, the difference between the experimental group and the control group was not statistically significant in the medication calculation test success.

DISCUSSION

There are plenty of MOOCs available and the level of the courses and the work load differs a lot.

We can ask, is this kind of on-line course an effective way of learning medication calculation? According to Hannula (2016) the learning outcomes didn't differ from the experience and control group but he considered it useful with good guidance by the teacher and held together with other learning methods. Also in Australia the computer aided calculation program improved the nurses' calculation skills (Sherriff et al. 2012).

Our Mooc medication calculation course needs to be developed furthermore; more cases and calculations as well as better instructions for the students for using and utilization of the course. As the action study of Hannula (2016) shows, the Mooc course should be a part of flipped classroom or blended learning and well tutored, that it could be the most useful for students. So the students' outcomes wouldn't depend on how the students can handle the mathematics and tempo of the clips as well as independent e-learning.

Because it is important for the registered nurses to rehearse their mathematical skills regularly, the Mooc course should be developed for different levels, so that the registered nurses could practice their skills before taking the hospital's official calculation tests.

The Medication Calculation Mooc is the first like this in health care area and needs to be developed further, for example some mistakes in material should be corrected, so that the students do not get confused or irritated by/because of the the mistakes. According to White et al (2014), there is a high drop-out rate behind MOOCs that is due to the "funnel of participation": awareness, registration, activity and progress. The courses should assure assessment for learning, be cost-effective, have wide inequalities, support learners' digital competencies and motivate and support the learner to complete the whole course.

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FOREIGN STAFF MOBILITY AS THE FACTOR OF INTEGRATION INTO THE WORLD EDUCATIONAL SPACE

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ABSTRACT

The purpose of this paper is an analysis of foreign staff mobility for the case of the Kazakh-British Technical University (KBTU). Understanding about the level of attractiveness to work in Kazakhstani higher education for foreign professors help to accelerate internationalisation and integration processes into the world educational space. Overall, the findings highlight the importance of staff mobility and suggest that some conditions can be improved at universities and the concluded recommendations can be introduced in governmental bodies. A data collected from the university annual report for the Ministry of Education and Sciences (2015). The questionnaire was used to analyze positive and negative aspects of working conditions in the country. In the light of this analysis, the recommendations for educational administrators and governmental officials will be considered for improvement the current higher education situation.

INTRODUCTION

In the modern world the integration processes influence the system of higher education positively. The harmonization of educational standards in different countries form open world space. Promoting staff mobility has become an issue of increasing importance in Kazakhstani higher education policy since we became the independent country and joined to the Bologna process in 2010. Mobility and internationalisation are key aspects of integration into the world educational space, and staff mobility is integral part of it. Yet despite the political attention to the topic, surprisingly little information about staff mobility is available in Kazakhstan.

Despite a strong emphasis on mobility per se in both higher education policy and research, there has been no systematic analysis of trends in academic staff mobility (Teichler, 2010). Most research on mobility in higher education has focused on student mobility and experience (e.g. Guruz, 2008; Schweisfurth & Gu, 2008; Brooks and Waters, 2010; Marginson, et. al., 2010).

ANALYSIS OF ACADEMIC MOBILITY FROM DIFFERENT PERSPECTIVES

Academic mobility, which includes mobility of students and staff, for both teaching and training, has always been considered as a **key, if not defining** element of Internationalization. Internationalisation is growing significance worldwide, with economic, political and social changes driving an increasingly global knowledge economy. Internationalisation within universities continues to develop apace as institutions move from equating international strategy with international student recruitment to developing mature internationalisation agendas that incorporate recruitment, research collaborations, and capacity-building. While Kazakhstani universities stated to engage in international recruitment and research, we see this expanding as technological, political and demographic changes make university internationalisation a strategic goal for many governments (International Trends in Higher Education, 2015).

In general, the benefits of foreign mobility range from enthusiastic and positive (particularly regarding wages for foreign academics) to ambivalent and firmly skeptical (in the case of bureaucratic procedures as visa prolonging). The positive sides for universities of Kazakhstan can be cooperation and partnerships in international research, mutual academic learning and skills development, enhancing intercultural awareness. Moreover, we could find other benefits as for foreign academic staff as for higher education of Kazakhstan: enhance the employability, career prospects, improving knowledge flows, stimulating new ideas, creating networks, developing cooperation for joint research, fostering innovation.

Issue from EU angle of strategising academic staff mobility

Institutions in EU are starting to pay more attention to different types of staff mobility, given the potential link to strategic internationalisation, enhancement of research and teaching and general professional development. The staff mobility has clear benefits for the individuals and the institutions and should be a stronger focus within strategies, whether for internationalisation, research or teaching. However, this sentiment is not always shared across the institution. A recent call has thus been made, both at the European and institutional level, to put staff mobility into focus and better understand its complexities.

The academic staff is a very heterogeneous category and the situation and status of staff differs greatly between higher education systems in Europe. This often makes it untenable to compare. The project participants felt that institutions should better assess the potential of academic staff mobility for diverse purposes, such as research, teaching, preparing joint study programmes, language training and inter-university development cooperation projects. These different types of staff mobility would need to be considered in conjunction with strategic goals and further incentivised and supported accordingly. Staff should be encouraged to take a proactive role in mobility programmes and opportunities, both by taking advantage of existing partnerships and initiatives but also by pioneering new ones.

Institutions should also consider the duration of staff mobility, which can vary from a few days (for conference attendance, for example), to shorter-term teaching assignments, to longer mobility periods, such as sabbaticals or mobility in the framework of joint projects. However, there are often administrative and regulatory restrictions and obstacles (lack of sufficient possibilities to take sabbaticals, pension restrictions, etc.) which make this impossible and need to be addressed at the level of both institutions and national regulatory bodies. It should be noted that international staff is increasingly perceived as a key factor for internationalisation. However, in most European countries higher education institutions predominantly recruit domestic staff, due to financial and regulatory restrictions, as well as cultural and language issues. A forthcoming EUA study clearly indicates a widespread preference for hiring domestic academics with “international experience” (Connecting mobility policies and practice, 2014).

Staff mobility for the case of the Kazakh-British Technical University

This research explores the foreign staff mobility in Kazakhstan for the case of the Kazakh-British Technical University (KBTU). The study addressed the following research questions:

1. Why foreign professors chose Kazakhstan as the place of their work?
2. What do they like about working conditions in Kazakhstani higher education?
3. What kind of problems do they experience to work in Kazakhstan?

Firstly, the analysis made based on a data collected from KBTU half year 2015 report of the invited specialists on the program "Invitations of foreign specialists to the Republic of Kazakhstan (RK) universities" for the RK Ministry of Education and Sciences. The countries of origin, the middle age and the higher education on specialization of foreign scholars were analysed according to the report. Secondly, the questionnaires with 6 questions in each were distributed among 36 foreign professors to analyze positive and negative aspects of working conditions in the country. The questionnaire consists of two parts, first part is about background characteristics - gender, age, country of citizenship, highest scientific degree, specialization, teaching courses and level of teaching. Second part includes 6 questions, 5 questions are open and 1 question is closed.

The questions of the analysis questionnaire are:

1. Why have you chosen Kazakhstan as the place of your work? Please, give the reasons.
2. What do you like about working conditions in Kazakhstan?
3. What you do not like about working conditions in Kazakhstan?
4. In general, do you think Kazakhstani universities are attractive places to work for foreign academic staff? Please, circle "yes" or "no".
5. Please, give some recommendations for improving the current situation in higher education of Kazakhstan to attract foreign professors widely?
6. Have you had teaching experience in other countries? If yes, please mention where?

Analysis

Analysis of 36 invited specialists showed that most of them are from Russia - 11, USA - 9, UK - 7, India - 5 and Germany - 4. The middle age of these specialists is 46 years old. Among 36, participating in this study most of scholars are specialists in engineering sphere of teaching. To answer the 1st research question: Why foreign professors chose Kazakhstan as the place of their work? The scholars answered - because it is new country for them, they were looking for a change, to make an impact of the next generation of leaders, contributions in terms of teaching, research and academic administration, a prior interest in post-Soviet Eurasia. To answer the 2nd question: What do they like about working conditions in Kazakhstani higher education? The specialists responded - like the freedom of working approach, warm and friendly attitude of colleagues, respect of students, academic atmosphere and weather. To the 3rd question: What kind of problems do they experience to work in Kazakhstan? We found - bureaucracy, corruption, lack of transparency, work permit and visa procedures, lack of respect for one another.

CONCLUSION

To summarise the results collected during the research we can conclude that most invited foreign specialists come from Russia, USA and UK. And the main reason of their choice of working in Kazakhstan is life changes and interest in the new country. About the positive aspects of working conditions in the country, the respondents stressed the warm and friendly treatment of colleagues and flexibility in pedagogics for foreigners. And the last conclusion is about bureaucracy in the governmental bodies of Kazakhstan which complicate work permit, visa and other procedures for foreign colleagues.

Addressing the problems in staff mobility of EU as the key process of internationalisation we can suggest additional steps to improve the level of attractiveness of Kazakhstani higher education: better align foreign academic staff to the institutional strategic goals; better use foreign academic staff to consolidate and enhance institutional partnerships in a more systematic fashion; to overcome the obstacles preventing staff of different types from being mobile; better address with the national regulatory bodies the problems linked to national-level regulations; at institutional and national level better eliminate obstacles to international staff recruitment.

One implication of this study is the development attractive climate of working conditions for foreign colleagues. Governmental officials can mitigate the bureaucratic procedures in work permit, visa prolonging. Educational administrators can support in renting accommodation, compensation package. The academic freedom in teaching methods and approaches can help to eliminate the patches of old Soviet system of education and a rigidity in Kazakhstani pedagogy. It gives the impulse for wider mobility and internationalisation and leads us to the integration into the world educational space.

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DIALOGIC CLASSROOM TALK – RETHINKING ‘MESSY’ CLASSROOM INTERACTION

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ABSTRACT

Over the past decades, dialogic classroom talk has increasingly been acknowledged to be of prime importance for teaching and learning. Many researchers refer to the writings of Mikhail Bakhtin when conceptualising ‘dialogic’ or ‘dialogism’, either as an epistemology or an ontology. In our study we rely on an ontological view of ‘dialogue’ and on the distinction drawn by Bakhtin between ‘authoritative’ and ‘internally persuasive word’ to conduct a sequential analysis (informed by CA) of an extract taken from the film ‘The Class’. Although, the teacher-student interactions at times appear to be ‘messy’ at first sight, our analysis will show that students’ utterances can be considered as an expansion of the subject matter which is accomplished dialogically with their teacher.

INTRODUCTION

Over the past decades, teachers and researchers have increasingly come to acknowledge that dialogic interaction/talk among students and teachers is of prime importance for teaching and learning in the classroom and beyond. Many refer to the writings of Mikhail Bakhtin when conceptualising ‘dialogic’ or ‘dialogism’, which can be described as “a general epistemology for the human sciences” and/or “an ontology of the human mind” (Linell, 2009, 30). In our subsequent discussion of related research, we will lean towards considering ‘dialogue’ as an ontological principle, since “then creativity, learning to learn, and an ethics of openness to the other are relatively easy to understand as closely related fruits of deeper identification with the space of dialogue itself” (Wegerif, 2008, 359). From this perspective, when selecting data for a fine-grained analysis, it makes perfect sense to take into consideration sequences of classroom interactions that appear ‘messy’ at first sight.

For this reason, we chose an extract taken from the film ‘The Class’ (Cantet, 2008) showing classroom interactions that at some point seem to ‘deteriorate’. By conducting a sequential analysis informed by conversation analysis (Gülich, & Mondada, 2008) and by further relying on the bakhtinian concepts ‘dialogic’ and ‘authoritative/internally persuasive word’ (Bakhtin, 1981, 1986), we will open up a new perspective on the event. In so doing it becomes possible to consider students’ utterances not as digression but as enriching contributions to an expansion of the subject matter that is conducted dialogically with their teacher.

THEORETICAL FRAMEWORK

Dialogism

When we investigate classroom interactions in terms of ‘dialogic classroom talk’, we rely on the bakhtinian concept of ‘dialogism’. ‘Dialogism’ is commonly related to assumptions such as ‘any speech utterance responds to what has gone before and anticipates future responses’ or ‘meaning is co-constructed in dialogues and does not exist *a priori*’. In this sense, ‘dialogism’ may be considered as an epistemology for the human sciences and as a resource to study human interactions. However, Bakhtin goes beyond epistemology by asserting “that the world for us, that is the world of meaning, is essentially dialogic” (Wegerif, 2008, 349). For Bakhtin indeed, ‘self’ is inherently dialogic, a relation, and “*to be means to communicate*” (Bakhtin, 1984, 287). ‘Dialogue’ in a bakhtinian sense arises in a space of difference: “In dialogism, the very capacity to have consciousness is based on otherness” (Holquist, 2002, 17). So, we address ‘dialogism’ in an ontological perspective, following Wegerif (2008, 347-348) who argues “that adopting an ontological perspective more compatible with dialogic has the potential to improve the practice of dialogue in education.”

Consequently, within the context of our research, we argue that in ‘dialogic classroom talk’ there is mutual regard for otherness; ‘dialogic classroom talk’ is based on “the differential relation between a center and all that is not that center” (Holquist, 2002, 17). ‘Dialogic classroom talk’ is open to different mutually crossing perspectives. We assume that in ‘dialogic classroom talk’, teacher and students have disposition towards considering each other’s perspective while engaging in shared inquiry. Attention is paid to more than one point of view, more than one voice is heard in the classroom and there is ‘interanimation’ of voices and ideas (Bakhtin, 1981). The ‘interanimation’ of voices occurs in a way that “the speaker himself is oriented precisely toward such an actively responsive understanding” (Bakhtin, 1986, 69) and that the listener simultaneously occupies an active responsive position towards it: he either agrees or disagrees with it. The bakhtinian notion of

‘responsive understanding’³⁵ appears here as a key concept. When teacher and students engage in ‘dialogic classroom talk’, “understanding is imbued with response and necessarily elicits it in one form or another: the listener becomes the speaker” and vice versa (Bakhtin, 1986, 68). The speaker-listener “does not expect passive understanding (...). Rather, he expects response, agreement, sympathy, objection, execution and so forth” (Bakhtin, 1986, 69). Thus, adopting a ‘dialogic’ approach in a bakhtinian sense to analyse classroom interactions means to build on the intrinsically social and intersubjective nature of language. We consider that in ‘dialogic classroom talk’ understanding and by that way meaning-making are mutually co-constructed by the teacher and the students, voicing their perspectives in a dynamic reciprocity of difference.

Recent Research on Dialogue and Education

In recent years, the work of Bakhtin has become of interest to many researchers in the field of education. The term ‘dialogic’, applied to education, has gained increased attention and classroom talk has become a key topic in educational sciences. To situate our research perspective, we will refer to the research of Robin Alexander, Neil Mercer and Karen Littleton, and Rupert Wegerif all working on audio and/or video data. We do however not pretend to provide an exhaustive overview of related research on classroom talk; we shall only draw together some common threads that advocate dialogic theory to investigate classroom interactions³⁶. The above quoted authors all build on ‘dialogic’ as an approach to deal with forms of talk in the classroom and their functions for the development of thinking and learning. Despite various research issues, they commonly agree that in dialogic classrooms, teacher and students, through purposeful classroom talk in which the ideas of the various participants are heard and jointly considered, engage in a process of mutually negotiated co-construction of knowledge.

Robin Alexander (2004, 2008) has developed an approach to classroom education that he calls ‘Dialogic Teaching’. He argues that talk is “the true foundation of learning” (Alexander, 2004, 9). Teachers need to be aware of the power of talk. Alexander shows how talk can be used effectively by teachers to promote children’s thinking and to initiate and support their learning. Picking out Bakhtin’s telling axiom that if “an answer does not give rise to a new question from itself, then it falls out of the dialogue” (Bakhtin, 1986, 168), Alexander differentiates dialogue from conversation in the classroom and states that “where conversation often consists of a sequence of unchained two-part exchanges as participants talk at or past each other (...), classroom dialogue explicitly seeks to (...) chain exchanges into meaningful sequence” (Alexander, 2005, 8). Dialogic interactions are the ones where teacher and students build on each other’s ideas and chain them into coherent lines of thinking and inquiry. That means that ‘Dialogic Teaching’ pays as much attention to the teacher’s talk as to the students’. Dialogic teaching reflects a view and depicts a practice where the teacher’s perspective is not prioritised; teachers take account of students’ contributions and all participants are co-developing the object of the lesson.

Neil Mercer and Karen Littleton (2007, 41) largely join Alexander’s view and describe ‘dialogic teaching’ as “that in which both teachers and pupils make substantial and significant contributions and through which children’s thinking on a given idea or theme is helped to move forward”. Investigating the ‘dialogic’ approach in science classrooms, Mercer (2007, 8) points out that “dialogic teaching has the potential to support meaningful learning of science” and that “dialogue appeared to shift children’s understandings and give them new insights.” According to Mercer, effective teaching in science

³⁵ Responsive understanding means to orient with mutual respect to each other (Voloshinov 1973).

³⁶ Be it in an epistemological or in an ontological perspective.

classroom means that there is a balance between ‘dialogue’ and ‘authoritative talk’ (see below). He concludes that “dialogic teaching requires the teacher to adopt different communicative approaches: at times encouraging exploration of different views; at other times focusing on the authoritative scientific view” (ibid.). Littleton (2011) summarises the above mentioned teacher approaches as follows: The *teacher-as-expert* relies on authoritative talk, putting closed questions, instructing and informing; whereas in dialogue, the *teacher-as-learner* asks open questions, eliciting students’ initial ideas, hearing what groups have achieved and discussing problems and misunderstandings.

Whereas Mercer and Littleton refer to dialogic teaching in terms of the use of talk as a tool for explicit reasoning and thinking³⁷ (in line with vygotskian theory), Rupert Wegerif refers to an ontological interpretation of ‘dialogic’ when relating to the bakhtinian concept of education. For Wegerif, “dialogic education is education for dialogue as well as through dialogue in which dialogue is not only treated as a means to an end but also treated as an end in itself” (Wegerif, 2011, 182). With regard to investigating classroom talk, he relies on the metaphor of ‘thinking as dialogue’ and points to how dialogic education leads to improved thinking and to enhanced learning. Thus, “for dialogic theory, learning to think means being pulled out of oneself to take the perspectives out of other people and, through that engagement in a play of perspectives, to be able to creatively generate new perspectives or ways of seeing and thinking about the world” (Wegerif, 2010, 10). That is to say that ‘dialogic theory’ is not just about dialogue, it is “that two or more perspectives held together in the tension of relationship open a space of potential new meaning” (ibid., 2010, 62). Wegerif (2008, 353) argues that “for each participant in a dialogue the voice of the other is an outside perspective that includes them within it. The boundary between subjects is not, therefore, a demarcation line, (...) but an inclusive ‘space’ of dialogue within self and other mutually construct and reconstruct each other.”

Authoritative and internally persuasive discourse

With regard to these reflections on ‘dialogism’, we will focus on two bakhtinian key concepts that are relevant for our subsequent analyses: the ‘authoritative word (voice)’ and the ‘internally persuasive word (voice)’. The *authoritative word* (e.g. the word of teachers) “demands that we acknowledge it” and “permits no play with the context framing it, no play with its borders, (...) no spontaneously creative stylizing variants on it” (Bakhtin, 1981, 342, 343). On the other hand, the *internally persuasive word* “awakens new and independent words, organises masses of our words from within and (...) enters into interanimating relationships with new contexts. More than that, it enters into an intense interaction, a struggle with other internally persuasive discourses” (Bakhtin, 1981, 345, 346). The internally persuasive word is organised as “half-ours and half-someone else’s” (ibid.) and thus takes account of the other’s perspective.

Bakhtin himself makes reference to school context when underlining the dialogic interrelationship (in difference) of the two categories of words and asserts that when “verbal disciplines are taught in school, two basic modes are recognized for the appropriation and transmission - simultaneously - of another’s words: (...) ‘reciting by heart’ and ‘retelling in one’s own words’” (ibid., 341). Here Bakhtin associates ‘reciting’ with the authoritative word which “orders me to do something in a way that forces me to accept or reject it without engaging with it” (Wegerif, 2011, 181). ‘Retelling’ on the other hand is related to the internally persuasive word “that includes within it an entire series of forms for the appropriation while transmitting of another’s words, depending upon the character of the text

³⁷ Studies showed that exploratory talk may be considered as a tool for reasoning under the assumption that exploratory talk produces educationally desired outcomes (Mercer et al., 2004).

being appropriated and the pedagogical environment in which it is understood and evaluated” (Bakhtin, 1981, 341-342).

Dialogic classroom talk

We should emphasize here that in ‘dialogic classroom talk’, students are given the opportunity to distinguish their own word from that of others so as to identify the ‘authoritative word’; this process being of decisive significance since “consciousness awakens to ideological independent life in a world of alien discourses surrounding it” (Bakhtin, 1981, 345). In the analysed excerpts, teacher and students cope with the usage of the subjunctive mode during a French grammar lesson. We will show in the first part of the subsequent analysis how, in an ‘ordered’ teacher-student interaction, the ‘authoritative word’ (teacher, grammar rule) seeks to impose itself in ‘hierarchical’ characteristics.

In the second part of the analysis, we will point out how the teacher and the students, despite or by virtue of displaying different understandings of the subjunctive mode, are doing expanding meanings, providing them with contexts. In other words, we will show how, in ‘dialogic classroom talk’, making accountable mutual understanding (of difference) and appropriating the subjunctive mode are intrinsically interrelated.

SOME REMARKS ON METHODOLOGY

The analysed excerpts are taken from the semi-improvised³⁸ French drama film ‘The Class’ (Cantet, 2008, original French title: ‘Entre les murs’), that is based on the novel of the same name (Bégaudeau, 2006). The novel is a semi-autobiographical account of François Bégaudeau's experiences as a French language and literature teacher in a middle school in the 20th arrondissement of Paris. Although the film is based on a screenplay, that follows the novel, it is often referred to as ‘authentic’ as the movie displays instances of classroom interactions in a rather realistic way. The analysed excerpts³⁹ show a teacher and his students during a French lesson discussing the correct use of subjunctive mode.

To investigate how they are doing re-contextualising and appropriating the subjunctive mode and by that way expanding the object, we conduct a sequential analysis of the teacher-student talk⁴⁰ that is based on conversation analysis (CA) (see Sacks, 1992; Gülich, & Mondada, 2008; Koole, 2015)⁴¹.

³⁸ The adolescent actors were all students of an existing French junior high school. During the shooting of the movie they “never had a script in hand [...] they improvised according to requested situations” and “came up with their own dialogue” (Cantet, & Bégaudeau, 2008, 11).

³⁹ Teacher-student talk of the selected excerpts has been transcribed (/ for raising voice; [for overlapping) and translated from French into English by partly relying on the official script (Cantet, Campillo, & Bégaudeau, 2006). For the purpose of our analysis here, we rely ‘only’ on verbal interactions although we advocate for CA based multimodal interaction analysis (see Arend et al., 2014).

⁴⁰ According to Linell (2001, 265) (referring to Sacks, 1992, Ochs et al., 1996, Atkinson & Heritage, 1984) “when it comes to method, (...) a cornerstone in the methodological arsenal is sequential analysis, which amounts to saying that no utterance should be analysed in isolation from the contexts and the sequence in which it is positioned.”

⁴¹ Note that here we do not intend to discover new classroom practices by analysing sequences taken from a drama film. We go for a so called ‘single case analysis’ that means that “in a sort of exercise, the resources of past work on a *range of phenomena* and organizational domains in talk-in-interaction are brought to bear on the analytic explications of a *single fragment of talk*” (Schegloff, 1987, 101). CA is considered here as an analytical

This approach allows us to grasp and to visualise the participants' mutual taking account of each other's perspective while dealing with the 'thorny' object 'subjunctive mode'⁴².

In our analysis of the first excerpt, we will show the 'authoritative word' in its located occurrence. In the second part, we will show that teacher-student talk (which may seem 'messy' at first sight) can be seen as 'dialogic' in its sequential unfolding. Our CA related analytic approach displays "that everything said in [the] dialogue, at any point, is interdependent with its position in the sequence" (Linell, 2009, 72) thus visualising dialogic sequentiality⁴³ in its ongoing dynamics.

ANALYSIS

Excerpt 1: IRE/IRF sequences: local occurrences of 'authoritative discourse'

In the first excerpt we will see that the teacher establishes himself as an expert of French grammar, that is to say as local authority on the subject matter 'subjunctive mode'. He is going to explain the use of subjunctive and then the sequence of tenses. To do this, he introduces a sentence (by writing it onto the blackboard) featuring the subjunctive mode of the verb 'to be'.

- 1 TEACHER imagine I say/ he insists/ that I be/ in shape he insists that
I be in shape what is this BE in that example/ Eva/
- 2 EVA it's a present subjunctive
- 3 TEACHER very good it's a present subjunctive well for the imperfect
subjunctive we follow the sequence of tenses and use a past he
insisted he insisted that I/ Khoumba/
- 4 KHOUMBA were
- 5 TEACHER were yes

In excerpt 1 we can see a prototypical teacher-student interaction consisting of recurring three-part sequences (lines 1-3; lines 3-5) "in which the teacher presents the student with an assignment or question (I), the student responds to that (R), and the teacher then assesses the correctness of that response (E)" (Koole, 2015, 4). Each IRE/IRF⁴⁴ sequence consists of three related turns (utterances). The first sequence is initiated by the teacher (line 1) addressing a closed question ("what is this BE in that example") and then picking Eva who produces the expected and correct reply (line 2). This response is positively evaluated and echoed by the teacher ("very good it's a present subjunctive") in line 3.

Then, right after his feedback (line 3), within the same turn, the teacher initiates a new IRE/IRF cycle by introducing the 'sequence of tenses'-topic. Here he relies on a different 'strategy' than in line 1, when addressing the students. The last part of his utterance is "designedly incomplete", that is to say, it is designed to be completed by a student (Koshik, 2002). Indeed, the teacher selects Khoumba right

resource in illuminating episodes of classroom talk in order to develop a deepened view on existing phenomena, in our case to reach a more detailed understanding of 'dialogism' in teacher-student talk within its local context.

⁴² See the note on the subjunctive at the end of the paper.

⁴³ Note that for Linell (2001, 86) "the principle of sequentiality, and even more so the notion of 'sequence', are given a broader interpretation (...) than in Conversation Analysis (e.g. Atkinson & Heritage 1984) where 'sequence' refers to a local, close-knit sequence, such as an adjacency pair or a repair sequence."

⁴⁴ This sequence is generally known as teacher initiation, learner response, and teacher follow-up or feedback (IRF) in the British school (Sinclair & Coulthard, 1975), and initiation, response and evaluation (IRE) in the American school (Mehan, 1979).

away as the next speaker by calling her name. Khoumba provides the correct response (“were”, line 4), which is again positively evaluated by him.

In both sequences, the teacher and the students co-construct typical classroom talk making accountable their responsive understanding about talk/turn organisation. Transition relevance places (Sacks et al., 1974) between turns are made mutually recognisable. Teacher and students, in mutual agreement, do locally re-contextualising a certain type of classroom talk. In other words, they are doing validating the authoritative discourse of the institution. The teacher’s feedbacks show that he obviously knows the answer to his own questions; the students know that he knows but nevertheless they ‘play’ the game as listeners occupying an active response position towards the known information questions, and as speakers (in the allocated turn) they try to give the expected answer. The interanimation of voices occurs in a way that the teacher is confirmed as expert. As Linell (2001, 74) points out, there may be various asymmetries of knowledge in institutional contexts and thus experts (teachers) tend to ask questions and other participants (students) are addressed to respond to these questions. The teacher’s authoritative voice putting closed questions, instructing and informing is heard in an actively responsive manner. Simultaneously, sequential analysis allows us to see how the teacher and the students are doing accomplishing the authoritative discourse of French grammar. The latter is “conjoined with authority” and demands that students acknowledge it and make it their own (Bakhtin, 1981, 342, 343).

Excerpt 2: Exploring ‘otherness’: local occurrences of ‘internally persuasive discourse’

In the previous part of analysis, we have pointed out how teacher and students, in mutually addressed commitment, *do* carrying out a teacher-designed activity. Focussing on the turn allocation system in IRF/IRE sequences, allowed us to illuminate how, in ‘authoritative discourse’, the students’ understanding of the grammatical item *subjunctive mode* is elicited and displayed.

In excerpt 2, some students are doing challenging the usage of subjunctive mode as well as the related sequence of tenses. We will see that, in distancing themselves from the ‘authoritative word’, they display ‘otherness’ and thereby are *doing understanding* otherness. There is a shift from teacher initiated IRF/IRE sequences⁴⁵ to questions and comments generated by the students. At that point, the students seem to be somehow ‘rebellious’ towards the teacher’s assertions and at first sight classroom interaction may seem ‘messy’. But, relying on Bakhtin, we will show “the importance of struggling with another’s discourse” to *do* understanding in difference. So, after the teacher has validated Khoumba’s answer (see lines 4 and 5, excerpt 1), another student, Esmeralda, breaks with the IRF/IRE device (‘structure’), by self selecting for the next turn.

- 6 ESMERALDA you really think I’ll go and see my mother I’ll say that I
were’d been in shape/ [what will she understand/
7 TEACHER [no no no it’s not I were’d been it’s
learn the sentence first [before bawling
8 ESMERALDA [that I be were in shape
9 TEACHER that I were in shape it’s a sequence of tenses
10 ESMERALDA no one says that in real life I don’t know eh it’s the truth
(other voices raising, inaudible comments)
11 TEACHER the first thing I notice is before even mastering something
here the imperfect subjunctive you’re already telling me it’s
no use start by mastering it then you can call its use into
question

⁴⁵ IRF/IRE sequences validated by the students (see excerpt 1)

- 12 ANGELICA it's she is right it's not the way people speak today that's
the way people talked in the old days even my grand mother
didn't speak like that
- 13 BOUBACAR even your great grand father didn't say that it's from the
Middle Ages
- 14 TEACHER no it isn't from the middle ages
- 15 BOUBACAR it is
(other voices raising)
- 16 TEACHER I'll talk this over but calmly indeed I well it's true not
everyone talks that way in fact people who do are pretty rare

Esmeralda (line 6) displays that she is distinguishing her own voice from the teacher's authoritative voice by addressing him directly and putting his word to the test ("you really think"). We can see here that understanding the other's word⁴⁶ as different triggers the meaning making process in a bakhtinian sense: meanings are produced dialogically in tension between different voices. The student sets the teacher's voice against her mother's voice ("what will she understand"). In that way, she is doing both, drawing a distinction between school context and (every day) home context *and* retelling in her own words the word of others. The teacher then proceeds to repair (line 7) Esmeralda's 'retelling' (Bakhtin, 1981, 341) by rejecting her grammatical phrase. In the first turn part ("no no it's not I were'd been"), he is voicing the authority of grammar and, in the second turn part ("it's learn the sentence first"), he displays the authority of 'reciting by heart' (ibid.). He does not answer the student's raising question about her mother's understanding. Esmeralda replies immediately⁴⁷ to the teacher's prompting ("learn the sentence first") (line 8) by a 'repair' ("that I be were"). Thus she shows that she takes into account the teacher's authority. The teacher makes a second repair (line 9): in the first part of his turn, he formulates the correct phrase ("that I were in shape") and in the second turn part, he is doing reinforcing his expertise ("it's a sequence of tenses"). The struggle and dialogic interrelationship of two distinct categories of discourse (the authoritative word and the internally persuasive word) are enacted here in the mutually responsive teacher-student voices. The teacher and the student are both defending their respective position by considering each other's perspective.

Esmeralda extends her line of argument (10) by asserting that "no one says that in real life". Note the use of the deictic 'that': even in school context Esmeralda doesn't say (repeat) the correct phrase 'I were'. Once more, she makes accountable being aware of difference: she believes that the concept of *sequence of tenses* has no place in real life. Yet, in the same turn she admits a doubt ("I don't know"). The student seems to be about aligning with the teacher's word before however supporting again her belief ("it is the truth"). Here, "it is possible to give a concrete and detailed analysis of" Esmeralda's "utterance, once having exposed it as a contradiction-ridden, tension-filled unity of two embattled tendencies" (Bakhtin, 1981, 272). Esmeralda is indeed voicing here two interior competing forces, the centrifugal tendency towards difference and the centripetal tendency towards unity (ibid.).

Other students' voices raise; the sound level is growing. Then (line 11), the teacher proceeds to launch the next authoritative word, clearly not orienting to Esmeralda's question. He defers any possibility of student comments. The teacher makes quite clear to the students that investigating the usage of imperfect subjunctive in their own words, is subject to the suspensory condition of mastering the grammatical item.

But another student, Angelica, validates Esmeralda's argument ("she is right") (line 12), by re-

⁴⁶ initially considered as authority (the teacher's voice so as the authoritative voice of a French grammar rule)

⁴⁷ note the overlapping with the previous turn

questioning the use of the imperfect subjunctive in everyday conversation with family members. Moreover, she expands the argument by providing it with a temporal dimension (“that’s the way people talked in the old days even my grand mother didn’t speak like that”). Boubacar then self selects as next speaker (line 13). He recycles the phrasal structure of Angelica’s turn completion and widens the temporal dimension to a far more distant past (“*great* grand father, middle ages”). We should notice here the use of the personal pronouns: Angelica’s “my” (line 12) becomes Boubacar’s “your” (line 13). Boubacar visibly transforms Angelica’s argument into a joint one, though he does it from his point of view. The locally occasioned appropriation of the other’s word as a resource for developing the discussion occurs in complementary reciprocity. Subsequently in line 14, the teacher proceeds to an authoritative rejection (“no it isn’t from the middle ages”) immediately countered by Boubacar in line 15 (“it is”).

We may see in lines 6 to 15 that different perspectives are held in tension. The students’ internally persuasive word enters into an intense interaction with the authoritative word. Exploring difference leads to the challenge and competition between ideas. Following here the ‘single case’ of interanimating discussion about the usage of subjunctive mode means that we follow the appropriation and the development of another’s word in “the gradation of its transitions” (Bakhtin, 1981, 346). In other words, we attend “the play of boundaries, the distance between that point where the context begins to prepare for the introduction of another’s word”. Finally (line 16), the teacher ‘agrees’ with the students (“it’s true”). However he does not change completely his earlier position; he transforms the students’ “no one” into “not everyone” and “people are pretty rare”. Thus, “instead of fixed me on one side (...) [he] enters into the space between⁴⁸ and learns to see (...) anew from there” (Wegerif, 2010, 62).

CONCLUSION

In the presented ‘single case’ study, we show how ‘dialogic classroom talk’ is accomplished in the locally verbalised occurrences of the teacher’s and the students’ crossing perspectives.

In the first part of our analysis (excerpt 1), we point out how the teacher and the students display knowledge about subjunctive mode as well as mutual understanding of prototypical classroom talk organisation. In a reciprocally enacted IRF/IRE sequence, both teacher and students *do* re-voicing the authoritative word of French grammar by making accountable⁴⁹ that “its authority was already acknowledged in the past” (Bakhtin, 1981, 342).

In the second part of our analysis (excerpt 2), we rethink ‘messy’ teacher-student interaction in terms of ‘struggle’ or dynamic interrelationship between ‘authoritative discourse’ and ‘internally persuasive discourse’. Relying on the bakhtinian concept of ‘dialogism’, we show that in the analysed classroom interaction, meaning-making builds on a dynamic reciprocity of difference. We point out that, in struggle with the other’s discourse, the participants display awareness of differences in point of view and they attempt to acknowledge and to understand the other’s perspective. In doing so, they co-construct new meanings and expand the subject matter of the lesson. Thus we assert that “it is essential to look beyond the moment of miscommunication to the longer-term ongoing dialogic process if we want to understand the struggles that lead to learning” (Warshauer Freedman, & Ball, 2004, 6).

⁴⁸ a ‘dialogic’ space

⁴⁹ through correct answers resp. positive feedback

NOTE ON THE SUBJUNCTIVE MODE

In the analysed excerpts the discussed object/subject matter is the subjunctive mode and more specifically the sequence of tenses when using it (present subjunctive or imperfect subjunctive). So, we shall briefly address this critical grammatical issue. The subjunctive is a mood of verbs that can be found, with varying functions, in many languages. Generally, the notions that are expressed by the subjunctive are “doubt, possibility, necessity, desire, and future time” (“mood,” 2016, para. 2). In English the subjunctive is not very common and is usually only to be found in formal styles⁵⁰ (see e.g. the example from our first excerpt: He insists that I be in shape) (op. cit.). In French, to express, for example, a wish or an order (“he insists that”) the subjunctive mode is used behind ‘that’. Furthermore, there are intricate rules of sequence of tenses that apply. In grammar lessons in French schools, the subjunctive remains nevertheless, or because of it, a commonly treated topic, that carries many challenges for both students and teachers.

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⁵⁰ “More often, subjunctive meanings are expressed by modal auxiliary verbs, such as *can*, *must*, or *may*, as in ‘He must be ready on time.’” (op. cit.)

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IMPACT OF STUDENT CENTRED LEARNING ENVIRONMENTS ON STUDENTS' LEARNING APPROACH IN HIGHER EDUCATION

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ABSTRACT

In this action research study we investigate the impact of a competence based and student centred learning environment on students' learning approaches. The impact in comparison to that of a traditional learning environment is taken into account. At four test moments bachelor of Computer Science students at the University of Antwerp filled in a questionnaire examining different aspects influencing a student's learning approach. Descriptive statistics and paired t-tests show a statistically significant impact of the competence based and student centred character of a learning environment on students' regulation strategies, their motivation, self-efficacy, student attitude and academic efficacy. No such impact was found on students' perceived fit in pedagogical approach between secondary and university education.

INTRODUCTION

Student centred learning environments and learning approach

In social constructivism learning is regarded as a social process in which students actively construct knowledge from experiences, preferably in cooperation and in learning situations as authentic and realistic as possible, in order to facilitate the transfer to vocational environments (Kinnucan-Welsch & Jenlik, 1998). Learning is student centred and the students themselves are responsible for their learning process, which requires the acquisition of self-regulation skills. Students need to reflect on their learning for their further competence based development. The realisation of a competence-based education influences all aspects of the learning and teaching process. The role of the student changes from passively acquiring knowledge to actively constructing knowledge and developing broader competences with complex skills. Students are considered individuals rather than part of the student group. The teacher not only offers learning contents, he becomes a coach of learning processes and designer of powerful learning environments. The student and the learning process are focussed on, not the teacher and the educational process. Through self and peer assessment students get a task in the assessment process (Birenbaum, 1996).

The educational literature covers mainly the surface, the deep and the strategic approaches to learning (Entwistle, Meyer, & Tait, 1991; Entwistle & Ramsden, 1983; Struyven, Dochy, Janssens, & Gielen, 2006). Typical of the surface learning approach is memorizing in order to reproduce, little personal engagement, seeing study tasks as unwanted external impositions, routine, procedural problem-solving, limited conceptual understanding of the learning content and lower quality learning outcomes. Characteristic of the deep learning approach is the search for meaning in order to understand and active conceptual analysis, which results in a deep level of understanding and learning outcomes of high quality. The deep learning approach is the only way to fully understand learning contents (Trigwell & Prosser, 1991). In a strategic learning approach students have a performance-oriented motivation and intend to get the highest possible grades by use of organised study methods and effective time management. Depending on the assessment form these students apply surface memorising or deep understanding. Learning approaches are not characteristics of learners, but determined by a relationship between a learner and a context. A student can apply a deep learning approach in one context and a surface learning approach in another, depending on (the perception of) the characteristics of the context. Among the teaching/learning environment features that have an impact on the learning approach are the (expected) type of assessment (Entwistle & Entwistle, Contrasting forms of understanding for degree examinations: the student experience and its implications, 1991; Marton & Säljö, 1997; Kirschner, Meester, Middelbeek, & Hermans, 1993), the global quality of the learning environment (Entwistle & Ramsden, 1983; Sivan, Wong Leung, Woon, & Kember, 2000; Trigwell & Prosser, 1991) and discipline and institution specific influences (Eklund-Myrskog, 1998; Cashin & Downey, 1995).

Earlier studies on the impact of student centred learning environments on students' learning approach

Research shows that it is not easy to predict the impact of learning environments on the learning approach of students because of the many factors of the learning environment that come into play. Various studies show an increase in the deep learning approach as a result of student centred and activating learning environments (Sivan, Wong Leung, Woon, & Kember, 2000; Wierstra, Kanselaar, van der Linden, Lodewijks, & Vermunt, 2003). Other studies show that certain course contexts exclude a deep learning approach (Case & Marshall, 2004) or when the teacher is the central figure a

surface learning approach is encouraged (Trigwell, Prosser, & Waterhouse, 1999). Marton and Säljö (Marton & Säljö, 1997) argue that it is obviously easy to set up a teaching/learning environment inducing a surface learning approach, but when trying to induce a deep learning approach the difficulties turn out to be profound. Various studies confirm this finding: teaching/learning environments meant to stimulate students' deep learning approach often do not meet the expectations (Segers, Nijhuis, & Gijssels, 2006; Maguire, Evans, & Dyas, 2001; Struyven, Dochy, Janssens, & Gielen, 2006; Stes, Coertjens, & Van Petegem, 2013). Problems such as higher workload, fragmented knowledge acquisition, less feedback and structure are associated with activating teaching methods and pave the way to a surface learning approach. These problems need to be solved in order to be able to come to a deep learning approach because experiencing a heavy workload and little freedom in learning is related to a surface learning approach while experiencing good lessons, clear objectives and more freedom in learning is connected with a deep learning approach (Entwistle & Ramsden, 1983; Trigwell & Prosser, 1991). According to Entwistle (Entwistle, 1991) the defining features are the students' perceptions of how the learning environment relates to their approaches to learning, not the academic environment as such.

AIM OF THE STUDY, DESIGN AND RESEARCH QUESTION

As discussed above, earlier studies show that it is not easy to predict the specific impact of learning environments on students' learning approach because of the many factors of the learning environment coming into play. The aim of this study is to investigate the effects of a student centred and competence based learning environment in three different university courses on students' learning approaches. To this end, we have chosen for each of these three experimental courses, a control course which applies a traditional learning environment and is attended by the same student group in the same semester. That way we selected for each experimental course a control course as similar as possible with regard to characteristics of study context: class size, level of expertise of the students, time and place. This yields an experimental design in which the experimental and control group are the same: in 3 successive semesters, participants attended both an experimental and a control course and filled out a questionnaire for each at the corresponding final exam.

As this study relies on the difference in students' perception between the experimental and control learning environments, in the first semester an additional pretest-posttest design was used in the experimental and control course to allow for the analysis of these differences in perception. For this purpose, in the first experimental course, the experiment started only in the second half of the semester, after an initial six weeks of traditional teaching until the pretest at the midterm exam.

Our research questions are:

1. To what extent do students perceive a difference between a traditional learning environment and a competence based and student centred learning environment?
2. For each of the following values of X,
 - a. regulation strategies of learning: self-regulation, external regulation, lack of regulation
 - b. student motivation: autonomous motivation, controlled motivation, amotivation
 - c. self-efficacy: self-confidence, self-image, self-appraisal
 - d. social aspects of learning: student attitude (student cohesiveness, involvement and cooperation) and teacher support
 - e. perceived fit in pedagogical approach between secondary and university education
 - f. enjoyment of studying
 - g. academic efficacy,

to what extent is there a difference in X in a learning environment that students perceive as competence based and student centred vs in a learning environment that students perceive as traditional?

RESEARCH CONTEXT

The University of Antwerp embraces a teaching concept of student centred and competence based teaching, aiming at challenging students to apply knowledge and skills in order to be able to solve problems in complex real-life situations. To change or strengthen lecturers' conceptions so that they are in line with this teaching concept and to raise professional standards with regard to classroom practice, lecturers can participate in a one-year instructional development program on a voluntary basis. This program, organised and designed by the university's Centre of Excellence in Higher Education (ECHO), triggered profound innovation in the three bachelor courses of the Bachelor in Computer Science in the Faculty of Sciences which are central in this study. Over the years their learning environments have been transformed from traditional to student centred and competence based, in particular in their extensive practical assignments. These learning environments are student centred in that they challenge students to take place in the driver's seat and to actualize their best potential in learning opportunities that activate their learning by doing. They are also competence based by requiring an integrated development of knowledge, skills and attitudes in learning situations as realistic and authentic as possible.

In each of these courses, students work in group on a practical assignment for a period of 11 weeks, after an initial preparation of 6 weeks of lectures and practical lessons followed by a written midterm exam. The three central courses to this study are taking place in the first, second and third semester of the study program. In the first course, students are given a realistic and authentic problem to be solved step by step using problem solving techniques that professional computer scientists use. In the next two courses they are asked to first create their favourite project proposal related to the course material, then present it to an audience (peers and lecturers), to implement it upon acceptance - if rejected, to adjust it – and to finally present their work at a simulated conference. The assessment includes self and peer assessment.

The control courses apply a traditional learning environment with lectures and practical lessons during 13 weeks, followed by a study period and a written exam. In order to find out whether students actually perceive a difference between a traditional and a student centred and competence based learning environment, we apply a traditional learning environment in the first experimental course until the midterm and diverge only after that pretest moment. *In what follows we use the following notation: E_i resp. C_i stand for the experimental course resp. control course in semester i .*

METHOD

Participants

Participation is anonymous and on a voluntary basis. In the first semester (2013-2014) of their bachelor in Computer Science study at the University of Antwerp, all beginning students were invited to participate in this study during three successive semesters. In the first year, students are very heterogeneous with regard to learning background and prior knowledge which results in a considerable drop out and study delay. The drop out is mainly situated during and shortly after the first

semester because students then get facilities to reorient: at the midterm exam $n(E1_{pre}) = 45$ en $n(C1_{pre}) = 43$ whereas two months later at the finals $n(E1_{post}) = 38$ and $n(C1_{post}) = 39$ and at the end of the second semester $n(E2) = 32$ and $n(C2) = 29$. The study delay comes into play in the third semester where students can only attend a course when satisfying the course prerequisites: $n(E3) = 26$ and $n(C3) = 15$.

Instruments

At the midterm exams shortly before the start of the student centred and competence based learning environment in E1 (experimental course in semester 1), students were questioned anonymously about their learning approaches in the first halves of the courses E1 and C1 (control course in semester 1). Given the design of our study, it was important that not only C1 but also E1 applied a traditional learning environment until the midterm exams. The questionnaire used is a compilation of items and scales from the following instruments: LEMO (Donche, Van Petegem, Van de Mosselaer, & Vermunt, 2010) to measure regulation strategies, motivation and self-efficacy, Perceived fit (Torenbeek, Jansen, & Hofman, 2011) to measure the perceived fit in pedagogical approach between secondary and university education, Modified WIHIC (Afari, Aldridge, Fraser, & Khine, 2013) to measure student perceptions of and social attitudes in the different learning environments, TOMRA (Spinner & Fraser, 2005) to measure the enjoyment of studying, and the Student Efficacy Scale (MJSES) (Jinks & Morgan, 1999) to measure the academic efficacy. It has 82 items in 14 scales, each reflecting a specific learning approach aspect (Table 1).

Table 1
Scales used in this study and their meaning

Scale		Meaning
Regulation strategies	Self-regulation	The extent to which students actively steer their own learning process.
	External regulation	The extent to which students rely on teaching staff or the learning material to steer their learning process.
	Lack of regulation	The extent to which students experience a lack of clarity on how to steer their learning process.
Student motivation	Autonomous motivation	The extent to which students are intrinsically motivated to learn.
	Controlled motivation	The extent to which students are motivated to learn by a desire to please others.
	Amotivation	The extent to which students experience problems with motivation.
Self-efficacy		The extent to which students have confidence in their learning approach and believe in their own ability.
Perceived fit		The extent to which students perceive a fit in pedagogical approach between secondary and university education.
Social aspects of learning	Student cohesiveness	The extent to which students are supportive of one another.
	Teacher support	The extent to which the teacher helps, trusts, and shows interest in students.
	Student involvement	The extent to which students have attentive interest, participate in discussions, perform additional work.
	Student cooperation	The extent to which students cooperate rather than compete with one another on learning tasks.
Enjoyment of studying		The extent to which students enjoy their classes and assignment meetings.
Academic efficacy		The extent to which students have confidence in their academic competence.

The items on regulation, social aspects, enjoyment and academic efficacy are scored on a five-point Likert scale ranging from 1=almost never, over 2=rarely, 3=sometimes, 4=often to 5=almost always. The items on motivation, perceived fit and self-efficacy are scored on a five-point Likert scale ranging from 1=disagree, over 2=rather disagree, 3=neither agree nor disagree, 4=rather agree to 5=agree. Acceptable Cronbach's alpha values were found for the following scales: *Self-regulation* (Cronbach's $\alpha = 0.70$), *Lack of regulation* (Cronbach's $\alpha = 0.73$), *Autonomous motivation* (Cronbach's $\alpha = 0.86$), *Controlled motivation* (Cronbach's $\alpha = 0.81$), *Amotivation* (Cronbach's $\alpha = 0.81$), *Self-efficacy* (Cronbach's $\alpha = 0.89$), *Perceived fit* (Cronbach's $\alpha = 0.72$), *Student cohesiveness* (Cronbach's $\alpha = 0.81$), *Teacher support* (Cronbach's $\alpha = 0.87$), *Student involvement* (Cronbach's $\alpha = 0.89$), *Student cooperation* (Cronbach's $\alpha = 0.86$), *Enjoyment of studying* (Cronbach's $\alpha = 0.90$) and *Academic efficacy* (Cronbach's $\alpha = 0.91$). Only the *External regulation* scale turned out to be unreliable (Cronbach's $\alpha = 0.59$) and could therefore not be used for further analysis.

Data analysis

First we apply descriptive statistics and paired t-tests using the pretest and posttest data gathered for the experimental course E1 and the control course C1 to verify whether, and to what extent, students perceive differences between a traditional learning environment and a competence based and student centred learning environment. To this end, we perform three paired t-tests: for E1 and C1 at the pretest, for E1 en C1 at the posttest and for E1 at pretest and posttest.

Next we use descriptive statistics and paired t-tests to examine to what extent regulation strategies, motivation, self-efficacy, perceived fit, teacher support and student attitudes (cohesiveness, involvement, cooperation) differ in a learning environment that students perceive as competence based and student centred vs in a learning environment that students perceive as traditional. Effect sizes are reported along with p-values in order to distinguish between practically significant results and results being statistically significant (Keselman, et al., 1998). In each of the paired t-tests we only use the data of participants who participated in both the experimental course and the corresponding control course.

FINDINGS

Students' perception

Tables 2 to 5 present for each scale the mean and standard deviation as well as the results of the corresponding paired t-test. The number of respondents (column N) differs from scale to scale due to missing data.

The stars indicate the statistically significant effects. *, ** and *** denote resp small (p-value < 0.05), medium (p-value < 0,01) and large (p-value < 0.001) effects. In case of statistic significance, both the corresponding p-value and Cohen's d are in bold. The notations (S), (M) en (L) indicate the practically significant effects. (S), (M) and (L) denote resp small ($0.2 \leq |d| < 0.5$), medium ($0.5 \leq |d| < 0.8$) and large ($|d| \geq 0.8$) effect sizes.

Table 2

Paired t-tests E1pre-C1pre (N = 39) and E1post-C1post (N = 31)

Scale		E1		C1		paired t-tests		N
		M	SD	M	SD	p-value	Cohen's d	
Self-regulation	Pre	2.79	0.76	2.61	0.61	0.16	0.23 (S)	39
	Post	3.11	0.78	2.91	0.93	0.28	0.20 (S)	29
Lack of regulation	Pre	2.63	0.65	2.58	0.71	0.65	0.08	38
	Post	2.28	0.67	2.71	0.69	0.01 **	-0.56 (M)	29
Controlled motivation	Pre	2.78	0.91	2.88	0.92	0.55	-0.10	39
	Post	2.95	0.86	2.99	0.84	0.78	-0.05	30
Autonomous motivation	Pre	2.87	0.56	2.86	0.76	0.95	0.01	38
	Post	3.07	0.62	2.84	0.85	0.16	0.26 (S)	30
Amotivation	Pre	1.72	0.60	1.64	0.55	0.51	0.11	39
	Post	1.66	0.62	1.87	0.79	0.12	-0.30 (S)	30
Self-efficacy	Pre	3.15	0.67	2.90	0.73	0.04 *	0.34 (S)	39
	Post	3.54	0.65	2.70	1.02	0.00 ***	0.97 (L)	30
Perceived fit	Pre	2.48	0.69	2.63	0.95	0.36	-0.15	37
	Post	2.36	0.67	2.60	0.89	0.20	-0.24 (S)	30
Student cohesiveness	Pre	3.06	0.84	2.86	0.76	0.19	0.22 (S)	38
	Post	3.72	0.62	2.93	0.63	0.00 ***	1.05 (L)	29
Teacher support	Pre	3.76	0.59	3.72	0.60	0.77	0.05	31
	Post	4.01	0.47	3.65	0.49	0.00 ***	0.70 (M)	26
Student involvement	Pre	3.02	0.73	3.06	0.62	0.82	- 0.04	35
	Post	3.67	0.38	2.96	0.57	0.00 ***	1.08 (L)	29
Student cooperation	Pre	3.06	0.79	2.64	0.84	0.01 **	0.48 (S)	32
	Post	4.04	0.46	2.59	0.77	0.00 ***	1.57 (L)	26
Enjoyment of studying	Pre	2.84	0.56	2.77	0.71	0.60	0.09	36
	Post	3.23	0.50	2.91	0.52	0.01 **	0.48 (S)	30
Academic efficacy	Pre	2.85	0.53	2.46	0.61	0.00 ***	0.62 (M)	34
	Post	3.14	0.65	2.30	0.76	0.00 ***	1.06 (L)	27

To answer research question A, we consider paired t-tests for the following 3 combinations:

- E1pre-C1pre (Table 2) to verify if there is a difference in students' perception between the learning environments of the courses E1 and C1 at the midterm before which both courses applied a traditional learning environment.
- E1post-C1post (Table 2) to verify if there is a difference in students' perception between the student centred and competence based learning environment in the experimental course E1 and the traditional learning environment of the control course C1, at the final exams.
- E1post-E1pre (Table 3) to verify if there is a difference in students' perception between the student centred and competence based learning environment in the second half of the experimental course E1 and the traditional learning environment of the first half of E1.

At the midterm the paired t-tests for E1pre-C1pre yield statistically significant differences and small to medium practically significant effects in 3 out of 13 scales. At the final exams (E1post-C1post), after the experimental learning environment experience in E1, students' data denote 8 - mainly large - statistically significant differences in favour of the experimental setting, with in addition mainly large practically significant effects. Moreover, the 3 scales with significant effects at the pretest show increased effects, statistically and/or practically, at the posttest.

Table 3
Paired t-test E1post-E1pre (N = 35)

Scale	E1post		E1pre		paired t-test		N
	M	SD	M	SD	p-value	Cohen's d	
Self-regulation	3.08	0.80	2.84	0.78	0.15	0.25 (S)	35
Lack of regulation	2.46	0.63	2.62	0.63	0.28	-0.19	34
Controlled motivation	2.83	0.88	2.74	0.97	0.70	0.06	35
Autonomous motivation	3.08	0.62	2.90	0.61	0.14	0.25 (S)	35
Amotivation	1.67	0.59	1.69	0.61	0.89	-0.02	35
Self-efficacy	3.41	0.61	3.24	0.65	0.25	0.20 (S)	35
Perceived fit	2.31	0.75	2.49	0.70	0.29	-0.19	34
Student cohesiveness	3.70	0.60	3.02	0.79	0.00 ***	0.69 (M)	34
Teacher support	3.95	0.49	3.77	0.51	0.17	0.26 (S)	29
Student involvement	3.60	0.36	3.09	0.68	0.00 ***	0.68 (M)	32
Student cooperation	3.95	0.50	3.11	0.74	0.00 ***	0.91 (L)	30
Enjoyment of studying	3.18	0.50	2.80	0.53	0.00 ***	0.53 (M)	33
Academic efficacy	3.01	0.62	2.90	0.61	0.50	0.12	30

Considering E1 in itself, with measurements at the midterm (E1pre) and at the finals (E1post), in between which an experimental learning environment was applied, paired t-tests yield 4 large statistically significant effects with medium to large practically significant improvements, again in favour of the student centred and competence based learning environment. In the next section, we discuss these results in more detail.

Impact of student centred and competence based learning environments

To answer research question B, we consider the paired t-tests for the combinations E1post-E1pre (Table 3), E1post-C1post (Table 2), E2-C2 (Table 4) and E3-C3 (Table 5) and summarize the results in Table 6.

Table 4
Paired t-test E2-C2 (N = 22)

Scale	E2		C2		paired t-test		N
	M	SD	M	SD	p-value	Cohen's d	
Self-regulation	2.99	0.88	2.89	1.04	0.56	0.13	22
Lack of regulation	2.69	0.65	2.56	0.54	0.33	0.21 (S)	22
Controlled motivation	2.92	0.96	3.17	0.83	0.01 **	-0.62 (M)	22
Autonomous motivation	2.76	0.58	2.64	0.96	0.42	0.18	22
Amotivation	2.02	0.83	2.21	0.79	0.28	-0.24 (S)	22
Self-efficacy	2.92	0.99	2.75	1.15	0.37	0.20 (S)	22
Perceived fit	2.41	0.87	2.83	0.99	0.09 .	-0.38 (S)	22
Student cohesiveness	3.29	0.56	2.84	0.90	0.01 **	0.61 (M)	22
Teacher support	3.97	0.60	3.61	0.81	0.02 *	0.56 (M)	21
Student involvement	3.50	0.61	2.94	0.90	0.03 *	0.51 (M)	22
Student cooperation	3.81	0.58	2.84	1.13	0.00 ***	0.82 (L)	19
Enjoyment of studying	2.74	0.56	2.50	0.72	0.18	0.30 (S)	22
Academic efficacy	2.54	0.76	2.42	0.97	0.39	0.19	22

Table 5
Paired t-test E3-C3 (N = 15)

Scale	E3		C3		paired t-test		N
	M	SD	M	SD	p-value	Cohen's d	
Self-regulation	3.27	0.72	2.77	0.80	0.02 *	0.69 (M)	15
Lack of regulation	2.10	0.47	2.77	0.52	0.00 ***	-1.42 (L)	15
Controlled motivation	2.68	0.81	2.79	0.86	0.41	-0.24 (S)	13
Autonomous motivation	3.26	0.78	2.54	0.97	0.01 **	0.86 (L)	14
Amotivation	1.58	0.51	2.27	0.94	0.01 **	-0.73 (M)	15
Self-efficacy	3.75	0.98	3.18	0.99	0.05 *	0.58 (M)	14
Perceived fit	2.29	0.64	2.29	0.73	1.00	0.00	14
Student cohesiveness	3.52	0.76	2.69	0.86	0.00 ***	0.96 (L)	13
Teacher support	4.42	0.52	2.93	1.06	0.00 ***	1.47 (L)	13
Student involvement	3.41	0.83	2.60	0.82	0.00 ***	1.26 (L)	14
Student cooperation	3.87	0.77	2.59	1.06	0.00 ***	1.33 (L)	14
Enjoyment of studying	3.27	0.69	2.06	1.03	0.00 ***	1.33 (L)	14
Academic efficacy	3.15	0.75	2.40	0.84	0.01 **	0.88 (L)	14

Table 6 gives an overview of the impact of the 3 student centred and competence based learning environments of this study. We notice a considerable number of statistically and practically significant improvements. Most striking are the effects regarding social aspects of learning, with mainly large statistically significant as well as medium to large practically significant effects for the scales *Student cohesiveness*, *Student involvement* and *Student cooperation*. Next comes *Enjoyment of studying* and *Teacher support* with statistically significant improvements in 3 cases and practically significant improvements in all cases. For *Self-efficacy* we find statistically significant improvements in 2 cases and practically significant improvements in all of them. *Academic efficacy* increases with medium to large statistic significance and large practical significance in 2 cases. *Lack of regulation* decreases both statistically and practically significantly with medium to large effects in 2 cases, and shows a small practically significant increase in one case. For *Self-regulation*, *Autonomous motivation* and *Amotivation*, we note statistically significant improvements in 1 case and practically significant improvements in 3 cases. *Controlled motivation* decreases statistically significantly in 1 case and practically significantly in 2 cases. Finally, for the scale *Perceived fit*, there are only 2 cases with a small practically significant decrease.

Table 6

An overview of the statistically and practically significant differences

Scale	E1post-E1pre	E1post-C1post	E2-C2	E3-C3
Self-regulation	0.25 (S)	0.20 (S)		0.69 (M) *
Lack of regulation		-0.56 (M)**	0.21 (S)	-1.42 (L)***
Controlled motivation			-0.62 (M)**	-0.24 (S)
Autonomous motivation	0.25 (S)	0.26 (S)		0.86 (L)**
Amotivation		-0.30 (S)	-0.24 (S)	-0.73 (M)**
Self-efficacy	0.20 (S)	0.97 (L)***	0.20 (S)	0.58 (M)*
Perceived fit		-0.24 (S)	-0.38 (S)	
Student cohesiveness	0.69 (M)***	1.05 (L)***	0.61 (M)**	0.96 (L)***
Teacher support	0.26 (S)	0.70 (M)***	0.56 (M)*	1.47 (L)***
Student involvement	0.68 (M)***	1.08 (L)***	0.51 (M)*	1.26 (L)***
Student cooperation	0.91 (L)***	1.57 (L)***	0.82 (L)***	1.33 (L)***
Enjoyment of studying	0.53 (M)***	0.48 (S)**	0.30 (S)	1.33 (L)***
Academic efficacy		1.06 (L)***		0.88 (L)**

CONCLUSIONS AND DISCUSSION

Conclusion

In this action research study we investigate the impact of a competence based and student centred learning environment on students' learning approaches. Students of the Bachelor in Computer Science at the University of Antwerp participated by completing four times a questionnaire (82 items in 14 scales) for three successive experimental and control courses. We applied descriptive statistics and paired t-tests to verify the difference in students' perception of a traditional and a student centred learning environment and to examine to what extent regulation strategies, motivation, self-efficacy, perceived fit in pedagogical approach between secondary and university education, and student attitudes differ in a learning environment that students perceive as competence based and student centred vs in a learning environment that students perceive as traditional. We find statistically significant differences in students' perception of traditional vs student centred and competence based learning environments.

Moreover, this study illustrates the positive effects that may result from competence based and student centred learning environments. Our results show that these environments yield statistically and practically significant improvements for all scales of our study but one (*perceived fit*). We find significant increases for the scales *Self-regulation*, *Autonomous motivation*, *Self-efficacy*, *Student cohesiveness*, *Teacher support*, *Student involvement*, *Student cooperation*, *Enjoyment of studying* and *Academic efficacy*. In addition, we note significant decreases for the scales *Controlled motivation*, *Amotivation* and *Lack of regulation*. The only two exceptions are the *Perceived fit in pedagogical approach between secondary and university education* scale with small practically, but no statistically significant results, and a small practically significant increase in the *Lack of regulation* scale.

Comparison with the results of earlier studies

Our findings are in line with various studies that show an increase in the deep learning approach as a result of student centred and activating learning environments (Sivan, Wong Leung, Woon, &

Kember, 2000; Wierstra, Kanselaar, van der Linden, Lodewijks, & Vermunt, 2003). On the other hand, when considering the different results in Table 6 for the different experimental learning environments, this study is also in line with research that shows that it is difficult to predict a learning environment's impact (Stes, Coertjens, & Van Petegem, 2013; Segers, Nijhuis, & Gijsselaers, 2006; Maguire, Evans, & Dyas, 2001; Struyven, Dochy, Janssens, & Gielen, 2006).

Pathways for future research

In this study, we concentrated on the impact of learning environments on students' learning approach. However, also the characteristics and experiences of the individual student are major aspects that define the learning approach. A question for future research is whether competence based and student centred learning environments are valuable instruments to act not only on the learning approach, but also on deeper levels such as personality and learning style. Education 4.0 (Scharmer & Kaufer, 2013) wants to provide learners with the opportunity to achieve their highest future potential. Further investigation will have to find out which educational environments can help students to bring their personality and/or learning style in line with their highest potential.

Implications for the design of student centred and competence based learning environments

This study shows that it is worthwhile to invest in making learning environments more competence based and student centred, in order to boost students' self-efficacy and academic efficacy, to improve their motivation and regulation strategies of learning and to increase the enjoyment of learning. It indicates (statistically significantly with mainly large effect sizes) that we can distinguish four social aspects of learning, characterizing the student perception of our experimental learning environments. These are: (a) student cohesiveness, the extent to which students are supportive of one another; (b) student involvement, the extent to which students have attentive interest, participate in discussions, perform additional work; (c) student cooperation, the extent to which students cooperate rather than compete with one another on learning tasks; and (d) teacher support, the extent to which the teacher helps, trusts, and shows interest in students. We conclude that these social qualities of learning may be helpful aspects when trying to induce a deep learning approach. Moreover, as earlier studies show that learning environments meant to stimulate students' deep learning approach often do not meet the expectations, an action research study such as presented in this paper turns out to be a valuable tool to measure the impact of the learning environment at hand.

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HOW TO SUPPORT EVIDENCE-INFORMED EDUCATION? REFLECTIONS FROM THE RESPONSIBLE DATA USE PROJECT

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ABSTRACT

The Responsible Data Use project aimed at supporting and stimulating schools to improve their quality development using data. In 2014-2015, 4 trainers supported 46 data-teams (of a Flemish elementary or secondary school or school community) on a certain theme (e.g., deliberation, participation in higher education, grade retention). The trainers helped members of the data teams to a) ask relevant research questions b) collect relevant and good data c) analyse the data according to plan, d) interpret the results as a group, e) communicate the results to others and e) use the data in terms of policy options, policy directions or new questions. The goals, vision and general outline of the project will be described: what were the key-elements of the project? What were the experiences of the trainers? How was the project evaluated? Were there indications of specific changes in schools at the end of the project?

GOALS AND AIMES OF THE PROJECT

Terms such as ‘information-rich school environment’, ‘evidence-informed education’, ‘data-driven decision making’ indicate that data use is a hot topic. Because of technical and digital evolutions it is now possible for schools to collect and process much more data than before. Internationally, the use of data in schools has increased and the use of has shown to improve educational development in schools in different countries (e.g. Earl & Katz, 2006; Schildkamp et al., 2014).

Also in Flanders (the Flemish speaking part of Belgium) this trend is visible. We notice an increasing interest for data use at various levels (policy level, governing bodies, principals and teachers). The Flemish government and the Flemish inspectorate are providing schools with relevant information about their school. Schools now have information on the characteristics of the pupils in their school, their recruitment areas, grade retention, the school trajectories that pupils follow, the success of their pupils in secondary or higher education, etc. These data which are provided are enriched with information about relevant others schools, so schools can compare themselves to others. This trend is remarkable because the Flemish educational landscape is generally characterized by mixed feelings about collecting and using data. Previous research has indicated that Flemish schools are less inclined to use data in comparison to other countries (DELECA, 2015), and they do not formulate high needs to get more data nor do they formulate explicit needs for professionalization in terms of data use (Van Gasse, Vanhoof, Mahieu & Van Petegem, 2015). In Flanders, there is no tradition of using central exams or central tests. Traditionally, Flanders is characterized by a climate which values high autonomy of schools and low accountability compared to the educational climate in other countries. (see for example Standaert, 2014).

The Responsible Data Use project (see also de Bilde, Goethals, Jacobs, Decuyper and Claeys, 2014; Jacobs, 2015) aims at stimulating schools (elementary and secondary schools or school communities) to use their data to improve quality development. The project was funded by the Flemish Ministry of Education and Training and the Flemish organisation of Catholic schools. The goal is to make schools (or school communities) become more skilled in learning to read data (make data more literate) and translating it into its own policy. This translates into the following general objectives for the project:

1. Participants endorse the importance of using data for the schools’ (or school communities’) policy.
2. They collect (relevant) data sources and evaluate them.
3. They can read different and interpret data sources (quantitative and qualitative) correctly.
4. They can use the data sources to improve their school policy and quality development.
5. They spread their knowledge to other relevant staff members in the school.

OUR VISION RESPONSIBLE DATA USE

Does analysing data in schools always lead to an improvement? Not necessarily (Van Gasse, et al., 2015). Although we are advocates of data use in schools, we also like to stress that there are some pitfalls regarding the use of data (see also Standaert, 2014) and stress the importance that data should be used in a *responsible* way, in with both quantitative and qualitative *data* are effectively *used*. We explain our three principles below.

“Responsible”

We value the idea that data should be used responsively, this relates to several domains. First, when you ask people the following question “Can you prove anything with statistics?” they are often inclined to agree. That is, because statistics can indeed be used to mislead. But this does not mean that everything that has to do with research or statistics should be mistrusted (see also Earl & Katz, 2006). In the Responsible Data Use project, we devote considerable attention to increasing data literacy skills so schools themselves are capable to *distinguish the sense from the nonsense*, to distinguish the useful, valid conclusion based on data from the misleading conclusions.

Second, data can be used for goals that are unrelated to school- or quality development. Why do we want to invest in using data? Just because there are more data available and we want to do something with them? Because we want to prove to the inspectorate that we are a good school? Because we want to recruit from a higher educated audience? Data can be used to serve different goals, and these goals aren’t necessarily productive. Data can be misused. The focus of this project was to focus on data use in *a school development perspective*. We want data to be used so schools can make informed decisions that benefit the students.

Third, responsible means using data in a concrete and realistic research design in which enough, but no exaggerated, means are invested. We need to support teachers, school leaders and others to become professionals that use informative to improve their practice. The research questions that schools can focus on are more specific and practice-based. In conducting research in schools, we should strive for enough certainty to draw relevant conclusions. Some kinds of research questions and designs more suited to be examined by academic institutes, and schools should be able to consult and use these studies.

“Data”

The term "data" may create the impression that the Responsible Data Use project focuses on numbers, statistics, and easily quantifiable things. We want to stress that both quantitative and qualitative data can be a valuable source of information. Besides quantitative data, pictures, observations, drawings, document notes from focus groups, etc. can be used to inform school development. We advise schools, if possible, to try to use both types of data so that the results based on quantitative and qualitative data can complement and reinforce each other. Earl and Katz (2006) use the metaphor of the Monet painting the garden of Giverny to describe how a painter (school researcher) focuses on a specific aspect (focus), chooses different kinds of colours and materials (quantitative and qualitative data), manipulates and works with it a certain way (analysis) to obtain a painting that reflects the interpretation of the painter of that specific aspect at a specific time in the garden. Like Monet’s paintings, when collecting data, the richer the data you use, the richer the painting will be.

“Use”

Data are means towards a goal, not an end in itself. As we see more and more data being available to use, we see more and more initiatives to collect and manage these data. This raises specific questions; “Which data are useful and which are not? What can we do with these data? How do we manage these enormous flow of data so we don’t drown in it?” In order to help schools with these questions we developed a framework that can guide which questions are relevant to answer and which are interesting but not relevant. We use this framework to distinguish the information that is nice to know from the information that we need to know (see Figure 1).

Start from mission, vision and goals

In determining which data is relevant one can start by examining the mission, vision and goals of the school. The more explicit and operationalized a school's goals and objectives are, the better one can distinguish relevant from irrelevant data. Data must be in some way connected to the context, mission, vision and goals of the school. The mission, vision and goals of the school should not only be guiding in determining which process- and outcome data will be used, but also in exploring information regarding context factors, future opportunities and challenges, environmental analysis and initial situation analysis. The question should be "how does this information help us to reach our goals?"

Data may serve two functions within school development:

A Monitor or Dashboard function

A first function regards the use of the school's mission, vision and goals to 'scan' all possible information and to get an overview of the school's important context and input factors, processes and outcomes. This process be supported by using a certain framework (like the EFQM or the CIPO model from the Flemish inspectorate). When one feels the needs to structure this process and create a systematic overview one can start using a school monitor or dashboard. A monitor is an instrument that can be used to map several aspects of the school together and gives a broad but superficial overview of the school. The establishment and development of a monitor should start from a shared vision about the school, important elements of the context and objectives of the school. This may include aspects that are situated in the context of the school (data regarding the environment of the school, regarding the legislation, etc.) input factors (pupil characteristics, staff characteristics, infrastructure), process factors (policy, initiatives) and output factors (certification, well-being, success in further career). Data that are collected in a school monitor are called indicators. These indicators may be qualitative or quantitative in nature, they can have a signal (with the standards), evaluation (with targets), or a communication function. Because these indicators are compared to previous values of the organisation (evolution), with a specific goal of norm (criterion value) or with the values of relevant others (referential group), the discussion of these indicators can lead to identifying negative (red flag) or positive (green flags) highlights (see for example Van den Berghe, 2011).

Define a priority

These highlights can be formulated in a *positive direction* (green flag, something that seems to be working very good) or *negative* (red flag, something that needs improvement). We find it important to not only focus on what goes wrong and could go better, but equally focus attention on what goes right (Cuyvers, 2006). Both types of priorities can be the focus of an inquiry cycle.

An inquiry function

The inquiry framework is not merely problem-oriented but can be related to a quality development framework such as the Plan-Do-Check-Act cycle of Deming (see for example Cuyvers, 2006). The differences with quality development frameworks such as PDCA is that here we focus on relevant questions for inquiry that can and should be embedded in quality development. In the following inquiry process we can work on maintaining what already goes well, as to improve what could go better. Focussing on positive aspects of the school works motivating to the staff members (Cuyvers, 2006).

- *Identification Phase (“Who? What? When? Where?”):* At the beginning of the planning phase, it is important to explore, identify and define priority. For example, if you are planning to decline grade retention rates, it is important to know where grade retention is most prevalent in the school, since when, etc. This leads to an identification of the current situation and an identification of the goals. These goals should be formulated SMART, which means Specific, Measurable, Attainable, Relevant and Timely. For example, “We see that the number of grade retainers increased to 8%. We want to reduce this to 5%, within ...”). In the identification phase, you also determine how you will evaluate if the goals were reached.
- *Diagnosis phase: (Why?)* In the diagnosis phase, you identify possible underlying critical processes and factors that influence the goals. For example, you ask yourself “Why do 10% students in third grade retain their year?” In the diagnosis phase you identify possible factors that can help or interfere with the accomplishment of the goals. These factors can be internal (manipulable by the school) or external (non-manipulable by the school). In the diagnosis phase several assumptions hypotheses can be tested (for examples see Schildkamp 2014).
- *Action phase: (How can we?)* Based on the assumption that certain underlying factors play an important role, we start looking for possible actions. “Which actions can we take?”, “How are they implemented in other schools?” “What are the necessary conditions for success?” In the action phase we make an action plan. For example, it may be decided for example to working grade transcending activities. In this plan we include relevant aspects such as the action but also include other important aspects such as who will be responsible, the necessary means and conditions, and we also focus on the evaluation of the actions. How will we know our actions were implemented according to plan?
- *Evaluation phase (What is the result of?):* In the final stage you evaluate the actions and the results. To what extent have the objectives been achieved? “Did we set up adequate class-cutting initiatives? Could we reduce the number of grade retainers?” The results of this evaluation can lead to a new inquiry process, with new goals, and new actions to be taken (single loop learning), but it can also lead to redefine the vision, and strategic goals of the school, and lead to double-loop learning (Cuyvers, 2006).

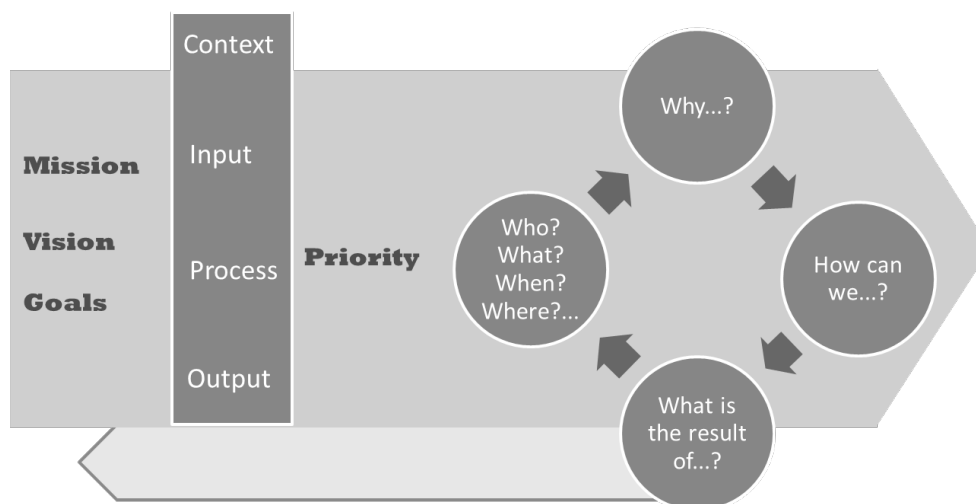


Figure 1: Responsible Data Use Model.

OUTLINE AND CONCEPT

Pilot project and the expert group

Because the Responsible Data Use project was very new, the school year 2013-2014 was used to develop and test the project in 10 pilot schools. Reflections and experiences (de Bilde et al., 2014; Jacobs, 2015) were used to develop and improve the training program.

Because the training project was so new, we consulted our network of experts, in 2013 with the question to participate in a resonance group, the 'expert group'. This expert group was involved from the outset of the project and followed up on important questions, issues and helped us to reflect on the project and to improve. They offered us valuable feedback. Through our joint reflections our vision on data use grew.

Combination of plenary and school sessions

The project involved 10 plenary sessions and 4 school sessions. In the plenary sessions we offered general content and practiced with relevant data. For example, the curriculum contained basic principles or inquiry, a framework for data use within school policy, the concept of measurement levels, reliability and validity, triangulation, causal inference, and quantitative and qualitative techniques of analysis. Regarding quantitative analysis, the focus was primarily on conducting descriptive analysis. Regarding qualitative analysis, the focus was on offering different analysis techniques that schools can use within their budget and time constraints. In the school sessions we focussed on a certain theme of questions formulated by the school. Examples of themes used in secondary education were mainly focused on exploring school trajectories (evaluation certification policy and orientation practice, examining success in higher education, retention and retentivity), but some trajectories focused on specific course content (medical mathematics, CLIL- education). In primary education more data is available from standardized test scores, so trajectories focused more on certain topics (world orientation, mathematics, language learning, speaking and listening skills). Other topics used in primary education were more general in nature (evaluating homework policy, reading information from the government, parent satisfaction and involvement).

Working in a 'data team' in collaboration with pedagogical advisors

In each school or school community, a 'data team' was formed. The data team can be a newly organised group or it could be an existing group which focused on school policy or quality development. The group usually consists of a school leader, members of the middle management (care coördinator, school administrators, ICT coördinator), teachers, etc. In each data team a pedagogical advisor (who offers general or specific support to the school) was also involved. The project was also oriented towards professionalising the pedagogical advisors in terms of data use. The advisor on his turn supported the trainers and the school in the process.

The inquiry cycle: a stepwise approach

In every school trajectory several phases of a inquiry cycle were followed. The trainers helped members of the data teams to a) ask relevant research questions b) collect appropriate data c) analyse the data accordingly, d) interpret the results, e) communicate the results to others and f) use the data in terms of policy options, policy directions or new questions. Figure 1 describes the inquiry cycle that we followed through the school year. Because we worked with customized trajectories, focusing on

the needs and questions of the school, the concretization of these inquiry cycle differed strongly between trajectories. In some trajectories, we merely focused on reading existing information, while in others a large data collection was organized.

Still, there are some common distinguishable phases. We start by brainstorming and formulating specific research questions. In this step, we also reflect on the possible use of the information and we formulate expectations regarding the answers we will get. In the second step, we make a plan: what data will we collect and what can we assume about the reliability and validity of this data? How will we process this data and who will be responsible? After the actual collection of the data follows the analysis phase where the data is processed as planned (Step 3). These results are discussed and interpreted with the data team (Step 4). In the interpretation phase, we start looking for possible explanations for the results, we link these statements to other aspects of the school, we ask additional questions and we reflect already about the use of the information. Communication is important throughout the inquiry cycle, but especially after having discussed the results and before using the information. That is why, in step 5, we develop a communications plan to disseminate the learned (about the results, interpretations and new questions, the learning process) to others (school staff, parents, students, etc.). In the last phase, we think about the next steps and we will use the data: Which goals do we define? What policy options will we take? Which questions do we have to answer now? Which priorities can we formulate? What actions can we undertake?

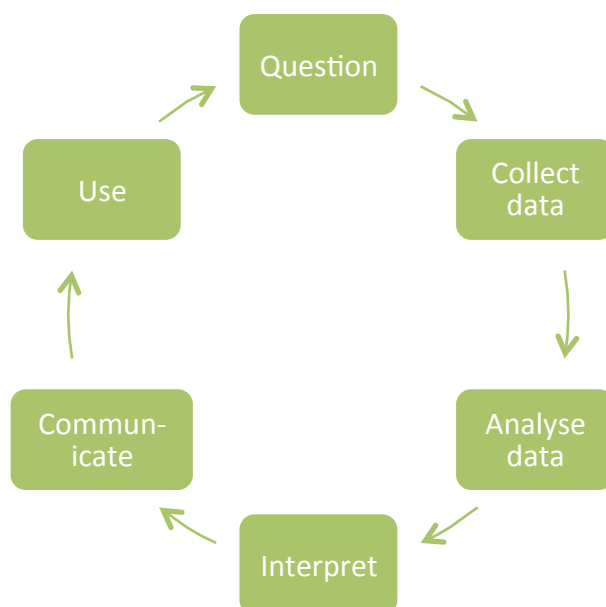


Figure 2: The inquiry cycle used in the Responsible Data Use Project.

EXPERIENCES AND EVALUATION

Methods of evaluation

During the project several evaluation methods were used. First, we conducted a baseline study assessing the attitude and perceived skills and competences about several aspects of data use. The reported attitude towards data use was already very high at the start of the project, so it was impossible

to detect a 'grow' in attitudes through the project. Participants got the same items at the end of the project, but although results pointed in a positive direction indicating grow in terms of data use skills and competences, the response rate was very low on this final questionnaire (only 20 participants filled in the questionnaire).

Second, specific aspects of the projects were evaluated individually using diverse questionnaires. These questionnaires contained items to be valued on a scale from 1 to 4, open ended sentences that participants had to complete, open questions about the sessions, etc. For the evaluation of the plenary session focussing on quantitative analysis methods, we asked participants to rate their perceived level of quantitative analysis before and after the session, so a indication of the general 'learning gain' could be depicted (for example, see figure 3).

Third, the informal feedback we got from schools and pedagogical advisors was included in the discussions and the evaluations by the trainers in the reflective meetings after and between the sessions.

General evaluation of the project

We learned from the different evaluations that we were able to improve knowledge, skills and attitudes with regard to data use in schools. We can say that overall the project was evaluated positively.

When we take the inquiry cycle as a framework, in most schools we discussed and interpreted the results (38 out of 46 schools) thanks to the efforts of many members of the data teams. In addition, we noted that one year and 4 school sessions is too short to formulate specific possible actions (17 out of 46 schools). In many schools (32 out of 46 schools) there is a willingness to communicate to an audience, but this is not necessarily realized in the same schoolyear. We noted that the schools want to apply the acquired knowledge further. About half of the schools (23 out of 46 schools) formulated new or clarifying research questions.

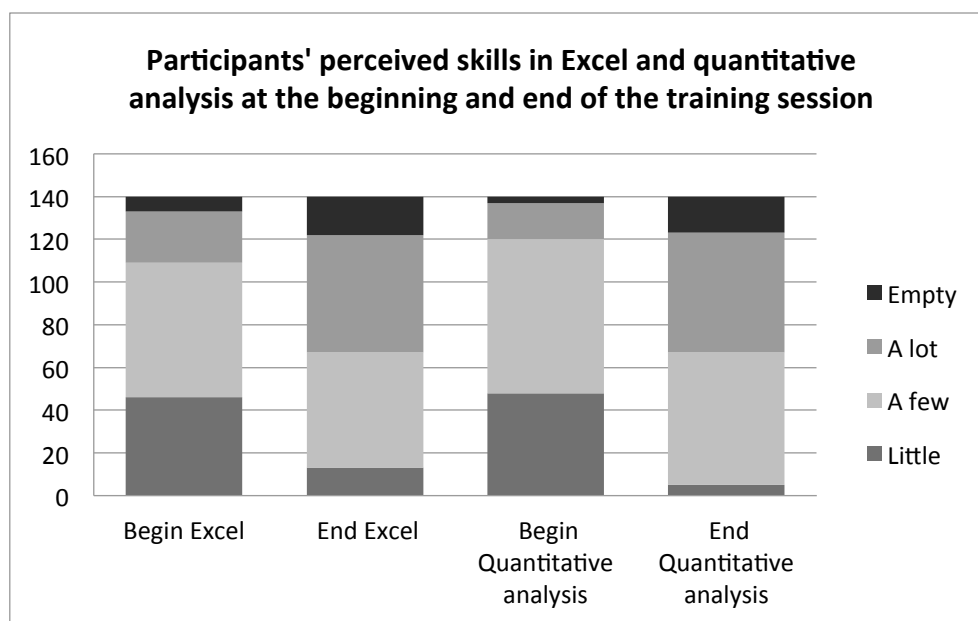


Figure 3: Example from an evaluation of the plenary session regarding quantitative analysis and the use of Excel.

Strengths and opportunities

Diversity between schools and trajectories

There were large differences between schools regarding to their interests, questions and the themes at the focus of the project. We also encountered differences in term of policy making capacities, which could be reflected in the capacity to decide which questions should be addressed. While in some schools the questions were largely driven by certain visions, goals and priorities, other schools struggled to find a focus for the data project. One of the major strengths of the project was that, because we conducted intakes and worked with general plenary sessions, we were able to adapt the program based on the needs and questions of the schools in the school sessions. In some trajectories we focused on developing good research questions, in others we primarily focussed on important aspects of data collection and analysis, while in others we focused a lot on communication and using data for policy making and quality development.

Diversity between data team members and inclusion of the pedagogical advisor

We promoted a diversity between members of the data team, not only members who feel affiliated with data use. Team members with a scientific background were more familiar with statistical terms like a standard deviation, while this was new content matter for others. There were differences in terms of motivation to involve in an intensive data project. The diversity between data team members has shown been a strong advantage. The presence of multiple types of members (principals, leaders, analysts) made the discussions much richer because multiple perspectives were involved. The presence of a pedagogical advisor, who worked with the school as a critical friend, enables a possible follow-up of the project in the long run. Including the pedagogical advisor also facilitates possible future role as promotor and supporter of data use in schools.

Data use in a developmental perspective

During the intakes, it was prevalent in about half of the schools that a previous or forthcoming visit from the inspectorate was one of the element to subscribe to the training project. In the beginning, this worried us because we want to use data mainly from a developmental perspective (see vision). The fact that the inspectorate was a motivating factor to subscribe did not influence the focus in the trajectories. In all trajectories data were used in a developmental perspective, which means that the focus was on central aspects of school quality and school improvement. The longterm focus was, in all trajectories, improving the quality of education.

Availability of school-level data

At the same time of our project, the Flemish government provided schools with new information about several aspects of their school ('de databundels'). Because this information was new to schools, we got a lot of questions from schools about the use of these data sources. This information was often used as a first step to explore key aspects of the school. Because of the availability of this information, the trajectories were facilitated because time and energy could be invested in other questions.

Promoting quantitative and qualitative methods

In most trajectories quantitative methods and techniques were used. This has to do with the expectations prior to subscription, with the motivation to invest time and energy in data collection, and

with still some suspicions about the objectivity of qualitative data. However, by consistently promoting and demonstrating qualitative methods and techniques, especially during our plenary sessions, we did broaden participants' perspective about different data sources and analysis techniques and encouraged them to try qualitative inquiries.

Weaknesses and challenges

Differences in competences and experiences between participants

Especially in the plenary sessions, this a weakness that came out during evaluations. Although we provided several parallel sessions meant to differentiate between participants, we did still received feedback that the plenary sessions were either 'too slow en too easy' or 'too fast and too difficult'. Also in the school sessions, it was challenging for the trainers to work with differences in competences, experiences, motivation, and policy making capacities.

Task load of schools

Although focussing on data use is meant to improve efficacy of schools and reduce workload in the long run, starting with data use is time and effort consuming. We noticed that it was difficult for schools to be able to find time to collect relevant data and analyse data. Frustrations about information that is only available in PDF, about software packages that do not allow to export information, etc. can occur. Often, the job of collecting and analysing data was work that had to be done by one or two members after hours.

Unrealistic expectations towards data use

During the intake conversations, we sometimes notices unrealistic expectations towards data use. For example, "we want to 'prove' that grade retention has a negative effect for our students in our school". Even in academic research, it is often very difficult to 'prove' the effects of certain interventions. Pupils are no objects you can use to experiment on, you can't manipulate the school trajectories ('for example, we are going to test if grade retention works and will randomly decide which pupils retain a grade'). In conducting research, you will have to work with the fact that not all necessary conditions to make claims about causality are met.

Secondly, schools can have goals that are related to more non-cognitive aspects of students functioning and focus on goals that are related to 'having happy students'. These types of goals are sometimes difficult for a school to control fully and difficult to examine the impact of the school in this regard. For example, a pupil scores high on a well-being questionnaire is primarily determined by factors outside a school, there are a lot of differences between pupils within a school (e.g. De Lee & De Volder, 2009).

CONCLUSION

In Flanders, studies indicate that schools are less inclined to use data compared to some other countries (DELECA, 2015) and do not formulate high needs for professionalization regarding the use of data (Van Gasse et al., 2015). The participants and schools which subscribed in de Responsible Data Use project generally had a positive attitude towards data use already at the beginning of the project. Of course, these participant can hardly be seen as a representative sample. In our experience,

some skepticism at the beginning of the project by some participants can be turned into enthusiasm about the use of data if we are able work with questions that are relevant for the school and if we are able to support schools enough so they can actually use this information. We experienced that starting to use data creates more questions and more needs for professionalization. During the project the trainers got more and more questions from the schools in the project, and actors outside the project, which led to extra support between sessions and after sessions.

Did the Responsible Data Use project support the quality development and the schools' capacities for policy making? At the start of the project, we did not select schools in term of prior general policy-making capacities. We experienced that schools, by working in the Responsible Data Use Project, indirectly practiced on three components of a school's policy-making capacities (Van Petegem & Vanhoof, 2009). First, focusing on relevant questions and the goal orientedness of these questions helps schools to reflect on their goals, express them, and move towards a joint goal-minded attitude. Second, in the project schools reflected on the questions formulated, the interpretations of data, the conclusions based on data, etc. These reflections can stimulate the reflective capacities of the participants. Third, during the project, we focused on stimulating a data team's communication towards other staff members. We reflected on what to communicate, to who and how, thus stimulating a joint communication in the school.

What effects did the project have in the long-run? The project was very short term, with only four school sessions and some plenary session. Therefore, we cannot expect that the project in itself will have a strong lasting impact in all schools. However, the collaboration with the pedagogical advisors does create opportunities to follow-up and support the schools in the long run.

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The project was funded by the Flemish Ministry of Education and Training and the Flemish organisation of Catholic schools. We would especially like to thank our co-trainers, Greet Engelbeen and Katrien Claes, for their inspiring enthusiasm in developing and implementing this project with us. We would like to thank Paul Mahieu and the members of the expert group for their contributions and feedback. Last but not least, we would like to thank all the participants, for their involvement, effort and valuable feedback.

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ORAL PRESENTATION SKILLS FOR ELEMENTARY EDUCATION STUDENTS: PEER GROUP AS A RESOURCE FOR DEVELOPMENT

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ABSTRACT

While the importance of the oral presentation competence has been widely acknowledged in Higher Education given its relation with professional demands, it remains unclear the potential benefits of the development of such competence in Elementary and Secondary Education. This research examines the effects of a training program aimed at promoting oral presentation skills with a group of 17 sixth grade's students (aged 11-12 years). The program consisted of 15 sessions of two hours each over a period of one year. Data collection consisted of audio and video recordings of the sessions and the students' performances when doing their presentations, written summaries of the sessions, and audio recordings of the research team meetings. The holistic content analysis of the data led to the identification of three topics: 1) the importance of taking into account the cognitive development of students; 2) the students' self-regulation of emotions which appeared throughout the process of speaking in public, and 3) the effect of peer support as a collaborative context which facilitated students' performances. The need to include and track the cognitive development of the participants, the management of their emotions as a meaningful element of their talks, and how peer support goes beyond the generation of informational feedback is theoretically discussed.

Keywords: Oral Presentation Skills, Primary Education, Peer support, Developmental Education, Self-regulatory Processes, Inquiry based learning, Qualitative Analysis

INTRODUCTION

“My view is that we have an universal phobia of being looked at on a stage [...]”.
(Johnstone, 1979, p.30)

Oral presentation skills is one of the most cited competences in the context of Higher Education (van Ginkel, Gulikers, Biemans, & Mulder, 2015a). However, there are little explicit pedagogical designs focused on developing students' communication competence (Bower, Cavanagh, Moloney, & Dao, 2011), much less in Primary or Secondary educational levels. Results obtained in Higher Education studies (De Grez, Valcke & Roozen, 2009) stress the importance of peer feedback, multimedia recording support (Bower et al., 2011), the inclusion of structure and non-verbal cues and above all the provision of opportunities of watching models and practicing to create a sense of self efficacy and self competence (van Ginkel, et al., 2015a).

Despite the many studies that have been carried out, there is still an open question regarding the relationship between how individuals learn to perform public talks and how to develop that competence by providing specific training contexts (van Ginkel, 2015a). In this vein, Bower et al. (2011) stress that there are few general pedagogical models for developing communication competence that relate how students learn to communicate within prescribed learning and assessment tasks. In this line, they argue that it is hard to find studies providing any underlying or formalized pedagogical approach for the students' communication improvements that they report. From its part, Van Ginkel et al. (2015a) show, in their systematic literature study, the incomplete and fragmented picture that still exists of the relationship between characteristics of the learning environment and students' oral presentation performance. In this connection, and as a path to describe the impact of didactical interventions in further research, they claim the need to include additional concepts, besides behavior modelling and feedback, as well as the need to adopt a systematic approach and a comprehensive perspective.

While we agree with the limited potential of excessively fragmented and constrained approaches to study how to teach oral presentation skills, we cannot agree with the purpose of adding more concepts to the existing “conceptual fog” (Bateson, 1972) inherent to the empiricism and the high value set upon prediction among many researchers. Rather, with the present research we aim to gain understanding of how our students developed the oral presentation competence by giving a prime role both to the observations made by the team of trainers, and the fundamentals of development theories, in order to offer detailed descriptions of the complex interactive system of our training program.

When it comes to the inclusion of the affective or the emotional dimension, previous research does not extend much beyond stressing a negative influence of anxiety in students' performances (Brown & Morrissey, 2004), or proposing rehearsal as a way to reduce such anxiety (Rubin, Rubin, & Jordan, 1997; Orejudo et al., 2012). In the same vein, in the literature there is no much detail when describing how the group of students functioned in the learning contexts under study, and usually just information about the group size or the group composition is provided. An example of recent research is De Grez, Valcke & Berings (2010), who studied the reliability and validity of peer assessment. For us, the group of students was not only a circumstance, but an essential aspect of our training program.

What does it mean for a preadolescent to give a talk?

Although most of previous studies have worked with students in Higher Education, it is hard to find in the literature a developmental approach to the training of oral skills. As Bower, et al. (2011) point out,

the oral presentation competence involves the interrelatedness of cognitive, behavioural and affective domains. In this line, when we started to think about how to teach to give a talk to a group of preadolescents we took into account the mentioned dimensions for the specific developmental stage of our students.

Preadolescence could be considered as a transitional period of life since the individuals in this stage are still concrete thinkers (Piaget, 1970; Meadows, 2012), but they are starting to be able to think in an abstract way. This implies a shift from individuals' current logic way of thinking towards a more flexible one when it comes to consider subtle nuances when making sense of people and situations. All this leads preadolescents to be able to express and evaluate more accurately arguments and ideas, detecting gaps in their own thoughts and in the others'. Thus, given the specific evolutionary moment of preadolescents, we conceived our training program aimed at promoting oral skills not only as a space where to gain knowledge, skills and attitudes to speak in public (De Grez, et al., 2009), but also as a context where to foster participants' development.

Our training program

Our training program started as a way to develop a local TED-Ed Club⁵¹, an initiative associated to the international organization TED aimed at supporting presentation literacy for students in school age. Once we spread this proposal in a public Elementary School, a group of 17 sixth-grade students and her teacher enrolled in the program. The training was guided by a team formed by five people, of whom three of them are the authors of the present paper.

TED-Ed offered us guidance in order to organize the training. From the very beginning, however, we considered such guidance as a mere reference, being open to emerging formative needs. Thus, our training program consisted of fifteen sessions and a final session developed over a period of thirteen months where the students made their final presentations. See Figure 1 for more detail.

During the first three sessions the training team had the opportunity to meet the students, their interests, and their current ability to perform a talk. In this way, we were able to sketch the main aims of our training program, which turned out to be the following: to improve the fluency in participants' discourse, to teach students narrative strategies that allowed them to create interest in their audience, to increase their emotional management of critical incidents, and to foster the collaborative support between students. Together with the above, and having in mind our objective to utilize this context as a developmental one for the students, there were several instructional principles that guided our teaching practice.

As a basis, along the whole training program we followed collaborative practices where dialogue was our main tool for generating and sharing ideas. Every time the students did a performance talking in front of their peers and trainers, they were given formative and individualised feedback (Hattie & Timperley, 2007). Specifically, from the tenth session on, co-constructed rubrics were used to let the student assess their peers and themselves. For us, rubrics had a double purpose: on the one hand, they enabled students to coordinate and distinguish different personal perspectives; on the other hand, they were a way of detecting what the students were able to notice from a talk in terms of performance. The latter principle of tracking students' development was specially noticeable in the ninth session, when

⁵¹ TED is a nonprofit initiative devoted to spreading ideas, usually in the form of short, powerful talks (18 minutes or less). TED-Ed was launched in 2012, characterized by their short, animated videos about ideas that could spark the curiosity of learners everywhere. TED-Ed is TED's youth and education initiative. It's mission is to spark and celebrate the ideas of teachers and students around the world. <https://ed.ted.com/about>, https://youtu.be/ZDq_pWi7dH4

we decided to go beyond the initial guidelines provided by TED-Ed. In that moment, we realized that we needed to work with the participants in a more individual basis, building up from their concrete performance instead of employing time in analyzing general video-recorded examples which functioned as a model for them. Thus, the last five sessions of our training program were based on working in detail around participants' individual performances, including progressively feedback provided by trainers and peers.

Research aims

This research aims to understand the influence of attending a training program to promote oral presentation skills in primary school students. Specifically, we aim to understand how our program facilitated participants' self-regulatory processes regarding cognitive, affective and social domains as well as the effects of peer comparison, peer support and peer assessment on participants' development.

METHOD

Research context and participants

The focus of this study is a training program aimed at promoting presentation skills addressed to 17 students aged 11 to 12 years. Participants, with the acceptance of their families, enrolled in the program together with her main teacher. The program was conceived as an extracurricular activity and it was held over 15 two-hours sessions from May 2014 to June 2015. Trainers were five people, including the three authors of the present paper.

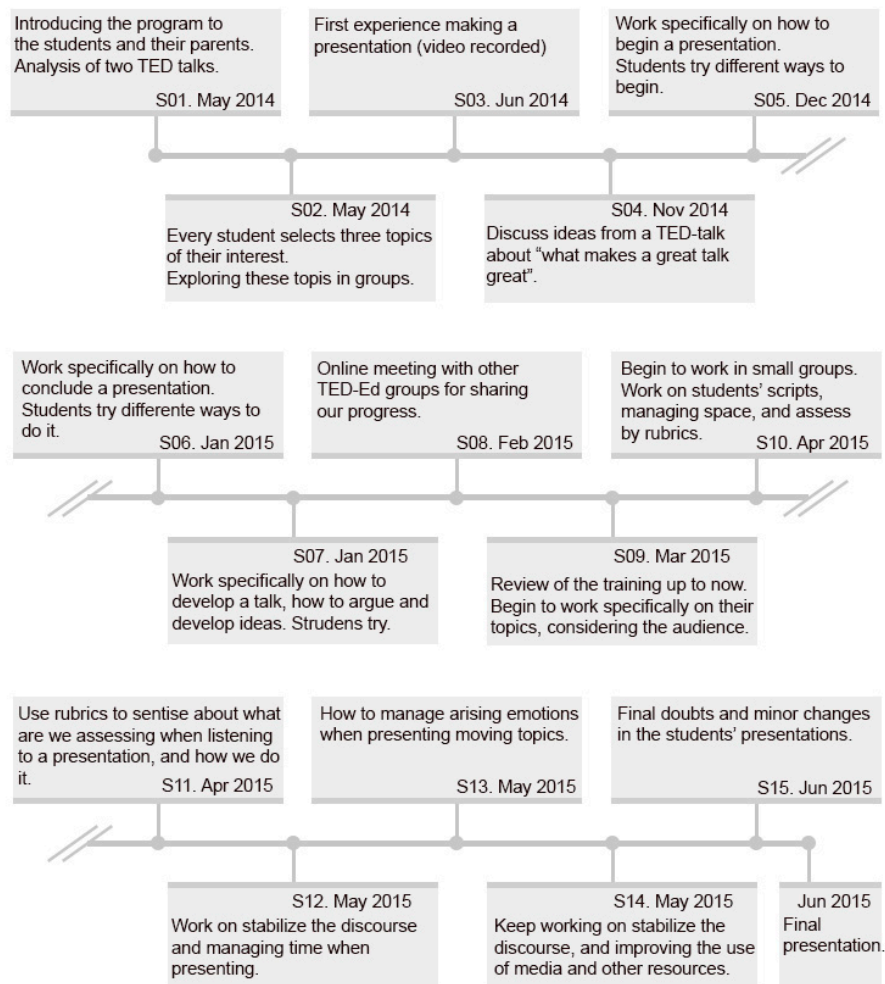


Fig. 1.: Overview of the sessions of our training program.

Data collection

All sessions of the training program were audio recorded, students' presentations over the training program were videotaped and written summaries of each of them were elaborated by the team members. Furthermore, research team meetings both before the sessions (preparation meetings) and after the sessions (reflection meetings) were audio recorded.

Data analysis

A qualitative research approach based on inquiry based learning (Pedaste et al., 2015) was adopted. A holistic content analysis (Lieblich, Tuval-Mashiach & Zilber, 1998) was made to closely examine the audiovisual and textual data in search of relevant topics. It encompassed the follow-up of each participant with regards to his own personal learning process, including also the evolution of the whole group.

RESULTS

Our preliminary results revolve around three topics which deal with (1) the importance of taking into account the cognitive development of students in order to promote their development of oral skills, (2)

the students' self-regulation of emotions which appeared throughout the process of speaking in public, and (3) the effect of peer support and collaborative coevaluation to facilitate students' performance when making an oral presentation.

Cognitive development of the participants really matters

Conducting a training aimed at promoting oral presentation skills in Higher Education could easily take for granted participants' cognitive development. On the contrary, cognitive development is something that you cannot ignore when working with Primary School students aged between 11 and 12. In fact, the cognitive variation within a group of pre-adolescents is similar to the physical variation that you can find in terms of their puberal changes. In this regard, the analysis of the students' oral presentations in terms of cognitive development revealed a typical pattern, leading us to identify three different kinds of presenters: concrete, transitional and basic abstract.

Concrete presenters had a discourse characterized by the concatenation of fragmented thoughts without a common thread and whose only connection was they were referred to a general theme (i.e.: different types of videogames, different family anecdotes). The beginning of this kind of presentation does not usually include any personal justification of the topic, and the change towards a different topic is signaled by the speaker by merely declaring that there it comes a new subtopic. This is an example: "Hello my name is M... and I want to talk about the family roles and my sister. First, I want to talk about the roles of the family. The roles of the family are assigned in some way but they are also assumed. They are not natural but a social and particular construction. I think that the most rigid is the family the worst it will be. *And now I am going to tell a bit about the siblings*" [emphasis added]. Generally, the end of the presentation comes in a sudden and unplanned way, as we can see here: "And this is my talk and I hope you liked it".

In contrast, transitional presenters attempt to introduce their topic with a more elaborated structure by presenting it as something worth to pay attention to as: "Hello I am S. and I am going to talk about *a very interesting topic*: the dreams. *First of all*, I am going to introduce you to Sigmund Freud...". This beginning is normally followed by a sequence of arguments intertwined with examples where the speaker positions himself with regards to his discourse using expressions such as "I also think that", or "I have also done that". This kind of presenter is more likely to connect more logically the different parts of the speech with 'discourse markers', such as: "...dreams are visions of desires. *And as we are talking about dreams we are going to move toward nightmares*". The end of the presentation uses to be brief and abrupt but there is a more active interaction with the audience, like in: "Thank you very much for listening to me and here it finished my talk".

Finally, basic abstract presenters provide a general frame for their topic, introduced by questions normally connected with the speaker's and the audience's interest, in a way that both the presenter and the audience are included as 'we', as in this example: "Hello my name is N. and I would like to tell you about a topic that I guess *everybody* loves: it is Magic. *Everytime we hear this word, what do we think? What is really Magic about? Does it really exists?*". In this kind of presentations, it is easy to follow the logical thread through the use of discourse markers, which are used in a smoother way: "Ok, *regarding the first question* I can give you an answer. Magic is the art or science, as you prefer, which...". As it was highlighted with regards to transitional presenters, in basic abstract presentations it is even more common to find sentences including the first personal pronoun and the presenter's opinion, as in "*In my opinion magic does not exist*". In contrast to the previous examples, this more formal and abstract kind of oral presentation finishes in a more elaborated and personal way, as in the following example: "*I would like to conclude with my own experience which justifies why I chose this topic. (...) And in order to finish I will pose a question: why do we ask a magician how did he perform*".

a trick? Perhaps it is because we are looking forward to ask about it, and this is the end of my talk, I hope you enjoyed it.”

Unlike concrete presenters, transitional and basic abstract presenters show in their talks what we can term a ‘narrator self’. They organize their presentation, ask questions to the audience and reflect on their own ideas. In this sense, both the presenter and the presentation are differentiated, being common to find metacognitive resources such as “I think...”, “in my opinion...” or “I consider...”. This is not the case in concrete presenters, who are fused with their presentations.

Attending to the former three different levels of performance, we found how most of the participants evolved from performing an objectified and fragmented discourse at the beginning of the training program towards a more personalized and integrative story at the end. At that time, most of the presenters were able to talk about more complex issues, developing their ideas throughout the presentation and attending to a common thread instead of juxtaposing ideas one after another. In this respect, we classified the final students’ performances according to the described continuum of three positions in terms of complexity of cognitive development: eight students reached the basic formal presentation, eight students were in the transitional position, and one student remained in a concrete position.

Emotions are around the corner when presenting in public

The expression and self-regulation of emotions appeared as a key issue in our training program, although it was not formally expected beforehand. In this regard, we differentiate between two different emotional experiences: those emerged during the exploration of a personal topic, and those more related to the process of speaking in public but not to the content of the presentation.

With respect to the content of the experiences presented, students had to learn to manage emotions that emerged as they connected with sensitive meanings arising from their topics, what was common when they were related to family issues, such as a relative’s disease recovery, or the premature death of a brother. Connecting with these meaningful experiences usually led participants to the expression of sadness or some kind of temporal despair. In those moments, the flow of the presentation was interrupted, providing students an opportunity to manage those emotions. Instead of ignoring or repressing the experiences connected to the emotions, participants were encouraged to connect with them in order to acknowledge why that topic was important for them, and also in order to let it go while they paid attention to their natural breathing. After several examples of experiencing this two-step process, the elaboration of the topic was lived normally by students, without interrupting the presentation. In this kind of emotional management, it is also interesting to mention joy, because it used to influence the process of talking about one’s experience by increasing the arousal of some participants. As a result, some of them provided too much detail, spoke too fast, or lost the structure of the general script that they followed. In all cases, emotions were understood as part of participants’ experiences, without labeling them as positive or negative, and therefore included naturally to make their stories more relevant for them and for their audiences.

With respect to the emotions linked to the process of speaking in public, it is worth noting that they were less frequent than we expected. Experiencing shame and anxiety because of being exposed to others was not a big issue. This was explained because most participants paid more attention to their willingness to share their ideas and stories with others, than to be judged or evaluated by others. There were just a couple of exceptions illustrated by two participants who showed less confidence in their capacity to talk in public. As a result, they used to talk in a low voice, showing little expressiveness in their non-verbal communication, and interrupting often their discourse while losing the thread of their

topics. In order to normalize these situations, we simply used to wait until the participants were able to proceed with their presentations. It is also interesting to stress that sometimes it was the opposite experience of feeling too much confidence what needed to be managed. Although less frequent, it was also important for participants to be able to acknowledge what could be the effect of such overconfidence in their audience. As a result of the inclusion and normalization of the emotional dimension, most presentations became more fluent and meaningful as cognitive and socioemotional resources were integrated.

Getting self-support through peer support

Support is a two-way path. In our training program we encouraged and witnessed how the whole group supported every participant's effort to explain himself in front of others. Small groups were formed from the beginning of the program where participants could share their understandings, ideas, strategies and experiences. These natural small groups worked as a natural scaffolding to generate trust in one's performance competence. As a complement to these small groups, the participation of the individuals within the whole group was also encouraged. Sharing their ideas, questions, doubts, conclusions and contributions of any kind was normal for the participants from the very beginning when talking with the main trainer of the session. Talking in the big group was also a subtle experience of expressing themselves in a more informal situation. In any of these situations, every presentation was encouraged and normalized as a good example of sharing ideas so that participants became used to exposing themselves to others.

However, from the tenth session on we developed a more formal evaluation of participants' public presentations. We introduced the use of rubrics in order to evaluate every presentation. Rubrics were created including criteria provided by every member of the groups in order to understand why they preferred a presentation over another. Some of these criteria were the following: non-verbal gesturing, managing physical space, interest of the topic, coherence, maintaining a steady gaze or degree of organization of the speech. The use of rubrics to evaluate others' and one's performance contributed to emphasize the key elements that participants could take into account to enjoy and also control their own performances. As they internalized these criteria, it was easier for them to focus on the experience of sharing their topics. Both informal and formal support based in the information provided by others was key in the creation of a standard of performance that participants could use in order to measure themselves and others, generating a higher control of their own sense of competence. Those participants who experienced an initial lack of confidence demonstrated a clear improvement in their public performance. Measuring oneself through the measuring of others' performances resulted to be a good complement to the formal and informal social support experience throughout the program.

DISCUSSION

Even when it has been widely acknowledge the influence of the cognitive dimension when developing oral presentation competence (Blunck, 1997), research based on Higher Education hardly specifies the implications of the developmental cognitive stage of individuals under study. According to our results, we state the need to include the specific developmental cognitive stage formally when working with Secondary and Primary Education students. Far of remaining stable, most of our participants showed a cognitive evolution during the year that our program lasted. This evolution had a clear direction of getting more complex presentations as an evidence of a more complex cognitive state that we have described as beginning from a concrete performance and evolving towards a more abstract way of presenting their talks. The analysis of their performances throughout the program provides interesting

information about the developmental nature of this cognitive change. Issues such as how fragmented or interconnected are their arguments, the growing presence of logical discourse markers, the emergence of what we termed as a “narrator self” able to reflect on his discourse, are good examples of the higher complexity that we found in our participants at the end of the training program, but also along the whole process. Learning to make a public presentation goes beyond a technical approach which stresses how to structure a discourse and how to manage verbal and non-verbal cues (Hardison, & Sonchaeng, 2005). This kind of complex competence can also promote cognitive development, and simultaneously it is also constrained by the cognitive state of the participants. Although this is clearer in Primary and Secondary School, it should be included in Higher Education as well.

Regarding our second result focused on the need to include emotional experience in order to learning how to regulate it, we agree with the definition of the competence of public presentation as a complex integration of cognitive, behavioural and affective domains (Bower, et al., 2011; Van Ginkel, 2015a). According to our results the emotions which arose around the promotion of a public presentation competence provided a key meaning to the learning experience. Far of considering such emotions as an epiphenomenon of the program or merely part of the non-verbal communication (Hardison, & Sonchaeng, 2005), we defend that it is fundamental to include them from the beginning. The distinction between emotions related to the task and emotions related to the content of the talks revealed itself as a very useful way of learning how to take advantage of this emotional experience. Emotions related to the task such as shame, fear and anxiety are part of the learning process and they may be found in several studies (Brown & Morrissey, 2004; Rubin, et al., 1997; Orejudo et al., 2012). However emotions which arose through the exploration of a personal topic needed a closer examination in order to manage them properly. The management of these emotions (sadness, despair, joy) is part of the ongoing process of the participants in the program and understanding the implicit advantage of these supposedly vulnerable states is one of its most valuable insights (Brown, 2012). Beyond considering some emotions as negative influences for the students’ performances (Brown & Morrissey, 2004), they can be conceived as a way for the students to connect with and to make meaning of their own experiences when presenting.

Both cognitive and emotional experiences could not be accomplished without taking into consideration the influence of peer support. Most of the programs which promote a competence of presenting in public are biased as they are generally oriented to promote the competence of their participants focusing on their individual performance (De Grez, et al., 2010). Although paying attention to the individual performance of our participants was important in our program in no way was the most important feature. Individual performance of the participants of the program relied upon being an important part of other’s performances. This was formally achieved by including others’ feedback about each individual performance from the beginning in line to the work of Shaw (2001). The use of shared and formal rubrics to make explicit what was important to include in one’s evaluation is key in this respect (De Grez et al., 2010). However, it was more important to include the whole group not only as an informational resource (van Ginkel, Gulikers, Biemans and Mulder, 2015b) for every participant, but above all the idea of considering peers as a relevant context in two different ways. On the one hand, the group provided enough variability of performances to compare and to be compared with. This variability was important to create clear limits of what was possible or desirable in terms of public performance. On the other hand, the whole group provided an emotional social support to maintain the meaning of the activity as something which was worth the effort. In addition to this, the informal social support generated a context to learn from others how to deal with similar challenges when presenting their topics. Trainers as facilitators could be included as meaningful others as they created the conditions where sharing information about each performance was possible.

CONCLUSIONS

Cognitive, affective and social elements are key dimensions to be considered when working with Primary or Secondary Education students. However, Higher Studies programs could benefit as well if they integrated these three dimensions in their programs. According to this, oral skill training programs could be something more than a context where to develop a competence. They could also be an opportunity to promote the individual and social development of the participants.

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ACTIVITY APPROACH TO TEACHING PLACE-VALUE PRINCIPLE

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ABSTRACT

We implement the Activity Theory into the development of instructional materials and teaching strategies for elementary and middle school math, focusing on how students learn place value concepts. The discussion about the mistakes students make, ways of correcting them, etc., is broadly presented in the literature. Our approach is to teach multi-digit numbers starting from the systems with different bases and to revisit them in the context of basic arithmetic operations and in different problem-solving contexts. We have used the place value model of a positional number as an instructional means to introduce multi-digit numbers, decimals in particular, to about 150 students (10-11 year old) from two regular urban schools. We present evidence that the students began appealing to place value principles as a mediating tool that helped them to deal with large numbers, decimals, and fractions with common denominator. Theoretically anticipated and actual results of the students' learning are compared.

INTRODUCTION

Elementary and middle school students often have problems learning and operating decimal numbers. One of the possible reasons is suggested to be the emphasis on procedural knowledge during elementary-school education (Marmasse, Bletsas, Marti 2000). R. Siegler mentions that elementary school students "frequently generate flawed procedures that generate systematic patterns of errors". This happens when students "fail to grasp the concepts and principles that underlie procedures" or fail to connect them relevantly (Siegler, 2003, p.221). Brown and Burton analyzed mistakes made by the students when subtracting multidigit numbers (Brown, Burton, 1978). These mistakes are understood by Siegler as a lack of relevant connection between principles of the base-10 system and the procedure of borrowing. Thus, understanding of basic principles of place-value system is considered essential (see also Lengnink and Schlimm 2010, Hopkins and Cady 2007, Van de Walle 2013). Special attention is paid to flexible regrouping of multidigit numbers based on actual operations with counting material, which in the end benefits computational fluency.

Incorporation of different number systems in the curriculum as a way of deepening students' knowledge of place value has been introduced and analyzed elsewhere (see, e.g., Mack, 2011). Presentation of this material to future teachers gives them a fresh look at place-value principle such that they can experience (and thus better understand) the difficulties children have (Hopkins and Cady, 2007). As we deal with children who have already learned natural numbers in elementary school, one of the reasons we use non-decimal systems is to avoid transferring malfunctioning concepts from the previously learned material.

Using other-than-decimal base number systems as an introduction to the decimal system is also not new, though most often it serves just as an additional training of principles already learned. Curricula that present the place-value principle through operating non-decimal systems are already functioning in Russia (Gorbov, 2002; Alexandrova, 2009). Here, we are making a step further devising a math course for 5-6 graders and investigating its potential for dealing with powers and decimal fractions. However, we first have to introduce number systems with arbitrary bases because our students have not been taught this material in elementary school.

METHODOLOGY

A local instruction theory has been formulated within an educational design research framework (Van den Akker, Gravemeijer, et.al, 2006). We have tested a two-year math course for grades 5-6 that included several basic concepts with corresponding contexts, with place value systems being only one of them. Two long-term macro-cycles of the design experiment in two urban schools have been completed. Nearly 150 students from 6 classes with 3 teachers have participated in the study; the third macro-cycle with two more classes (43 students) is now in progress. In addition to the standard diagnostic tools, we had to develop new ones that include, e.g., trap problems, false clue problems, etc. Students' materials, such as notebooks, quizzes, tests, audio-taped classroom and small group discussions, were examined. Teachers' diaries, reports, and meetings materials were also used as data sources. These data were compared to the expected outcomes in terms of understanding, engagement, progress, motivation, etc. Individual cases of children who were transferred in the middle of our macro-cycle were treated as a special sub-sample. With these data, the actual learning process was compared to the learning process that was expected in the theory-based design of the strategy.

Context, Model, and Tasks

As we develop the Cultural-Historical (Vygotsky, 1986) and Activity Theory (Leontiev, 1978) ideas about relationship between teaching and development (Karpov, 2005), we employ the concept of Learning Activity (Davydov, 2008). Following P.Galperin (Galperin, 1989, Arievidtch, Haenen, 2005) and V.Davydov, we pay special attention to the earliest stages of concept formation in the child activity. It is generally accepted that supporting students' actions and mediating them with carefully chosen instruments is a practical way to form concepts (Cobb, Yackel & Wood, 1992). Being a fundamental concept since elementary school, the number concept includes a certain way of notation and a corresponding act of counting. Multi-digit number-writing based on the place-value principle is only one of the ways to write down one's measurement results.⁵² A digit grid model of multi-digit numbers (Fig. 1) is very popular. Typically, a textbook would present it populated with some numerals alongside with the idea that the value represented by a symbol depends on the position in this grid. Nevertheless, naming numerals is almost the only task that requires referring to this model. Though operating numbers (multiplication, subtraction, etc.) relies on the place-value principle, there is always a "way round" — an algorithm or a procedure that can guide children to the right answer without comprehension. So, the question is "How do we know that students are relying consciously on the place value principle instead of performing some well-memorized procedure?" For example, in the addition operation, you have to pass "1" from the two-digit answer you obtain to the next position. You don't have to know that you are re-grouping the value in the place of ones by base 10, thus obtaining additional "1" in the next place.

Moreover, even when students do explain their operations in terms of grouping by ten, this ten-grouping is a given thing. It can be argued that grouping by ten evolves from having nine non-zero symbols such that ten is the smallest value that cannot be represented by a single symbol; however, this knowledge cannot usually be passed to the students as there is no task or operation that relies on this fact. So, our main challenge was to create a situation or a problem that will bring students to the necessity of using this model. Basic principles of place-value systems are to be discovered by students in their own actions as a thing not given but created by people in their cultural history. Consequently, we sought for actions hidden in the model that would demonstrate its internals to students (Fig.1).

This is why we have chosen counting in non-decimal place-value systems as the learning context (see Rose (2012)) such that students participate in constructing the number systems themselves. This situation can be accompanied by a story (real or fictional) of dealing with an alien civilization or a primitive tribe; alternatively, one can study positional or non-positional numeral systems that existed in human culture: Babylonian, Roman, Egyptian, Indian, etc. To support the instruction, we have used lots of areas and lengths for measuring and small blocks that allow construction of geometric forms corresponding to power series. Additionally, instruments like counters and abacus are used.

⁵²The significance of seeing the difference between the symbol and the value it represents has been noted, e.g., by K. Lengnink and D. Schlimm (2010).

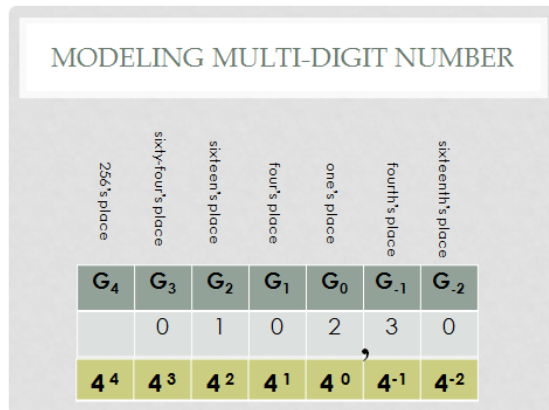


Figure 1: The model in its final state with movable decimal point⁵³. Operations of constructing power series and corresponding measuring with grouping and re-grouping of place values are internalized in this grid. The movable decimal separator (in Russia, this is comma) marks the location and associates a number with a certain measure from the set of measures. It is for this mobility, and for the mobility of the whole number before the separator, that further work on positional fractions (decimal and non-decimal) is possible.

COURSE STRUCTURE

Our course can be represented as a sequence of learning contexts that develop into "exploratory tasks" where children can independently build a solution.

Introduction	<p>1.1. "One —many": is it possible to have numbers if you can count up to one only?</p> <p>1.2. Who is primitive now? Comparing our comprehension of decimal system to the principals of Roman and Babylon numbers.</p>
Core	<p>2.1. "Groups" in various base systems, power series.</p> <p>2.2. Measuring with a whole system of measures corresponding to number-grid positions.</p> <p>2.3. Positional fractions. What is the meaning of the location of decimal separator?</p> <p>2.4. Number line as an alternative to numbers.</p>
Extension	<p>3.1. Conversion between decimal measures.</p> <p>3.2. Addition and subtraction: can we predict results operating numbers instead of measurements?</p> <p>3.3. $100 \times 0.0001 = ?$ Multiplication and division.</p>

Figure 2: Course curriculum

The stage is set by a story of a shipwreck, after which students meet a tribe that is ready to provide them food and water in exchange for matches (the only thing left in children's possession). The first task students have to accomplish is understanding tribe's "numbers" that they "write" with stones. After meeting the tribe chief, children come to a conclusion that one stone does not always mean "one" unit. Moreover, the same number of stones can stand for different numbers depending on the configuration of the line of stones. Having arrived at these conclusions, children are allowed to watch

⁵³ In Russia, the common symbol for the decimal separator is comma rather than dot.

the process of one-by-one counting. When asked to reconstruct the process, the students first reveal the necessity of some grid to "hold places". Then, they discover the logic of "opening" a new place when all previous places are full and do not allow to make an increment. As this tribe is using a single kind of stones, the binary system is introduced. Students cipher and de-cipher numbers and solve some other tasks. Further on, several types of stones are introduced. Depending on the amount of symbols used, students can switch to systems with different bases. These systems are more compact, but they require a new model: power series. The latter is concealed in binary system, but the search for some basis of our grid construction brings it to light. The main idea goes like: "Eight-base system is a system with seven non-zero symbols. While there is no symbol for "8", we put "1" in the next cell. This way, we get 1's place, then 8's place, then 64's place ($8 \text{ groups of } 8 = 8^2$), 512 (8 times 8 groups of eights = 8^3), and so on. Students work in pairs: one groups and re-groups objects counted, while his/her partner makes a count by placing stones in a grid or flipping a counter. There are also special tasks organized to scaffold further development of place-value concept: constructing geometrical representations of power series related to naming numbers (Fig. 3). Some tasks are based on the analysis of foreign or fictitious languages, while others require comparison of the newly adopted model to "ancient" systems: Roman, Babylonian, Egyptian, and to the modern decimal system. The fact that the common decimal system has the same structure and differs only in the amount of symbols used is really a shock for some students.

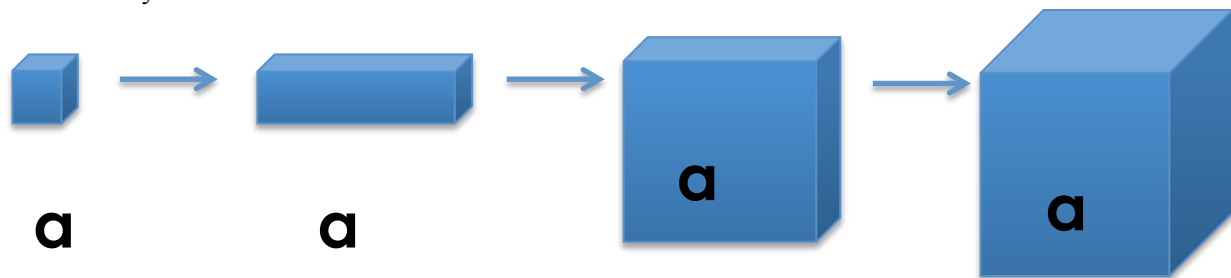
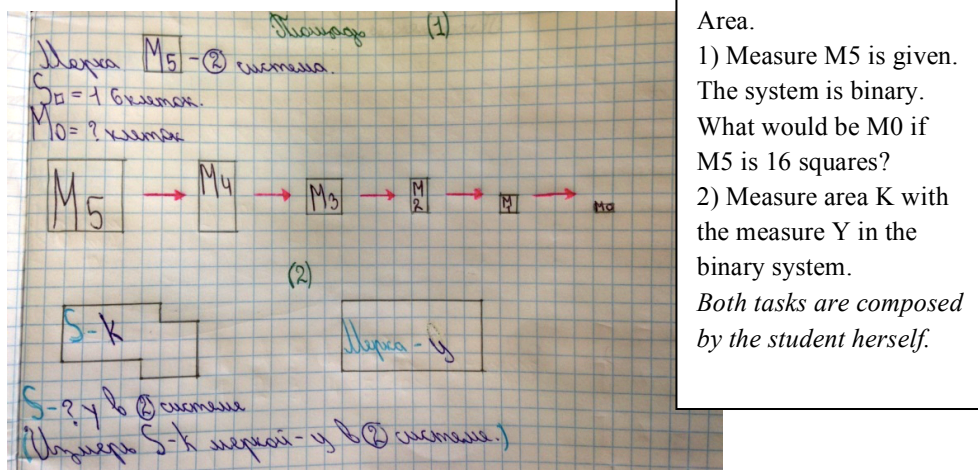


Figure 3: Power series, geometrical forms, and number denomination:

seven - seventy - seven hundred -seven thousand...

As soon as students adopt the idea of a special operation of counting by selecting the number starting with the biggest place-value available, their task develops into measuring different parameters. Note that lengths, areas, weights, and volumes are to be counted in non-decimal place-value systems. Students are prompted to create a system of additional measures that corresponds to different places of our place-value grid (Fig.4-6).



Area.

1) Measure M_5 is given.
 The system is binary.
 What would be M_0 if
 M_5 is 16 squares?

2) Measure area K with
 the measure Y in the
 binary system.

*Both tasks are composed
 by the student herself.*

Figure 4: "Rules-book". Constructing system of measures for binary system.

Solution: Measure 5 corresponds to the 5th digit and also power 5 ($2^5=32$). Each smaller measure is two times smaller than the previous one. The same can later be done with numbers that represent digit units (Fig.5)

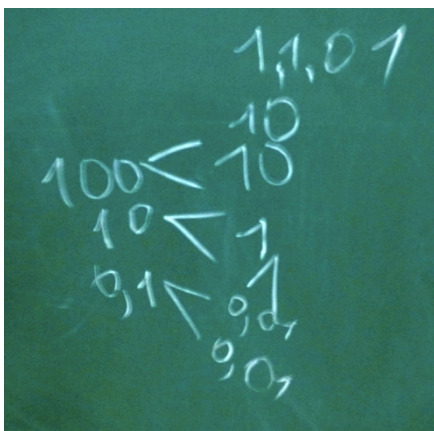


Figure 5: Digit units in binary system. 100 contains two "tens", a "10" contains two "1's", "1" contains two "0.1's" and so on.

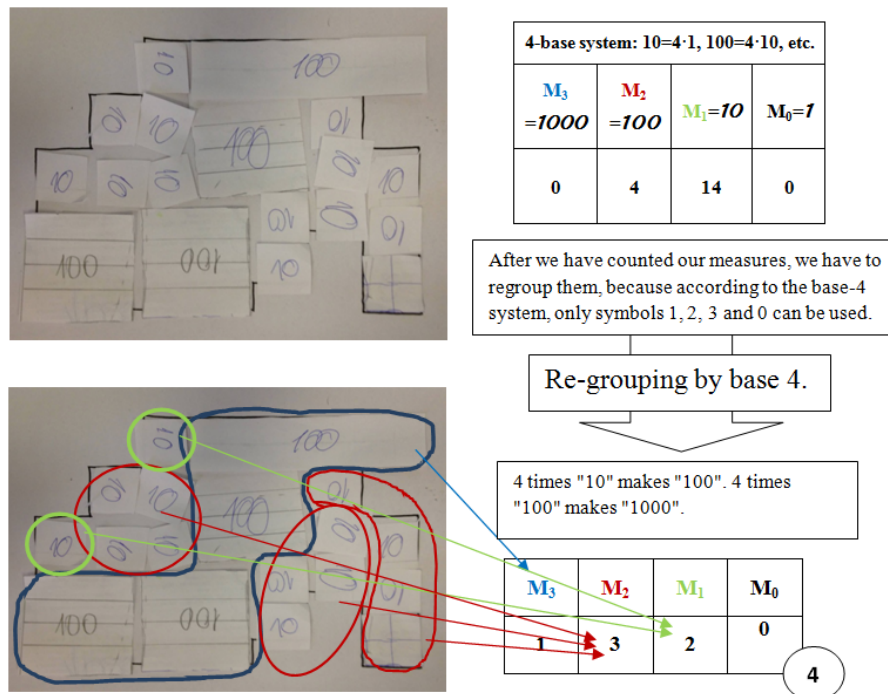


Figure 6: Measuring with system of measures for base-4 system.

Having a system of measures instead of a single measure allows students to overcome the problem of measuring values smaller than the initial measure. This brings us to the introduction of decimal point, which may rather be called a fractional separator because we continue operating in arbitrary base systems. This new concept connects the system of measures with the place-value grid because it marks the place of ones that corresponds to the initial measure. For example: 105.67 meters means one measure of hundred meters, 5 meters, 6 decimeters, 7 centimeters. As a result, children regard our model as a flexible structure. Besides, common fractions are naturally introduced and used as extension of arbitrary base systems into measures that are smaller than "one". Still, common fractions are written down as positional fractions, as their role is to measure values smaller than "one". Although not vital for introducing common fractions, this comes in handy when we start learning them (Vysotskaya et al., 2014).

After the model of positional number is assimilated by students, we extend it to a range of different tasks and purposes such as 4 arithmetic operations, conversion of measures, etc. These tasks should be approached in different ways, so the students have to construct their own extended models using the basic principles already learned. For example, addition and subtraction appear as a method to predict and estimate the value without additional measurements. For example, a floor plan may be divided between students (or groups of students) to measure areas of each room. Then, all values are collected, and students have to tell whether a certain amount of carpet is enough to cover floor in all these rooms. Some fake thought-provoking suggestions are presented for a discussion to start. Thus, analyzing each other's way of estimating the sum and errors, students return to the basic principles of number construction and derive three rules of addition and subtraction: (1) do it "place-wise" by only involving digits in the same place; (2) remember re-grouping and do it according to the base of your system; (3) it is better to start from the smallest values and plan for re-grouping.

RESULTS

Most students have learned to operate place value numbers and fractions (not only decimals) and are able to explain what and why they are doing.

Below are examples of tasks that our students are able to solve.

Someone has started multiplication (in decimal system)

Continue the calculation:

$$\begin{array}{r} \times 233 \\ 405 \\ \hline 932 \end{array}$$

Common answers among students learning the conventional curricula would be:

$\begin{array}{r} \times 233 \\ 405 \\ \hline 932 \\ 932 \bullet\bullet \\ \hline 94132 \end{array}$	$\begin{array}{r} \times 233 \\ 405 \\ \hline 932 \\ 1165 \bullet\bullet \\ \hline 117432 \end{array}$	$\begin{array}{r} \times 233 \\ 405 \\ \hline 932 \\ 1165 \\ \hline 2097 \end{array}$
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These common answers show that mostly children can perform the algorithm but are not able to change it. As their actions are based on repeating some steps and not applying basic principles, they cannot proceed if the procedure differs from what they have learned.

Our students know that multiplication by different digits in the multiplier can be done in any order, and as they are able to identify digits not only in the final answer but also on any intermediate step, nearly 80% of students are able to continue correctly, while the rest can continue with some prompting.

$$\begin{array}{r} \times 233 \\ 405 \\ \hline 932 \\ 1165 \\ \hline 94365 \end{array}$$

Mistakes in operating large decimal numbers can be either avoided or reflected and corrected by students themselves. Similarly to the problem above, children are able to grasp the reasoning behind other people's operations, so they not only state that something is incorrect but can also tell what went wrong and what false assumptions have been made.

As our students study the operation of multiplication in its relation to operating values and measures, they are aware of the basic principles of multiplication. These basic principles — multiplication of each digit of one factor by each digit of the other, defining the right digits in the result— are used to examine different cultural ways of multiplication and even create their own (Fig.7, 8).

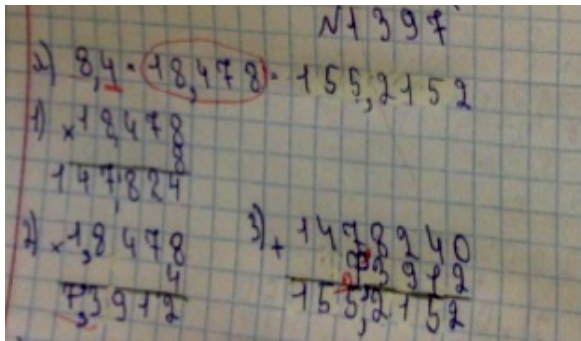


Figure 7: Doing multiplication step-by-step

Every symbol of the number $8,4(=8.4)$ does "two jobs": tells us to make the other number smaller or greater by an order of magnitude, and tells how many times to take it. #1)The factor $18,478 (=18.478)$ is not changed when multiplied by 8 because the latter is in the place on ones, resulting in $147,824$. #2)By shifting the decimal separator, the factor $18,478$ turns into $1,8478$ to be multiplied by 4 in place of tenths, the result is $7,3912$. In fact, two multiplications can be done in any order. #3)Two results are summed to get the final answer: $155,2152 (=155.2152)$.

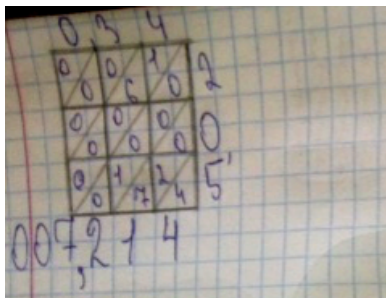


Figure 8: "Italian multiplication": $0,34 \times 20,5$

Each symbol in the first factor can be multiplied by each symbol in the other factor. In this table, the diagonals correspond to a single place, thus summation goes along the diagonals. Our students are able to reconstruct the algorithm and continue it even if it is given partially.

Besides performing four arithmetical operations in any given place-value system (which is where we start before moving to decimal system), our students are able to calculate answers with "hidden" symbols. Even if the symbols are blotted, students are able to estimate the order of magnitude of the answer (i.e., the number of places), the digits that will definitely be in the answer, and digits that may potentially be there (Fig.9). That ability certainly benefits children later when they can make quick estimates to detect wrong answers.

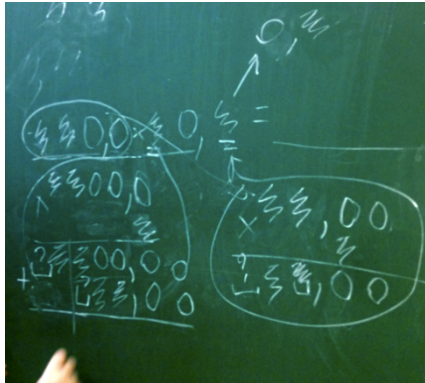


Figure 9: Solving a blotted calculation: $##0 \cdot 0, \# = ?$ (" $##0$ " is converted into " $##0,0$ " by the student to mark the place of ones.)

First operation is multiplying $##0$ by $0, \#$, which means we get $##00,0$ and multiply it by $\#$ (which is an unknown number). Thus the result would be $?##00,00$. The highest order is occupied by a question mark meaning that the result depends on trading. After that (although the order does not matter), the student has determined that $##0$ multiplied by $0, \#$ (written separately above) is the same as to multiply $##,00$ by $\#$. Thus, we get $?##,00$, also depending on regrouping. Summing it up (down left corner) we come to the result (to be written in a second) of $?####,00$. Two remarks are in order: (1) our students can operate zeroes freely to their convenience because they know where they are necessary and where they can be casted away; (2) the student performing the task is a low achieving student (or, rather, she was identified as one when she came) and is doing the task in detail, appealing to the most explicit way. Most students grasped the task sparing the long way as they cared only about the leading and trailing digits of the answer.

Another example is converting values in the decimal system of measures

Someone measured the length of his pencil and wrote down the result as $00,00135$. What was he measuring his pencil with? mm? meters? km?

km	100 m	10 m	m	10 cm	1 cm	1mm
0	0	0	0	1	3	5

Figure 10: The grid behind the number "becomes vivid".

As students try to guess the measure, they initially fail because the pencil appears either several meters big or too small to be even seen. So the right decision, as they soon discover, is to start from the digit they know for sure to be the biggest and correspond to the decimeter, and then adjust the grid with the number to see where the decimal separator happens to be. In our case, this is hundred meters. Students in other classes, even in senior grades, often fail, not even knowing what to start with. Perhaps this is the reason these tasks were included in the Russian state tests for 6-7 graders in the past two years.

Speaking of psychological effects, students' attitude to the learning process shifts from receiving and applying ready-made algorithms to a more reflective position of creating their own task-specific ways of dealing with numbers. Their motivation towards math classes and engagement in classroom activity

stay high. Students are able to extend their knowledge of place value and create new challenges for themselves.

Our conclusions are as follows:

1. Introduction to non-decimal place value systems makes a solid basis for operating large decimal numbers and for studying decimals in the future.
2. The task of regrouping and renaming quantities in different positional number systems may serve as the primary context in the introduction of place value principle for writing down multi-digit numbers.
3. Mistakes that students make while dealing with large numbers, decimals, or fractions with common denominator can be interpreted psychologically as a lack of basis, i.e., deficiency of available concepts that mediate their actions.
4. Mediating students' interaction with positional numbers in different systems with the place value number model is a way to improve learning.

Place value systems with different number bases proved to be rich with opportunities to support learning activities with numbers. We not merely create a solid basis for mastering arithmetic operations but also invest into the future learning of decimals and fractions and other related topics. Afterwards, students request a theoretical basis for what they are learning, i.e., they are content no more with mere algorithms. Thus, principles of the Activity Approach allow us to construct learning contexts that provide students with a possibility to assimilate concepts through their meaningful activity. Making students learn not mere algorithms but basic principles behind them is indeed worth the effort.

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EXPLORING BIASED RISK DECISIONS AND (RE)SEARCHING FOR AN EDUCATIONAL REMEDY

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ABSTRACT

Why are risk decisions sometimes rather irrational and biased than rational and effective? Can we educate and train vocational students and professionals in safety and security management to let them make smarter risk decisions? This paper starts with a theoretical and practical analysis. From research literature and theory we develop a two-phase process model of biased risk decision making, focussing on two critical professional competences: risk intelligence and risk skill. Risk intelligence applies to risk analysis on a mainly cognitive level, whereas risk skill covers the application of risk intelligence in the ultimate phase of risk decision making: whether or not a professional risk manager decides to intervene, how and how well. According to both phases of risk analysis and risk decision making the main problems are described and illustrated with examples from safety and security practice. It seems to be all about systematically biased reckoning and reasoning.

Is there a remedy? Based on the process model this paper presents and discusses the design of two evidence based educational experiments to be conducted in 2016. The first experiment consists of a blended learning intervention with bachelor students of Safety and Security Management. The second one will be an experiment with airport security agents who are responsible for security checks of baggage and passengers. Visualization, heuristics, meta-cognition and blended instruction are some of the main variables of the effect studies to follow. The design of both the intervention and the evidence based experiment could be applicable for innovative competence-based learning in general.

INTRODUCTION

Safety and security risks can originate from various sources and must be controlled by risk managers in very differing domains. Traffic accidents, natural disasters, hazardous materials, polluted food, power outlet, terrorism, domestic violence, cyber-bullying, fraud, viral diseases and addiction are only a few random examples. Making risk decisions is surrounded by uncertainty. Determining adequately the probability that a specific risk will manifest itself in reality and with what effect is a difficult task in all kinds of professional contexts. In general professionals tend to overestimate certain risks and underestimate others (Kahneman, 2011). In the last decades a broad range of hardware and software aids was developed to support professionals in making risk decisions. Nevertheless risk management practice is not as satisfying as desirable, in spite of all models, procedures, norms, standards and checklists available.

This paper describes the main causes of problematic risk managing in the broad field of safety and security, including healthcare, traffic safety, welfare, crime fighting, construction industries, among others domains. With a generic process model we illustrate where the shoe pinches in the process of risk analysis and risk decision making. The model reduces common models of risk management to the two phases that are crucial for analysing problematic risk decisions (Bertholet, 2016). From research literature an overview of pressure points is disposed and illustrated with examples of practice. At that point the question arises if, when we know what is going wrong, we can develop an educational remedy for (future) professionals? A design for two training interventions, embedded in an evidence based experimental setting, will be presented in the last part of this paper.

DETERMINING, MEASURING AND CONTROLLING RISKS

Risk management is often visualized in process models with from three to six successive phases, for example COSO or ISO 31000⁵⁴. Determining, measuring and controlling risks via interventions is the common denominator of these models. The focus of our process model is to point out where sub-optimal or even irrational risk decisions are made, where inadequate interventions may follow, instead of adequate ones. Therefore we distinguish the process of risk management into two constituent processes: risk analysis and risk decision making. Risk analysis consists of measuring by calculating or estimating a risk. A risk decision based on the analysis leads to a decision to intervene or not, in order to control the risk. (Figure 1).

Risk intelligence and Risk skill

We define risk intelligence as the ability of people in general and safety and security professionals in particular, to mobilise and operationalise, under uncertainty, knowledge and experience on risks, and to convert it into adequate risk analyses. As risk skill, we define the ability to make adequate risk decisions based on a risk analysis (Figure 1). Adequate in each case means that a risk is determined, controlled or reduced in a rational, effective and efficient way. And that, in other words, the probability that a risk manifests itself or the impact of such an undesirable event is reduced.

⁵⁴ The COSO-model was developed by the Committee of Sponsoring Organizations of the Treadway Commission (cso.org), a network organisation in the field of risk management for businesses. The framework of ISO 31000 contains principles and guidelines for Risk management of Organisations, drawn up by the International Standardization Organization (iso.org).



Figure 1: Two critical competences applying to the process of risk management: Risk Intelligence and Risk Skill

In daily practice, three types of problems occur, when professionals have to determine risks and have to make risk decisions on the basis of this risk analysis. In the following sections we will describe these three types: calculation biases, estimation biases and decision making biases.

CALCULATION BIASES: ON THE COGNITIVE LEVEL RECKONING WITH RISK IS HARD

Determining the probability that a certain risk will manifest itself is a very technical and often complicated task. Nevertheless it is important to quantify risks wherever possible. It enables the comparison of one risk with another and testing it against norms. Furthermore risks can be expressed then in financial or social costs, so priority setting in risk management and safety and security policy becomes possible.

Restricted numeracy, complexity and predictors

Quantifying risks means reckoning and gaining insight in figures, and that is not everyone's cup of tea. John Allen Paulos (1998) and Gerd Gigerenzer (2002) were the first of a long list of authors who have written about the human incompetence to cope with numbers and quantitative abstractions. Doctors and patients both draw wrong and rigid conclusions from positive and negative HIV-testing results (Gigerenzer, 2002). The same happens when a woman's first mammography is positive and the question is: does she really has breast cancer (ibid.). In jurisdiction professionals have to deal with risks when they have to calculate probabilities of guilt and evidence.

The issue of misleading intuition according to numbers was adopted by Daniel Kahneman (2011) as well. Kahneman describes how the human brain works and distinguishes between a fast and intuitive way of thinking (System I) and a more analytical, systematic way (System II). Reckoning with risks indeed is partly a technical matter, but the human intuition is unreliable when coping with acquired quantitative results in lots of cases. When we use technical instruments and methodologies, permanent critical reflection on the meaning of the outcomes is necessary. Technology needs psychology is Gigerenzer's conclusion (Gigerenzer, 2002).

Two other factors that make it difficult to calculate risks are their complexity and the restricted possibility to predict them. The complexity's basis is the fact that we often do not know what factors exactly are contributing in what way and to what extent to the manifestation of a risk. In traffic safety for example we can calculate to what speed limit car passengers are safe in case of a collision. But the combined factors that together lead to an accident cannot be taken into account, when we are making a calculation. When we use statistics to predict risks, another aspect of the limited human mind reveals, particularly in dealing with extremely small probabilities. Nassim Nicholas Taleb demonstrates this phenomenon in *The Black Swan* (2007). The impact of the most unlikely, which is what the black swan stands for, is systematically underestimated by the human mind. Taleb regards it as one of the causes of the recent global financial crisis. The attacks at the Twin Towers in New York on 9/11/2001 and the impact they had, Taleb regards as Black Swan as well. The statistical probability of event like that is extremely small, and therefore the human mind is trivializing it. On the other side: once such an unlikely event has taken place anyway, its probability will be overestimated. This can lead to disproportional safety measures and law-making.

About risk calculation and management in general Taleb (2013) states that calculations can lead to a certain kind of illusory safety, for example in the construction industry. Stability norms are based on historical events and cannot be transferred unrestricted to all future events. The next earthquake might be stronger than all others before. Or a mere coincidence can occur that could not had been taken into account. The Fukushima nuclear power plant was designed 'earthquake proof', but the sequential appearance of an earthquake and a tsunami in 2011 lead to a nuclear disaster.

ESTIMATION: ASSESSING RISKS ADEQUATELY IS MENTALLY CHALLENGING

Risks and indicators which cannot be calculated, have to be estimated, in order to get a somewhat adequate risk determination. Just as with calculating, the aim of estimating is to assess and weigh risks based on the probability that they occur and the damage they might cause. Professionals as well as laymen and even experts not only make incidental, but also structural mistakes in the process of estimating: "systematic deviations from rationality, from optimal, logical, rational thinking and behaviour"(Dobelli, 2011). In the meantime in social science literature about one hundred and fifty of such, sometimes related biases are known, and there are still new ones getting discovered and described. Below we will discuss the most relevant biases in the safety and security domain.

Confirmation bias

According to researchers in the field of rationality and irrationality the confirmation bias is also known as 'the mother of all biases'. On the individual level this 'thinking mistake' is hard to prevent. Intuitively we accept the information that fits to an existing risk profile and reject the information that

doesn't fit in (confirming versus disconfirming evidence). 'Profilers', who for example observe football supporters, museum visitors or travellers on airports have to be aware that they should not only focus on physical appearance that matches with an explicit or implicit offender profile or suspicious signs they have already in their heads. To come to a good estimation of risks and to prevent tunnel vision, there is room required for independent, creative and out-of-the-box thinking. Later on we will be talking about dealing with risks after they have already been calculated or estimated and this bias will be discussed again. At this point the role of the confirmation bias in estimating risks and confirming or debunking existing visions, paradigms, patterns and analyses, is relevant. The authority bias goes along with the confirmation bias. When a professional is regarded as an authority or when he or she is placed on a higher position, the professionals around him tend to recklessly except his estimations instead of evaluating them critically and professionally.

Overconfidence

The tendency to overestimate one's own (assessment) capacities is a universal, inbred and 'incurable' phenomenon. With men the tendency in general is a bit stronger than with women, with expert extremely stronger than with laymen. (Dobelli, 2011; Kahneman, Slovic & Tversky, 1982). When you ask a random group of professionals at a conference, risk analysts or professors for example, who thinks their professionalism is above average, there will likely be much more than 50% of self-declared outstanding experts. Statistically this cannot be possible, of course. This overestimation of one's abilities by experts leads often to substantially underestimation of safety, security and other risks. In financial and insurance markets, and in big infrastructure projects, this can cause enormous financial losses. In for example industry and the medical world this can lead to accidents, in the worst case with a fatal ending.

Availability bias

Numerous experiments have shown how hard it is to estimate what risks on a certain moment are most threatening to an individual, a community, a nation or the whole world. What is known in literature as the availability bias makes those risks which came in mind most recently, or the ones which are most spectacular, appear as most dangerous (Dobelli, 2011). When smokers accept one old heavy smoking uncle or neighbour as proof of the 'fact' that smoking isn't that unhealthy, this is an example of an availability bias. The availability of one example of incurable smoker who has been smoking for years, seems enough reason not to quit. This goes for climate critics as well, when they accept one strong winter as proof that there is no climate change (Mommers 2015). The role of imagination in this bias is shown when the probability of dying by a bomb attack or an accident in traffic is considered more likely than dying by suicide or diabetes, while the evidence proves exactly the opposite (Dobelli, 2011).

Risks that were in the news recently are considered to be relatively hazardous and to be more dangerous and threatening in the future. Most people in 2014 regarded the risks of Ebola and the marching Islamic State to be bigger than the risks of malaria or the drug gang wars in Mexico, while the numbers of victims showed it was the contrary (Sitalsing, 2014). Research of Philip Tetlock on how adequate the expert judgements of advisors to the yearly World Economic Forum were, demonstrates that professionals suffer from the same bias (Tetlock, 2005).

RISK DECISION MAKING: REGARDING RISKS RATIONALLY IS MENTALLY DIFFICULT

The problems regarding calculating and estimating risks that have been described above, only represent the restrictions of coping with risks adequately and rationally in practice partly. The concept of bounded rationality presented by Herbert Simon (1984) explains why risk decision making under uncertainty is that difficult: time pressure, lack of reliable information and the restricted capacities of the human brain. Lack of reliable information can explain the problems for at least a part. Besides that the human brain processes available risk information with difficulty, new biases occur and inadequate risk decisions come along.

Confirmation bias

As mentioned before, the confirmation bias is regarded as the most important bias by many experts. With all risk management systems, protocols, checklists, risk profiles and other risk management instruments this bias is on the lurk. This means not necessarily, or certainly not only, with the systems themselves, but with the thinking of the professionals using them. The focus often lies on finding confirming information, what can easily lead to a tunnel vision. One of the six principles of persuasion distracted by social psychologist Robert Cialdini from his experiments closely connects to this bias. The so called 'social proof' leads people in a group or team to a joint perception of reality and makes them confirm each other's perception and assessment of reality and social norms (Cialdini, 2009). The phenomenon of belief perseverance is strongly connected to the confirmation bias. Accepting the earlier mentioned disproof (disconfirming evidence) often turns out to be a mental hurdle, which is strengthening tunnel vision and group think.

Another, earlier mentioned bias that is significant for risk decision making is the availability bias. Professionals in all kinds of disciplines choose the interventions that are provided by their brain and which they already know. Doctors for example tend to prescribe those therapies they are most familiar with. In all sectors this could be empirical proven interventions, which nevertheless need reflection. Not the best or the most rational risk decision of is chosen, but the available one.

Hindsight bias

"This had to go wrong." This at least is what one often might think after media reports on reconstructions of incidents with so called lone wolves. Personal and other circumstances of the perpetrator are dug up by the media and presented as a compelling context for the event that happened. The question to follow often is why the professionals on duty didn't intervene before the dramatic climax took place, as in the case of Tarik Z., who disordered the Dutch NOS News show at prime time on 29 January 2015. With a fake weapon and a simple written message on a piece of paper he held a doorkeeper as a hostage and was live on screen for minutes. (Wierenga, 2015). The story bias and the outcome bias are relevant in this context as well. Both biases allow a logical and even compelling connection between independent events afterwards, whereas this relation does not exist in a causal way, or at least not had been caused by (omitted) interventions or risk decisions that had been made. Media and the general public both want to know who was responsible for or guilty of the incident. Analyses of accidents often show that it isn't mainly because norms, procedures and protocols are insufficient, but the fact that in daily practice it is the human factor that is to blame for this kind of problems. In other words, it is the way professionals deal with rules and how they maintain them.

The effect of this bias is that one gets the idea of a negative risk scenario that has manifested itself in real life, and that would have been easily to prevent. And in the future it must be prevented, naturally. This approach disregards the prevention's price. Assets available to risk control are not only rare in an economic sense: it is impossible to monitor and control everything to the maximum. Studies in theory and practice of risk management showed that in most of the cases there is no such thing as a zero risk scenario.

RISK MANAGEMENT AS AN OBSTACLE RACE

Coping with risks in a rational way is hindered by mental processes and what is more, it makes us rely on insufficient risk analysis. Even when it is someone's sincere intention to reduce a certain risk and he or she is fully convinced to really do so, the actual risk decision can be suboptimal or even contra productive. With all rationalisation that took place in the past decades, men appear to be the weak link in the chain of risk management. The big number of systematic, partly unconscious biases that occur during the risk management process, makes way for the conclusion that risk management itself is kind of an obstacle race. Figure 2 visualises the obstacle track across three types of biases.



Figure 2 Three types of biases occurring in different stages of the risk management process: 1 calculation biases, 2 estimation biases, and 3 decision making biases

(RE)SEARCHING FOR A REMEDY

After exploring the most relevant biases applying to the risk decision making process, the next question is if there is some kind of solution possible. Can we remove obstacles or would a hurdling training be a better strategy?

In order to optimise the process of risk management in the field of safety and security, it is important to get to the bottom of risk analysis and risk decision making, and to understand the problems that

occur during the process. The empirical literature of social psychology and behavioural economics doesn't give us much hope of removing hurdles from the track. We should rather try to strengthen the critical competences of risk intelligence and risk skill where possible. With risk intelligence this could mean training the ability to analyse risks on a (meta) cognitive level. Can we improve the crucial skills of numeracy and risk literacy: calculating, estimating and evaluating? With risk skill, training the practical ability to make adequate risk decisions on the basis of a risk analysis might be functional.

The question how far the critical competences mentioned above can be trained or improved is not clearly answered in research literature. On the one hand Gigerenzer (2001; 2002) showed that clear and critical thinking can be stimulated by what he calls 'teaching clear thinking', and certain complex reckoning tasks as well. On the other hand Kahneman (1982; 2011) has apparently become less optimistic about the possibility of correcting biases of the intuitive brain system I, by training heuristics via the (meta) cognitive system II. In a small experimental study with Safety and Security Management students of Utrecht University of Applied Sciences, we found a small positive effect of a training in numeracy and risk literacy (Bertholet, 2013). A larger scale study on the effectiveness of professionalization interventions has started in February 2014. In 2016 two pilot projects will be conducted, one of them with airport security agents and one with bachelor students in safety and security management (BPM). The pilot studies will have an experimental design founded on evidence based research methodology for innovation of teaching. Results of both experiments will lead to conclusions about the effectiveness of the interventions and the various instructional strategies used. Lessons learned in these pilots can be applied in up scaled follow-up experiments.

INTERVENTION 1: AIRPORT SECURITY

Security agents on Amsterdam International Airport Schiphol are, among other tasks, responsible for security checks of passengers and baggage. In a quite hectic atmosphere they have to assess passengers and their hand luggage, respecting strict security procedures and looking for suspicious signs and behaviour. Airport security agents are well trained and equipped with state of the art hardware and software, such as X-Ray for baggage and security scanners for passengers. Nevertheless, security threats are dynamic and the airport's quality assurance management wishes to keep the human assets up with the latest standards. With a pilot experiment we will search for an answer to their question: to what extent do biased risk decisions by security agents occur and what kind of training could be a remedy for that problem? In the first half of 2016 an intervention group of 60 randomly selected agents will be trained in two intensive workshop sessions per 12 agents and afterwards in an extensive individual training.

Intervention

The two workshop sessions will focus on the most relevant biases. The theoretical concept will be presented briefly and in a way that is appropriate for the intermediate vocational education level of the agents. In this way awareness of biases will be created. With the use of cartoons, a visual transfer tool will be introduced to help the agents remember the pitfalls of the various biases and to automate strategies to avoid them. The training materials to be used will apply the theory to the working practice by visualizing, reflection and metacognition. After the training sessions the agents in the intervention group will receive a 1-item test on every working day for one month, with a realistic risk decision task from practice and immediate response to their decision on that case. This extensive form of training will help the agents to build heuristics in rational, non- or less-biased risk decision making.

Experiment

The experimental setting of the first intervention is shown in Figure 3 below. Cases with critical decision moments will be collected first, to develop the training content for the workshop sessions, the extensive training and the tests.

Intervention 'Security Performance'

Training Airport Security Agents

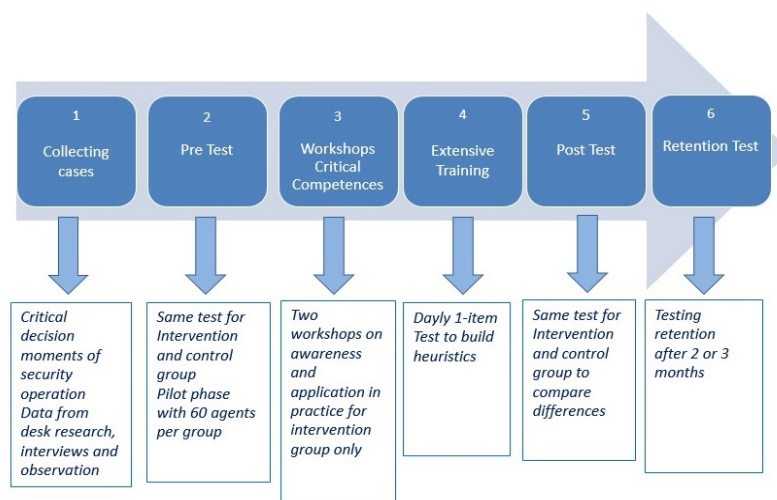


Figure 3: Experimental design of intervention 1: Equal, randomly selected intervention and control groups will get the same pretest and post-test. Only the intervention group will get the two phases training intervention and a retention test after 2 or 3 months.

INTERVENTION 2: TEACHING CLEAR THINKING TO BACHELORSTUDENTS

Bachelor students in Safety and Security Management are preparing themselves for a professional role as coordinators or liaison officers in an extremely broad working field. However, risk management always is one of their core tasks. At the Department of Safety and Security Management Studies, teaching staff members were realizing since a long time how important competences like analysing and critical thinking would be for the 'reflective professionals' we are educating for practice. So as we started to redesign our curriculum in 2014, we assigned 15 ECT's (420 hours) to Analysis & Interpretation and Intervention Strategy, as new subjects for our second year students. Analysis & Interpretation fits to a phase of Risk Analysis of the process model. Intervention Strategy covers the phase of Risk Decision Making. In the current academic year (2015-2016), the new modules are offered to the students for the first time. A dedicated training in 'debiased Risk Decision Making' will be added in the next academic year, in an experimental effect study.

Intervention

On the cognitive level students are provided with theoretical background knowledge on decision making and biases from social psychology and behavioural economics, as Figure 4 shows. On the basis of the process model we will collect cases from about ten subdomains of safety and security

practice, where risk decision biases occur. For each subdomain, for example domestic violence, health care, outdoor sports, traffic, we will produce an instruction video, explaining how the pitfalls of biased decisions apply to it in a specific way. The videos can be used in a blended learning setting, where also face-to-face trainings sessions and (online) training and testing modules will be part of. Visualization will be a leading principle of instruction strategy, as well as student achievement (Hattie, 2009; Valcke, 2010).

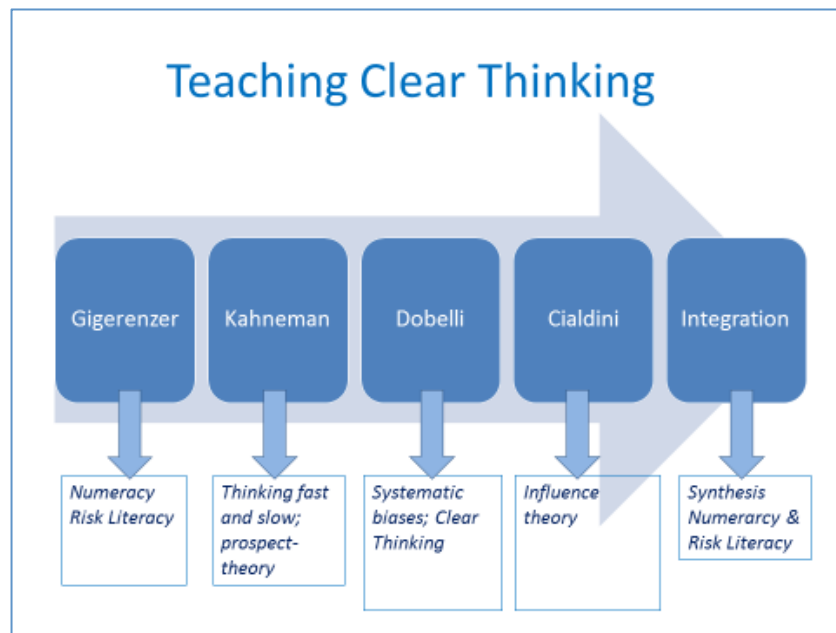


Figure 4: Design of intervention 2: Core conceptual knowledge of biases to be transferred on a theoretical basis and in applications like instructional videos and cartoons

Experiment

The experimental setting of the second intervention will be similar to the first. Half of the student groups will be in intervention and the other half in control groups. Pretest and post-test are based on the standardised Berlin Numeracy Test (Cokely, 2012) and a risk literacy test we used in earlier experiments. The test results will be evaluated with statistical regression analysis and compared with results of the preadmission test the students have made in 2015.

CONCLUSION

Both effect studies will already show in the pilot phase to what extend ‘debiasing by training’ in education as well as in practice might be possible. First experimental data may be presented to the EAPRIL Conference 2016 in November.

An early pilot study to this research project was presented at the EAPRIL 2012 Conference in Finland. At the EAPRIL 2015 Conference in Luxembourg we presented the actual design of both the two experiments and the educational interventions.

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ASSESSMENT OF EYE MOVEMENT TRACKING ON SELECTED EXERCISES

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ABSTRACT

In our studies the eye movements of 10-11-years-old students were analyzed, while they were solving tasks related to the planar orientation in front of the Tobii T120. The students had to follow the instructions on the image according to the text of task guidelines. We found on the basis of various statistical and thermographic studies, that many of the tested students are not fully aware of the basic directions and more of them blended eastern and western directions. The tasks performed with instructions were more accurately solvable for students. Based on the studies exercises should be developed for students that are interesting, understandable and ameliorate the two-dimensional and three-dimensional orientations.

EYE MOVEMENT TRACKING AT SCHOOL

Instrumental monitoring of eye movement has significantly improved over the last decades, naturalized in several areas of international researches, and appears more and more in Hungary too. This technology allows us to get acquainted with the process of evolution of cognitive abilities, the growth of learning abilities common and individual characteristics among elementary school students. Visual information gaining and processing is the key in most subjects – especially in science – so results of eye movement monitoring can influence and make more effective the methodology of various subjects, can provide guidelines for answering the questions of teaching methodology (Steklács, 2014). Furthermore it may help to improve application of course book researches.

The eye movement tracking research enables us to recognize the subjective importance of a particular area - i.e. part of a course book - by the number of fixations (duration of accepting and processing visual input stimuli) belong to it. The length of the fixation belonging to the investigated area shows the complexity of information content of that area. Our sight settles on the most informative places for us, so the time spent on the so-called AOI (Area Of Interest) becomes measurable, how much interest the investigated areas can generate, and the related importance and information value (Hámornik, Józsa, Hlédik and Lógó, 2013). If the monitored area has exact determined goals then this technique is the best way to investigate if the current details (like pictures) attract the desired amount of attention (Maródi, Devosa, Steklács, Fáyné Dombi, Buzas and Vanya, 2015). With this methodology we can demonstrate which area draws significant attention first or that how much and how long do people pay attention to particular areas. We can make some statistical analysis using the gained data which can lead to correlations. These statistics can determine an order among the areas of interest by showing which area was noticed first, second, etc. but also can show how long the subjects viewed them during the research. So the eye movement tracking as visual methodology allows gathering and analysis of data because it monitors the movement of the eye revealing that which parts of the given – course book - page attracts the attention of the students and how much (Duchowski, 2007).

During our previous eye-movement researches we tried to find the answer how the students have a look at pictures belonging to text (Maródi, Devosa, Buzás, Steklács and Sagrillo, 2015; Maródi, Devosa, Steklács and Buzás., 2015; Maródi and Devosa, 2015; Maródi, Steklács and Devosa, 2015) and we came to the conclusion the Hungarian students focus primarily on text and only small percentage of them take a look at the corresponding pictures. The teachers should try harder to draw the students' attention which pictures should be looked at to make learning more effective (Maródi, 2014).

In our eye tracking research the Hungarian students were asked to solve several orientation exercises on computer, which were selected from various Hungarian science course books. We typed the text and enlarged it making it easier to read for the students on the computer, and placed the pictures according to their position in the course books. Numbers were not present in the original exercises, only here for easier understanding. The subject 4th class students had to advance according to the instructions described in the exercises and provide the correct answer. They were asked to think loudly allowing us to be able to keep track of their progress, and we made notes about their solutions. Ten elementary school students participated in our pilot research. It is questionable how exact are the course book's exercises to them, how they feel about the difficulty and complexity, how much time they spend on solving them, can they understand the two dimensional space (Devosa, Maródi and Grósz, 2015). We used Tobii T120 type eye tracker monitor and the data gathering was made by using the Tobii Studio software.

EXERCISES OF OUR STUDY

For this to be better understandable we translated a few exercises to English (figure 1, figure 2, figure 3).

Laci invited his friend Zoli. As Zoli didn't know where Laci lives, he was given a top view drawing with the following instructions:

Start from the school and head to the following directions (N-North, S-South, E-East, NE-North-East):

E → S → S → NE → N

In which house Laci resides?

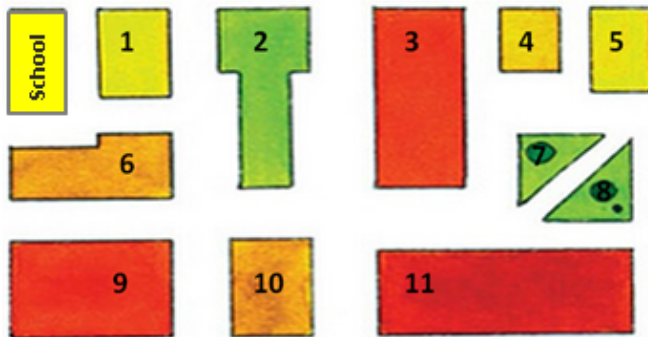


Figure 1: Exercise 1

Follow the path of the frog according to the given directions!

To which leaf will the frog arrive in the end? The path of the frog:

E → S → SW → S → SE → N → NE → SE → S → E → N → NW → N → W → SW → SE

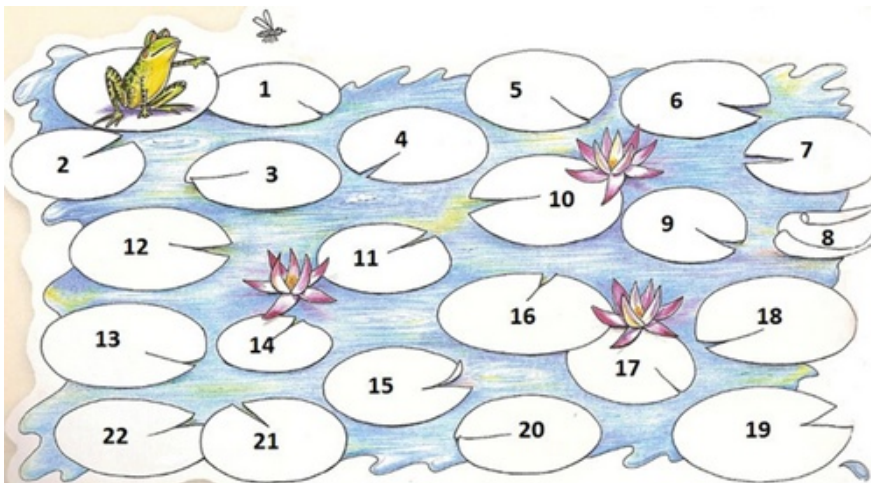


Figure 2: Exercise 2

Follow the given directions. Where will you get to?

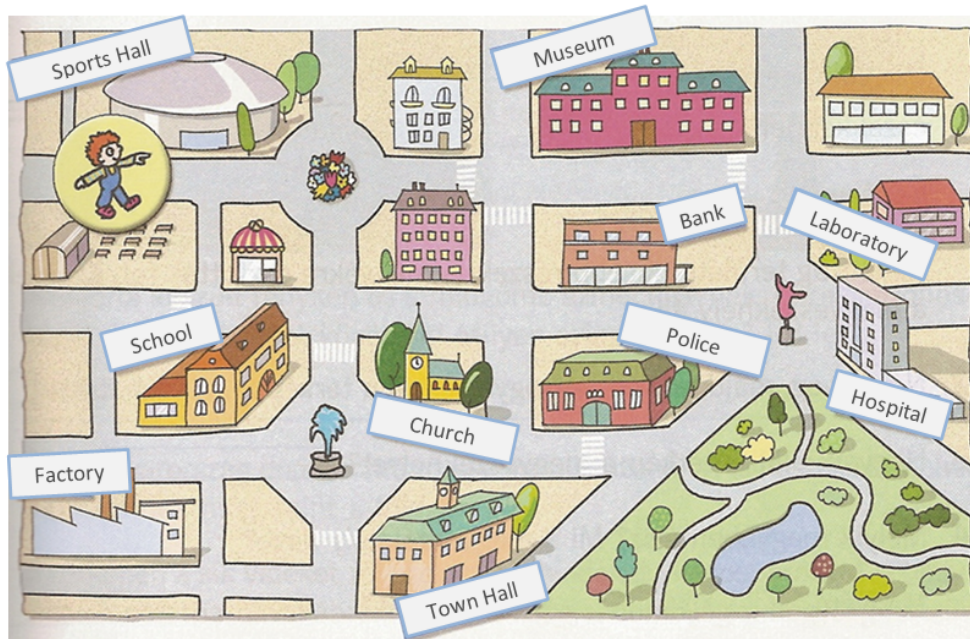


Figure 3: Exercise 3

1. Head to the east until the roundabout!
2. Turn to the south. Walk till the next square!
3. Go to the east till the next intersection!
4. Turn to the north! At the next opportunity head to the east!
5. After reaching the square go to the north till the next intersection!
6. Turn to the east!

RESULT OF THE EYE MOVEMENT TRACKING STUDY

The Tobii Studio software allows you to process huge amount of data i.e. heat map researches, gaze plot analysis, duration of the first fixation, number of fixations, duration of visits, number of visits, etc. These datasets can be examined for each area of interest (i.e. picture, text or part of the text). The heat map is a very efficient way to demonstrate the fixation points of the subjects, which are marked by cool and warm spots. Fixation count and duration also can be calculated using the heat map.

Laci meghívta barátját, Zolit magukhoz. Mivel Zoli nem tudta, hogy hol lakik Laci, ezért adott neki egy felülnézeti rajzot és a következő utasítást:

Indulj el az iskolától a következő irányoknak (É-észak, D-dél, K-kelet, ÉK-északkelet) megfelelően: **K -> D -> K -> K -> ÉK -> É**

Melyik számú házban lakik Laci?

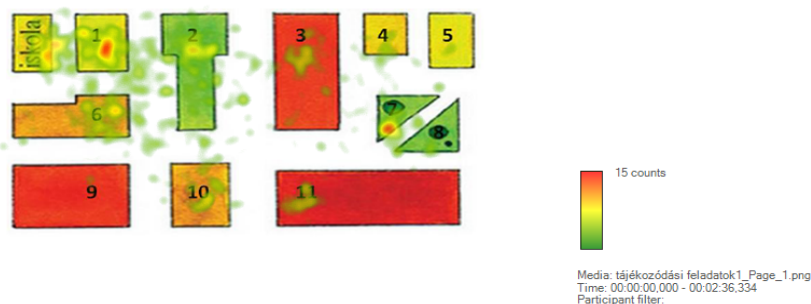


Figure 4: Heat map

The areas on which the subjects spent more time than average were marked by red - the redder the area the more attention were measured on it.

As the students were asked to think loudly, the figure shows they had a look at the number of the building they progressed by (figure 4).

When a picture contains similar colors to the heat map we can use the inverse of the heat map analysis: the gaze opacity analysis (figure 5).

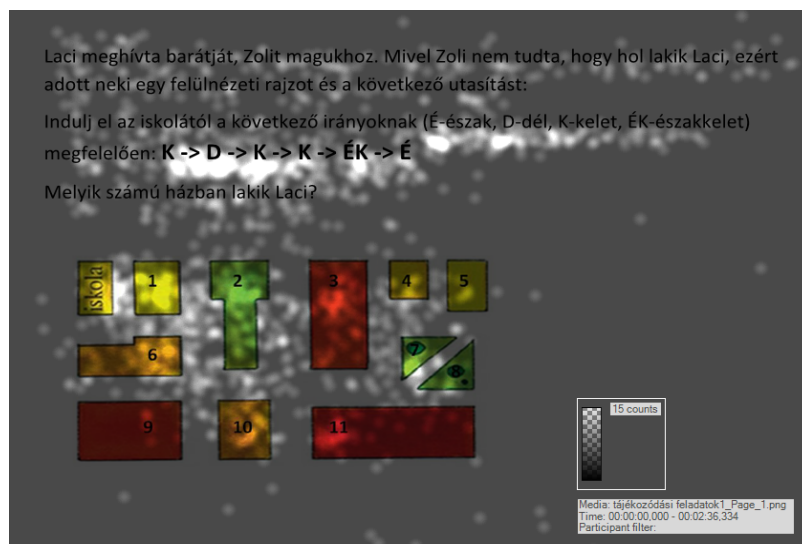


Figure 5: Gaze opacity

In this case the white spots mark the area which drawn attention. The brighter the area the more focus it got from the students.

The gaze plot (also known as scanpath) analysis allows us to get acquainted with the path of sight movement and the method of searching. The sight tracking technique reveals where the subjects look for the information they need by instinct. All subjects were denoted by different colors in the analysis and all of their fixations denoted by a dot, where the length of the radius reflects the duration of the fixation. The largest circles denote approximately half-a-second fixations. According to this it's easy to decide whether the subject looked at a certain area. The following gaze plot analysis summarizes the eye movement of all students (figure 6).

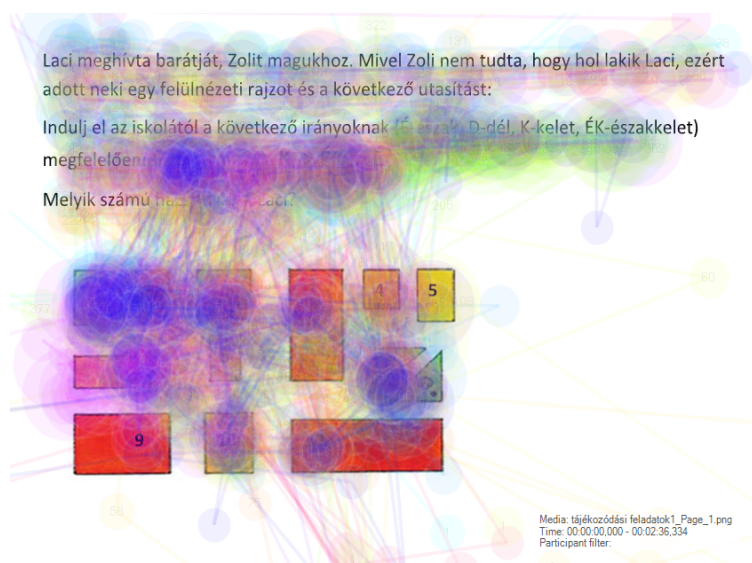


Figure 6: Gaze plot analysis

The gaze plot analysis shows to what the students paid attention at the first, or the first few seconds, where did their sight jump to among the parts of the course book and in what order. The students could hardly follow the long instructions, more of them have been stalled even at the beginning of the task, as seen on the image (in the first and third red areas of the leaf on figure 7).

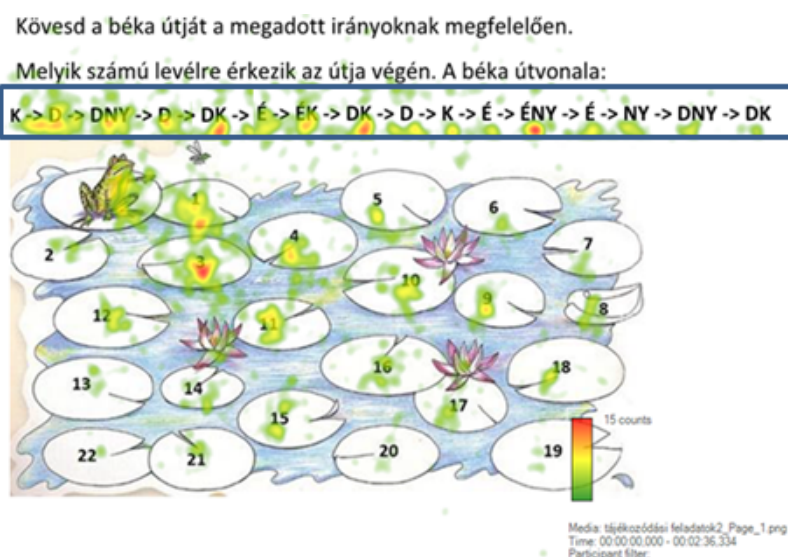


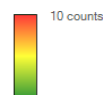
Figure 7: Heat map

The realistic examples – in which the students receive guidelines to the task – the students could perform much better (figure 8). Although these helping guidelines (i.e. roundabouts) meant difficulties to whom can't read perfectly yet.

Haladj a megadott irányok szerint! Hová jutsz?



1. Menj keleti irányba a körforgalomig!
2. Fordulj délre. Sétálj a következő térig!
3. Menj keletre egy sarkot!
4. Fordulj északra! A következő saroknál haladj keleti irányba!
5. A térre kijutva menj északi irányba egy sarkot!
6. Fordulj keleti irányba!



Media: tájékoztatói feladatok3_Page_1.png
Time: 00:00:00.000 - 00:02:36.334
Participant filter:

Figure 8: Heat map

The second analysis may demonstrate more that the part of the students got lost at the beginning so they didn't even reach the roundabout (figure 9).

Haladj a megadott irányok szerint! Hová jutsz?



1. Menj keleti irányba a körforgalomig!
2. Fordulj délre. Sétálj a következő térig!
3. Menj keletre egy sarkot!
4. Fordulj északra! A következő saroknál haladj keleti irányba!
5. A térre kijutva menj északi irányba egy sarkot!
6. Fordulj keleti irányba!



Media: tájékoztatói feladatok3_Page_1.png
Time: 00:00:00.000 - 00:02:36.334
Participant filter:

Figure 9: Gaze opacity

Exercise 3 proved the easiest among the students this was solved correctly by 50% of them (figure 10).

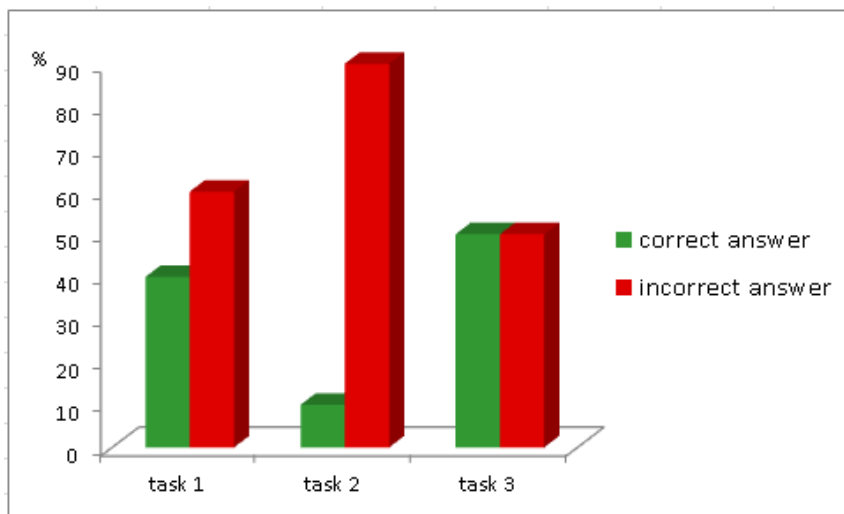


Figure 10: The rate of solving tasks

This was followed by Exercise 1 for which 40 percent of them provided correct answer. Exercise 2 turned out to be the most difficult as only 10 percent of them could solve it. The students can follow detailed instructions more easily than they can when they need to follow directions one after another. I wonder how they would perform with a compass.

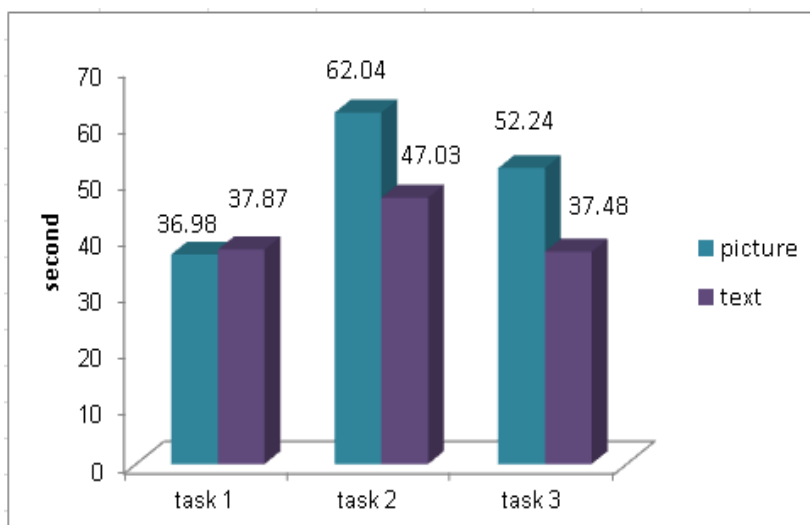


Figure 11: Total Fixation Duration (mean)

The duration of fixation was similar for picture and text at Exercise 1 whilst in case of the rest the fixation's duration was longer on the picture (figure 11).

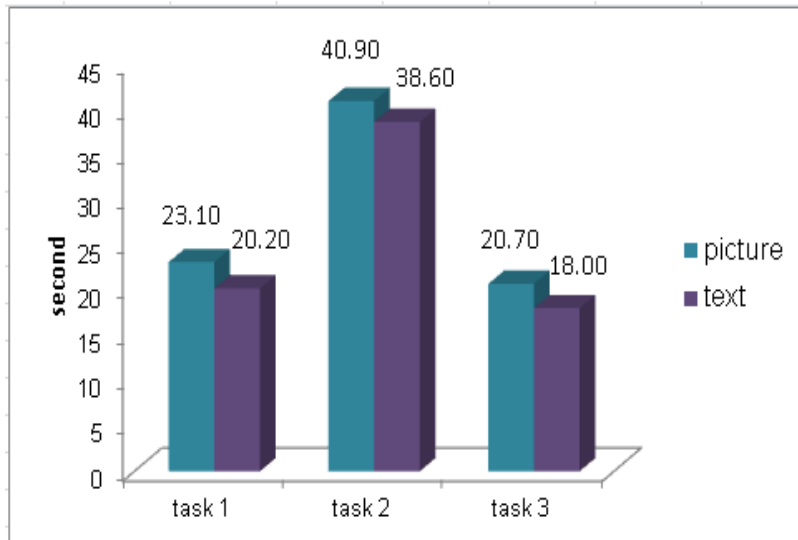


Figure 12: Visit Count (mean)

The number of jumps between the text and the picture was the highest at Exercise 3 because they were able to follow instructions from text from and they could memorize where they're at (figure 12).

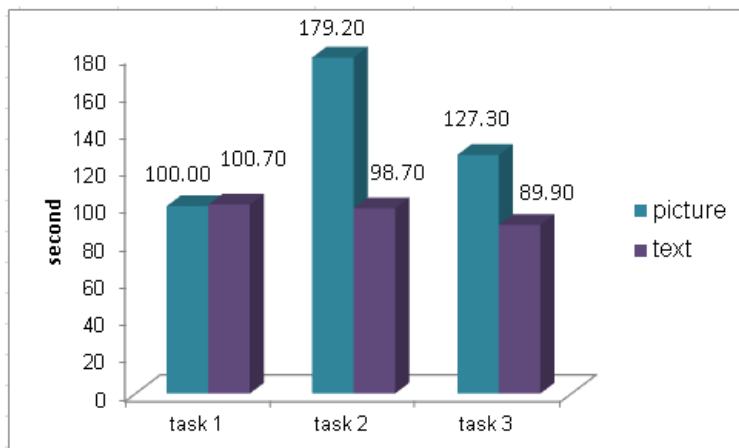


Figure 13: Fixation Count (mean)

According to number of fixations the students focused on the picture of Exercise 2 the most often because it was hard to follow that long sequence of instructions (figure 13).

CONCLUSION

Students participated in our research had difficulties to solve these simple exercises even if they are already 4th grade students. It can be stated following instructions took much time. They often missed east and west directions while they are familiar with south and north. One reason can be that children are often lack confidence in setting left and right side. The students enjoyed the monitoring of their eye movement and according to them they found the exercises mediocre difficult. We continuously encouraged them while they solved the tests and gave full marks for performing well.

The students use several brain functions during reading and writing, such as orientation in plain and in space. These abilities are very important in gaining new knowledge. Lack of space orientation can often cause difficulties in reading. Developing plain orientation is important because it helps the student not to miss the direction and positions of letters (i.e. p-d-b). If a child cannot orient well in plain and space can have difficulties in Mathematics too. As long a student has problems with any of these part-abilities their reading, writing, calculation can't evolve. Spotting these problems is very important as soon as possible because the student has difficulties in orienting in space. Games connecting to directions can prove powerful tool for improvement in form of exercise, board game or even online games too.

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WHY DO PRIMARY STUDENT TEACHERS USE INDIVIDUAL MOMENTS OF WORK IN CLASS?

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ABSTRACT

The sociocultural paradigm emphasised the social conditions of learning. It was regularly invoked in order to promote a pedagogy of group work. Although many research showed positive effects on learners due to cooperative or collaborative dynamics, teachers can be reluctant to use group work. This preliminary study is designed to better understand how individual moments of work can be thought according to student teachers' perspective on their own teaching practices. We explored primary student teachers' responses concerning "individual work", defined as a social situation to work and learn in the classroom. Using a short open questionnaire, twelve primary student teachers gave a large array of rationales about using pupils' individual moments of work in class. This study should help to better acknowledge how they anticipate and specify these individual moments of work during the lessons. The results also point out potential contradictions which may enlighten teachers' frequent resistances to group work in class. Finally, it opens up a field for further research in education.

INTRODUCTION

“Individual work” is a commonly used term in education. In this paper, we will refer to this term for better clarity, instead of individual moments of work and individual activities in class. After a few words on what individual work means in education, a few processes leading teachers to use individual moments of work in class are illustrated. Several scientific references occasionally refer to individual work. Surprisingly, most studies found into databases focus on social interactions or on learning as an intraindividual process. A large amount of research early on compared individual *versus* group productivity with various conclusions (Karsten, 1949; Moscovici & Paicheler, 1973). A few pedagogical approaches are also based on “individual work” as a notion. “Individualised” or “personalised” instruction is a classical theme in education referring to the way educationalists and teachers deal with pupils’ heterogeneity with specific strategies like “programmed learning” (Seel, 2012) or “open instruction” (Stark & Herzmann, 2012). Yet, an individualised strategy can also be adopted during group-work activities (Block, 1977).

Johnson and Johnson (1984) defined individualistic work as a concept: pupils have to “*work independently on their own learning goals at their own pace and in their own space to achieve a preset criterion of excellence*” (p. 1). The task is based on the acquisition of simple skills or knowledge or on specific facts, no interdependence is supposed to occur among pupils and they all expect to be left alone by their classmates, every pupil has his/her own separated space, the teacher is the main source of assistance, the pupil has the needed material at his/her own disposal, the evaluation implies some objectives that any pupil can reach individually. This definition is historically still situated in a system of mass education, where teachers work with several pupils using one-to-one tutoring.

Rather than this specific definition, a panel of educational usages are possible. For instance, Johnson and Johnson (1984, p. 68) proposed that “individual work” may be a moment of separated activity when the task is divided among group members. It may also help teachers to deal with classroom ambience, with societal values... Hence, individual work has to be thought as a social situation, and more specifically into the classroom context, it relates to copresence: “*persons must sense that they are close enough to be perceived in whatever they are doing, including their experiencing of others, and close enough to be perceived in this sensing of being perceived*” (Goffman, 1963, p. 17). In that sense, “individual work” is a specific format of limited interactions occurring in a range of social situations, located in a material context, and in cultural situations where individuals still use social mediations (e.g. internal speech). The term can be used to speak about a product (e.g. a personal production), an activity (e.g. an individualised exercise), a moment (e.g. period of separation during group activities) or a situation (e.g. working on your own). We now explore the way teachers and student teachers may use the notion in their practice.

Teachers reasons to use individual moments of work

Multiple reasons to use individual moments of work in the classroom are now proposed: the strength of an individualistic background focusing on individual learning processes, teachers’ usual resistance to group work pedagogies, and the possibility of a personal choice of teachers for pedagogical reasons.

A western individualistic background

Teachers may refer to two essential conceptions of teaching and learning processes. The first conception is supposed to be strong and resistant to a more social perspective of education. Indeed,

teachers early on develop their personal conceptions about learning and teaching in a context where most psychologists and education researchers share an individualistic epistemology. Indeed, originating in western philosophical traditions, educational psychology first developed individualistic conceptions of mind and thought. This critic was particularly highlighted in the 1970's (e.g. Hogan, 1975; Sampson, 1977), and still after a western emergence of a socioconstructivist community of researchers on the borders of mainstream psychology (e.g. Turiel, 1989).

After the emergence of social psychology, the rise of a vygotskian perspective occurred in the 70's and helped to redefine educational issues in a social interactionist perspective (Vygotsky, 1986; Wertsch, 1989). The vygotskian concepts are now widespread even in schoolbook prefaces ("scaffolding", "internalisation", "mediation", "activities"...) supposing that teachers are familiarised enough to understand this approach. Researchers also use the sociocultural paradigm to legitimate the potentials of group work. It is the case for research on "collaborative learning" or on "cooperative learning" (Johnson & Johnson, 1984). However many studies in these fields do not really use the vygotskian concepts or are in contradiction with this paradigm. This may strengthen teachers' individualistic conceptions of learning as well as their resistance to group work.

Teachers' resistance to group work pedagogies

It has been shown that student teachers and teachers develop some resistances to group work in class, explicitly because it needs them to develop new and specific kinds of task, to think on how to compose groups, to develop new teachers' roles, to reorganise spatial arrangements... (Gillies, 2003; Gillies & Boyle, 2006, 2008, 2010; Kohn, 1992). But it is possible to find deeper reasons for these resistances.

Teachers actions and intentions are oriented by their representations, conceptions and beliefs about learning, intelligence, teaching and in particular group work (Baines, Blatchford, & Kutnick, 2003; Gillies & Boyle, 2008, 2010; Wanlin, 2009). It has been regularly argued that these representations, conceptions and beliefs are difficult to change. In particular student teachers often consider teaching in a transmissive way with other learning conceptions (Donche & Van Petegem, 2011; Gipps, McCallum, & Brown, 1999). An individualistic perspective of teaching-learning processes is consistent either with a behaviourist or an information-treatment paradigm, but less with a sociocultural one. As the sociocultural perspective is largely misunderstood but is often invoked to support a pedagogy of group work, focusing on group activities can provoke negative reactions of student teachers and the perpetuation of an individualistic stance on learning.

A personal conception of individual work?

Teachers may have explicit pedagogic reasons to use individual moments of work. A possibility is to question which academic activities are preferably developed as an individual work: exercises, exploring preconceptions, assessment, reflective writing... From the learner's perspective, Boissonnade (2011) suggested three main reasons to use individual work: (a) avoiding negative collective experiences, (b) adapting a learning situation depending on the developmental level of the child, (c) articulation of individual and collective "moments" for complex activities. But "individual work" is not only thought to change pupils' knowledge. In the classroom as a complex system, a teacher has several roles. "Individual work" can be mobilised for organisational reasons like managing pupils' attention, implementing instructional materials ready to be used in individualistic settings... It can also be used for other reasons, even unconsciously (e.g. traditions, habituation, personal experiences, values).

Aim

This study is focused on primary student teachers' conceptions and representations of individual work. The first goal is to identify prior experiences and reasons of the student teachers to propose individual work in class. The second goal is constructing a schema of student teachers argument to use individual work: classifying and schematising diverse intentions to mobilise individual work in the classroom.

METHOD

To define a variety of reasons student teachers may give about individual work, we used an open questionnaire and asked a few students to describe their use of "individual work" during their practicum experiences and to detail whether "individual work" can be adapted to classroom activities.

Participants

The participants are second year primary student teachers. In the first year, they had a short practicum experience (8 weeks). During a first lesson on research methods, we gave them a questionnaire: 12 out of 18 students gave back their written responses (*girls/boys* = 6/6), which were considered as an opportunity to have a first data collection here centred on primary student teachers' perceptions.

Open questionnaire

The participants received seven open questions in French, here translated (See table 1). A thematic analysis was performed on participants' responses explicitly referring to "individual work", and the categories were then re-elaborated with the second researcher to design main and second-order categories.

Table 1

Seven open questions to answer in a written questionnaire

1	Can you tell me about your teaching style? What appeared to be specific in your way to teach relatively to what you know / saw in other teachers? What are you trying to develop as a style?
2	What did you teach recently to pupils? Can you tell me about the last period you taught (domain, learning goals, competencies...)?
3	Did you use collective activities (pairs, trios, small groups)? Can you describe these periods and their reasons?
4	Did you use plenum situations? Can you describe these periods and their reasons?
5	Did you use individual work (where the task is independently controlled by each child)? Can you describe these periods and their reasons?
6	Did you plan a different time line of all these differing situations? Or a different functioning of these situations?
7	Can you list different usages you do in general of individual work in the classroom?

RESULTS

In a first section, we present successively some categories and subcategories of responses. Then a synthetic view of this analysis is proposed.

Categories of arguments to use individual work in the classroom

Some preliminary analyses were realised in order to distinguish a variety of rationales used either to describe, to define or to specify some usages of individual work in the primary classroom.

The responses of the participants concerned: (A) class management, (B) cultural values and objectives, (C) combinations of individual and collective work, (D) social regulations of activities, (E) typical activities concerned with individual work, (F) learning processes supposed to be supported, (G) teaching activities, (H) time management by the teacher, and (I) general circumstances. A first category of responses lists students' reasons for using individual work as a teaching strategy to focus pupils' attention, i.e. "class management" (see table 2).

Table 2

Class management arguments and examples

Subcategories	Examples of response
(A1) Managing pupils' heterogeneity	"to be able to meet more individually children who meet some difficulties" (S1)
(A2) Management of motivation	"I try to vary my lessons, not always doing in the same way (whole-class, half-class...), to change location (outside, displacement of tables, etc.)" (S2)
(A3) Attention management	"it is essential that every pupil cannot be distracted or influenced by someone else" (S4)

Another category is that related to the learning objectives, either as a cultural value linked to societal expectancies, or as an educational goal oriented toward the child's interest (see table 3).

Table 3

Cultural values and educational goals as arguments and examples

Subcategories	Examples of response
(B1) Autonomy	"to give them a secure and supporting frame that develops autonomy" (S3)
(B2) Individual knowledge and mastery	"for the children to be able to differentiate seasons, to know their particularities" (S2)
(B3) Child own rights and interests	"I see the individual work not as isolation but as a right" (S6)
(B4) Institutional necessity	"I often organise individual work because we have to" (S11)
(B5) Didactic goals, content objectives	"to lead a questioning activity with diverse approaches for the teacher as well as for the pupils" (S4)

Another category involves the way individual work is thought in chronological and topological dimensions, where several situations are articulated or combined successively. Temporally, individual work is here presented as an initial or a final phase, rather than an intermediate phase of learning (see table 4).

Table 4

Combination of individual/collective work as arguments and examples

Subcategories	Examples of response
(C1) Preliminary moment	"[...] taking some information before a collective moment (ex: reading)" (S3)
(C2) Final moment	"An individual work is generally useful during a learning phase, when the pupil starts to assimilate the content" (S5)
(C3) Spatiality, topology	"they were 2 or 3 on each table but did an individual work" (S2)

Another category of response is linked to the regulations expected to occur between the agents in the classroom, i.e. teachers and/or pupils (see table 5).

Table 5

Social regulation of task realisation as arguments and examples

Subcategories	Examples of response
(D1) Teacher's heteroregulation	"to drill" (S1)
(D2) Individual autoregulation	"for children to advance at their own rhythm" (S1)
(D3) Pupils' coregulation	"they had to work in a dyad but after an individual work, to compare their responses and to argue in order to reach a common response" (S2)
(D4) Competition	"an individual ranking" (S5)

The next category distinguishes school activities considered to be specific to an individual work (see table 6).

Table 6

School activity proposed in the classroom as arguments and examples

Subcategories	Examples of response
(E1) Reading and writing	"learning to write a number" (S2)
(E2) Exercise, repeated tasks	"mathematics/French exercise" (S11)
(E3) Dictation to an adult	"Dictation to the adult" (S6)
(E4) Creative task	"Imagining the rest of the story. The pupils worked in solo to imagine their own suit. It was to train on creativity" (S11)
(E5) Drawing	"drawing" (S11)

A frequent invoked argument is related to what learning processes are supposed to be supported in individual work. The participants often cited these learning processes, either to point out psychological processes supposed to occur in individual situations, or learning processes expected to be supported in those situations (see table 7).

Table 7

Learning processes in individual work as arguments and examples

Subcategories	Examples of response
(F1) Information treatment	<i>"Taking information [...] (ex. : reading)" (S3); "listening, observing" (S4)</i>
(F2) Individual retention	<i>"[...] the pupil learns, revises contents" (S2); "knowledge interiorisation" (S6)</i>
(F3) Automation	<i>"to drill" (S1)</i>
(F4) Reasoning	<i>"build reasoning" (S4)</i>
(F5) Arguing	<i>"to compare their results", "to share an agreement", (S2);</i>
(F6) Social interaction	<i>"to dare to speak" (S11)</i>
(F7) Reflexing, self-assessment	<i>"introspection" (S6)</i>
(F8) Appropriation	<i>"to make a personal reading" (S3)</i>
(F9) Assimilation	<i>"a learning phase when the pupil is starting to assimilate the discipline" (S5)</i>
(F10) Creativity	<i>"It was thought to exert their creativity and it seemed sensible to me to make them work individually to avoid the influences by others" (S11)</i>

A category of response indicates the specific activities of a primary teacher during individual work periods (see table 8).

Table 8

Kinds of instructional activities

Subcategories	Examples of response
(G1) Observing the pupils	<i>"we discover the pupils differently when they are working in group or in solo" (S11)</i>
(G2) Drilling	<i>"to drill" (S1)</i>
(G3) Assessing knowledge and competencies	<i>"to assess acquisitions/knowledge" (S4, S6); "self-assessment" (S3)</i>
(G4) Interacting with the pupils	<i>"to question/answer" (S4)</i>

Another category combines the responses on how primary teachers may invoke individual work by anticipation or to handle the dynamics of classroom. However, in this data sample, we did not observe responses about teachers' post-reflective activities on classroom experiences (see table 9).

Table 9

Teaching preparation and adjustments as arguments and examples

Subcategories	Examples of response
(H1) Planification des moments de travail individuel	<i>"the lesson's plan was defined formerly and did not change [...]. It happened to me to move from an individual work to a collective one in order to save some time" (S3)</i>
(H2) Adjusting social situations during the classroom	<i>"to go quicker in the lesson's plan" (S3)</i>
(H3) Reflecting on past situations	No responses

Finally, a category was thought to encompass the factors students use to relativise any general usage of individual work in primary classrooms (see table 10).

Table 10
Classroom and curriculum circumstances

Subcategories	Examples of response
(I1) Class level	<i>"it depends on class levels"</i> (S2)
(I2) Pupil's development	<i>"with 1H or 2H classes, it seems to me that it is difficult to organise activities with self-assessment"</i> (S5)
(I3) Lesson	<i>"it depends on the lesson to be given"</i> (S11)

Final synthesis: response classes and categories

The categories were restructured using subcategories and superordinate categories. This effort enables one to locate student teachers' reflection on using individual work in the classroom. It is also helpful in order to develop a flexible tool for students as well as for researchers who have to remember and mobilise these categories. This schema also enables one to observe which fields are particularly cited: it is particularly interesting to observe that our participants often cited educational outcomes. When reflecting on individual work, they focus on what a primary teacher would have to reach as objectives. This should be interpreted with caution: the responses could have been driven by our questions and their organisation. Thus our observation is also a matter of research methodology. The schema can also be used in order to clarify the way we further formulate research questions and methodology.

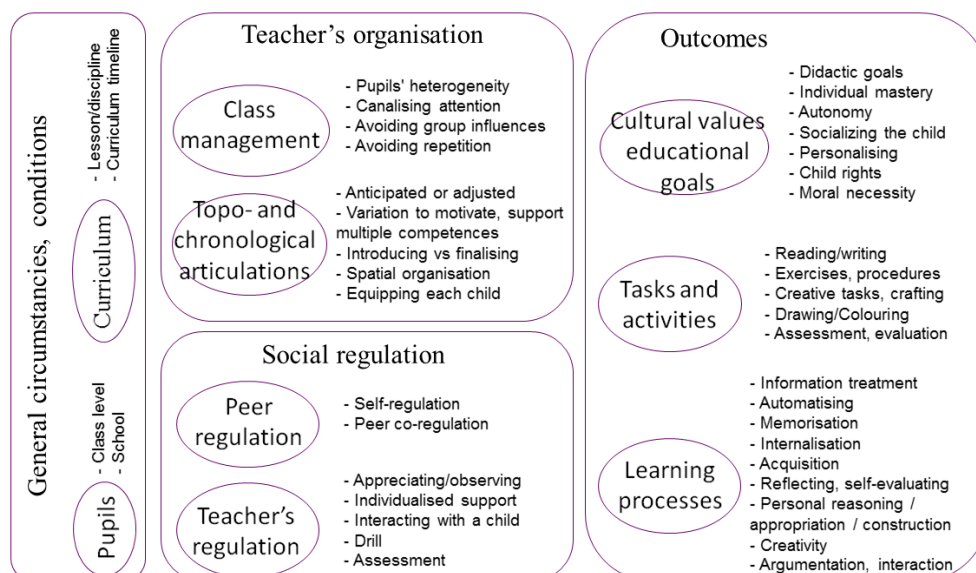


Figure 1: Primary teacher students' usages of "individual work" in class

DISCUSSION

Data interpretation

This research is an exploratory study to better explain why teachers often plan and mobilise moments of individual moments of work. Multiple reasons have been distinguished among the participants.

Moreover multiple reasons were evoked by each of the participants. This suggests an intraindividual heterogeneity in the reasons to use individual moments of work, and even sometimes in order to promote social skills and interactional activities. These reasons could be even more diverse and detailed with professional teachers, because their teaching experience could lead them to discriminate with more precision conditions implying individual moments of work.

Individual work is often related to classroom management in order to lead individuals (canalising pupils' motivation and attention) or persons (differentiating pupils' needs or characteristics). Rather than a second-best solution, these primary students think about using individual work voluntarily, as a strategy to regulate pupils' attention, commitment, and social influences. They seemingly express a need to control the class and pupils' undesired behaviours. The responses challenge the possibility to deploy true individual moments of work in the classroom, when a teacher gives the pupils an opportunity to act and think on their own with limited interactions.

These student teachers often refer to learning processes located at an intraindividual level (information-processing, memorisation...). In particular, they write about two major classes of individual learning processes. A first class refers to acquisition and automation (repeated exercises, procedural knowledge, information memorisation...). However a second class of processes refer to appropriation and motivation. They suppose that children may be actively involved in activities using individual moments of work. This is not contradictory with group work. However group work implies an essential transformation of school activities, involving new social and sociocognitive skills. These teacher students seem to be particularly concerned with discipline and pupils' attention, rather than on the nature of the activities proposed to children. It is why we observe a range of teacher proactive behaviours in these individual moments that are supposed either to observe, guide, support or evaluate (cf. individualistic work, Johnson & Johnson, 1984), suggesting a strong representation of teacher professionalism.

Finally, we found some evidences of a tendency to use individual work involuntarily: the participants rarely indicate that individual work may be chosen out of a personal or rational choice. This can be a consequence of the research method and an effort from participants to over-rationalise what they have in mind. First they proposed a range of typical "individual activities". Relating individual moments of work to "exercises" or "lecture and writing" could be influenced by cultural representations. Second, they also shortly write about "predefined worksheets", which are commonly proposed in school books and teaching material.

Further analyses and perspectives

This paper summarised first analyses, but next analyses could clarify several teaching strategies and conceptions about individual moments of work rather than general tendencies. This could be helpful to support students to reflect on their teaching practices. Further research should be done to collect data on professional teachers' perceptions and rationales, to better acknowledge their thinking about collective and individual moments of work and their conceptions about "learning" in these moments.

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THE VALUE OF WEB-BASED VIDEO IN IMPROVING TEACHING PRACTICE

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ABSTRACT

After obtaining quantitative evidence that 100 teachers were enthusiastic about the value of web-based video in their professional learning, the MirandaNet team explored the views of six experts in the method; one coach, two coachees and three of these interviewees who had undertaken both roles. This qualitative data from educators who were all committed to improving practice showed how effective web-based video can be if it is introduced into the school in carefully considered conditions. Negative disruption only occurred when pupils were not informed in advance about the camera use. When it is clear that the cameras will not be used for surveillance evidence was found of positive changes, even transformation in teacher practice and incidental improvement in pupil behaviour.

WHAT WORKS IN PROFESSIONAL DEVELOPMENT?

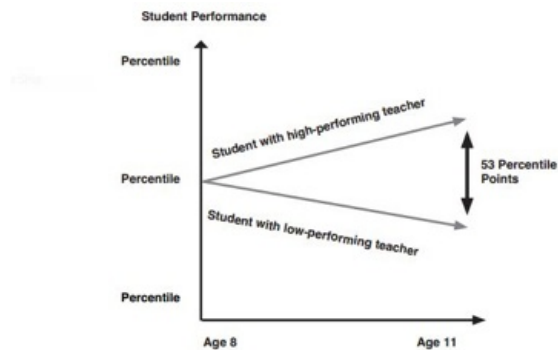


Fig 1: Sanders and Rivers, (1996) 'Cumulative Effects of Teachers on Future Student Academic Performance'

A growing consensus can be traced in research globally that suggests that, among school-related factors, the quality of teaching has the greatest impact on pupil achievement. Sanders & Rivers (1996) shows that there is a difference of 53 percentile points between the achievements of pupils with a high performing teacher and one who is low performing (Figure 1)

Edmonson (2005) indicates the impact of the different types of learning experiences on the actual skill transfer in the classroom practice. Each component of this model plays a significant role in the process of professional development. However, the application of skills is much higher when the professional development is teacher-led and includes coaching, self-reflection and peer review (Figure 2).

The history of coaching

Given that research findings show that teacher performance is paramount in the cycle of pupil achievement, it follows that the quality of classroom teaching should be a key focus of teacher education (Imig & Imig, 2006; Hassel & Hassel, 2010; Dinham 2013). Through his meta-analyses of 15 years of research data, Hattie (2009) puts his emphasis on performance in the classroom as well:

As a profession we are excellent at critique: let's use this critique to evaluate whether we are having sufficiently high impacts on all students, whether the nature of how we impact on this learning can be made more effective and efficient, and to make decisions about what we do based on this positive impact on learning- together (p.192).

Coaching is a technique largely associated with sporting prowess that has been introduced globally into teacher education in order that teachers can share and refine performance strategies that seem to have impact. In terms of pre-service training and Continuing Professional Development (CPD), the idea that a teacher should be encouraged to reflect on their own performance in contrast to being told what to do was first developed by Schön in 1987. His innovative thinking around notions such as 'the learning society', 'double-loop learning' and 'reflection-in-action' has become part of the language of education. In this spirit coaching was well established in the 1980s to support the development of staff (Joyce and Showers, 1980).

Whitemore (1995) describes coaching as mentorship that promotes personal learning rather than just teaching teachers about teaching. Coaching can concentrate on what the teachers already do and can help them to think about ways of improving: in fact, teachers' existing level of skill can be better acknowledged using this method. Indeed in educational settings coaches who are versed in constructionist pedagogies provide personalised professional support to teachers who want to improve

their classroom teaching. The resultant learning and development underpins school improvement and can be deployed to raise student achievement.

By the 1990s policies in England predetermined that new teachers should report their learning and practice to a 'mentor' to allow them to develop their teaching practices and raise student achievement (McIntyre, 1996; Hobson and Malderez, 2013). Similar projects to support early career teachers took place in North America and parts of Europe (Feiman-Nemser, 1990; Medgyes and Malerez, 1996). Originally developed to support the induction of new teachers as part of the initial teacher preparation, coaching has now become a central feature of pre-service and in-service levels university programmes (Hobson and Malderez, 2013).

E-coaching is a development where coaching is underpinned by video clips from the classroom - and even real time in-ear coaching or bug in ear coaching that we do not discuss here. Although studies have shown that e-coaching is a highly effective method of improving the efficacy of teaching (Franke and Dahlgren, 1996; Marable and Raimondi, 2007) there are also some challenges. Hobson and Malderez (2013) indicate that e-coaching does not always bring positive outcomes for the practitioner, and can restrict a teacher's learning and development. As a result Hobson and Malderez believe that for trainee teachers e-coaching can hinder the beginning of their career and possibly damage their self-esteem (Beck and Kosnick, 2000; Maguire, 2001).

In contrast Cox (2013) argues that e-coaching allows one to reflect on practice, which can be transformative (Mezirow, 1990). Coaching is fundamentally a relationship between two people to allow them to share similarities and learn from the experience of the coach. Furthermore, the Rock et al. (2009) study found that the bug in-ear coaching not only supported the performance of the teacher, but also the students' learning. In the first stage of this MirandaNet study we concentrated on 100 teachers who had been receiving e-coaching using the IRIS Connect web-based video for at least 4 months (Preston 2014). The unique point about this system is that teachers own the video clips of their performance that they film themselves by pre-setting the camera system. They have full control over their own videos: only the teacher decides if the coach or other colleagues can see the video or not.

In brief the results of the survey were that:

- 94% of teachers using IRIS Connect said their teaching had improved
- 88% said their confidence had risen
- 88% felt there had been a positive impact on collaboration
- 96% felt they were willing to take more risks
- 99% felt there were more conversations between teachers about teaching in their school

THE RESEARCH DESIGN

In this second stage of the research we interviewed three coaches and three coachees in-depth about their general views on the impact of web-based video e-coaching and about their experience of a particular method of e-coaching called 'in-ear coaching', 'bug-in-ear coaching' or 'real time coaching (RTC)' that has been developed and researched mainly in Australia and the United States. (Rock et al., 2009). In this paper we present the findings from the general views of the value of coaching using web based video.

This project was intended to study the pilot programmes taking place in England in order to provide a context and framework for web-based video professional development programmes with a focus on 'real time in-ear coaching.'

The questions

The literature study and the discussion with some of the researchers in Australia and the US helped to clarify the questions that would be relevant in England. The two questions we aim to answer in this report are:

- What are the pre-conditions for web based video coaching to be effective ?
- Can web based video be disruptive?

The methodology

The research team undertook online and telephone interviews which included a combination of structured questions, a free answer section and encouragement to offer critical incidents that can be described as ‘light-bulb’ moments that signify change in an accessible way.

The interviews were analysed using grounded theory techniques. In this method the analysis is not dictated by a rigid quantitative framework: researchers code the data based on what has been offered by the subjects rather than by the categories they have been directed to use. This means that the researchers must be sensitive to ideas that they might not themselves have predicted. These procedures are intended to make the researchers’ emerging theories denser, more complex, and more precise (Charmaz 2000). This methodology seemed to be appropriate as web based video is a tool used to develop and improve some very complex human behaviours that have not yet been fully categorized by practitioners and researchers.

The sample

In this qualitative study the six interviewees were selected from schools where web based video coaching had been established for at least a year. At this stage in England there is a limited pool of practitioners to draw on and this is a small sample. These factors must be taken into account when assessing the results.

Experience and knowledge ranged from those who were just beginning in teaching, to leaders who were well established, leaders who were learning to be coaches and one experienced in-ear coach. All of these interviewees were enthusiastic in general about the results. However, they were also articulate about the potential pitfalls and risks.

FINDINGS ABOUT WEB-BASED VIDEO COACHING

In the first place those who were interviewed shared their knowledge and expertise in the effective use of in-ear coaching. They all emphasised that the effectiveness of this method could not be divorced from the design and culture of the whole CPD programme. They were generous with the time they devoted to passing on experience to others in an area that is quite new in Europe. Below we have summarized the key findings.

Success factors

The school culture

The coachees and coaches were agreed that, web based video coaching is not a magic bullet and cannot be used effectively to develop teaching techniques unless the teachers work out techniques *for noticing their behaviour* in their own time. The intention of the coachee to learn is crucial to success. The leaders who were interviewed were sophisticated in their understanding of the need for pre-conditions that need to be in place in order to ensure that CPD supported by web-based video was to be effective. In fact, they covered with ease the levels of impact on the school culture and policy, on teaching practice and on the achievements of the pupils. Introducing 'in-ear' coaching into the CPD mix seemed to be clear evidence that significant levels of trust had already been established between the parties involved. All the coaches had developed significant resources to support their work which showed a deep understanding of the principles. They were also generous in sharing those resources with other colleagues across academy chains and schools.

In terms of **school culture** the advice for school leaders and the senior management team (SMT) was that web based CPD required a positive and encouraging approach to professional development and teacher improvement. The results should contribute to a Code of Practice rather than being used for performance management. This also related to establishing agreed norms around video coaching.

Senior management considerations

The whole cohort were using the IRIS Connect system where the teacher is in full control as they own the video they have filmed themselves or have permissioned the coach to film remotely. The system is designed so that the video uploads automatically into the teacher's individual user account on the platform, protected by a personal password, and only they can decide if, when and with whom they might share their videos". This avoids any suggestion of surveillance and puts the teacher in control of their own improvement process.

One coach who had tried to sign up all the staff in his first programme had experienced hostility from staff who were nervous of being observed and were afraid of the surveillance implications. He had had more success when he invited a small group of teachers to lead a slow change in the school culture by signing up voluntarily. That way he worked first with those who had confidence in this method and took to it naturally. They were then the advocates for change in CPD processes at their school.

Getting started

A general view was that a school engaging with web-based video in CPD should adapt a sample code of practice with their staff and also be prepared to change this code as more was learnt and circumstances changed. The ownership of the staff was considered to be paramount. Here is one example of a Code:

As a professional learning community we agree:

- The system is for personal reflection, collaboration, coaching and enquiry learning, and remains under the control of the individual teacher at all stages;
- The system will not be used for surveillance;
- No pressure will be placed on teachers to share their practice with other users of the system;
- All individual users, agree to use the system sensitively, developmentally and with due respect for colleagues;

- Individual users agree to use all of the systems security features and protocols to ensure privacy and security for teachers and pupils;
- Consideration will be given to teachers applying to use the system for different purposes, however, each new purpose will only be agreed if it can be shown to enhance teaching and learning and be aligned with our collective ethos of positive, trust-based collaboration;
- If new uses for the system are agreed, in future the adoption of the new approach will proceed on an opt-in basis and old videos will not be put to new use;
- All individual users have the responsibility to gain appropriate training in the use of the system;
- All individual users have the responsibility to ensure that relevant parties, learners, other teachers, visitors etc. know when the cameras are recording and the purpose of the recording;
- All individual users have the responsibility to protect their own data and the data of others, and not to disclose passwords.
- Some of the CPD methods used in a whole school programme were:
 - observations (both formal and informal);
 - team teaching;
 - discussions;
 - reflecting on practice.

One of the coaches also explained how he got started with coaching: *I knew what coaching was because before I joined a school I was doing executive coaching. So I ended up applying the executive coaching principles and ethos to this new video technology and seeing what worked and what didn't. Because there wasn't really a map for in-ear coaching that I could find, I researched and found a couple of people: Lee Canter model (different ethos, not the kind I would subscribe to) and Marcia Rock, which I would. At the beginning I didn't know what I needed to know.*

The specific skills that I have taught myself are what you say, how and why you say it and in what context. It's down to the timing and down to the context of the session. I am always open to new research of how this works. So my skillset is – and always will be – growing, evolving, changing.

The model I have evolved at the moment is:

- *pre-meeting;*
- *the technology bit;*
- *then a debrief.*

The specific skills used at each stage are guided by general principles of integrative executive coaching.

However all the coaches admitted that 'in-ear' coaching was likely to be stressful even for the most confident who had agreed to go through the process: *Some people have had negative experiences with video as a child – overzealous parents and the like – birthday parties and holidays etc. They come to the experience with the whole anxiety mindset, so it takes a lot of nurturing to show that this is different. Some people want a rational conversation about it which they must have. With video (and folks usually sense this rather than realise it's happening) people are presented with the possibility to see that they are not the person they want to be or thought they were. Letting people know that you empathise is important – I allow them to express how they feel about it rather than say I know how they feel. Some people I have worked with have used off-site conversation with their colleagues in an informal situation to alleviate their anxiety – provisions of coffee and chocolate seem to help.*

In advice for the coaches it was clear that participants needed to be keen to reflect on their practice and learn new techniques. It was seen to be as much the coachees responsibility as the coaches to engage in clear aims for the particular intervention and ensure constructive follow-up and feedback with coach. The exercise in addition would not bear fruit if the coachee did not build feedback into subsequent lessons and experiment with the results.

Less disruption was caused if the equipment was used regularly in the classroom and kept there whether it was in use or not. One piece of good advice was to avoid using the equipment where it might disturb pupils with learning difficulties.

Ensuring pupil benefit

Coaches and coachees agreed that pupils gained the most benefit if they understood that this activity is designed to improve teaching and learning. *I enjoyed a lightbulb moment when a year 8 student helped carry the kit into a classroom and another pupil asked what it was for. The year 8 student replied immediately before I had a chance, "This is a teaching tool that we use in school to make our teachers better".*

Disruptive forces

Several of the interviewees pointed out that in the field of innovation disruption can be an important dynamic for change. However, occasional disruption has been when some students were waving at the camera. The behaviour had been exacerbated by a teacher who had not followed the instructions to explain the system to the class. Once this was done the poor behaviour was short lived. Another coach advised, 'If you leave the camera in situ the kids get used to it. But a sensible school will not use the system with pupils for whom it will not work: for example, autistic students who do not want to be filmed.

The worst case, said an experienced coach, is children being forced to do the learning but for the wrong reasons. Unethical motivation is when an ill-informed head threatens that they can watch the children any time – Big Brother style (even though this is not possible to do with IRIS Connect cameras as the system is designed to be permission-based). Equally seriously another teacher described 'scare-mongering' amongst the staff when the use of the system was announced as well as fear. 'An older colleague of mine used to put a bag over the camera for fear of being filmed all the time'. Another teacher warned. *When web based video coaching was first introduced there was a 'failing teacher vibe' from the other staff. It is important that in the school culture we remove the stigma of implying that having the kit in the room implies that that particular teacher is failing.*

One coach said the first meeting with the staff is very important to overcome these emotions which are understandable. *The initial impact is essential and an insensitive announcement of the CPD programme can be met with a 'sea of negativity'. Launching to the whole staff body in one school was with an array of 'verbal assassinations' by the other staff. The instant reaction was reticence about being monitored - it took over one year to change the culture.*

Learning from this disruption, the academy chain team launched to a small number of selected staff the next time with a two-day programme including the cultural view of the system, how the team would be coached and how the system fitted into the school experience and the technical set-up. This worked much better. The success has been such that the programme will now be rolled out to three

more schools in the chain. In addition the original lead school is becoming a centre of excellence to train in coaching.

CONCLUSIONS

Web-based video coaching has its challenges because when human behaviour is observed by others there is the danger of disruption, fear and unethical surveillance. On the other hand, when used in the right conditions with the right attitude and sensitivity, it can have a transformative positive impact on teaching practice and enhance professional development programmes. The qualities that are mentioned in this research as being paramount in facilitating human interaction in the coaching sessions include trust, sensitivity, reflection, empathy and ownership, as well as humour, and chocolate. One can only admire those teachers who have the courage to invite others to critique their classroom practice and learn from their errors. The volume of sharing of video clips on the platform is witness to teachers' keenness to learn with and for each other. These teachers deserve rewards for enduring the positive stress that accompanies deep and transformational professional learning.

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EXPLORING METAMEMORY STRATEGIES WITH CHEMISTRY SYMBOLISTIC LANGUAGE IN PRE-UNIVERSITY EDUCATION

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ABSTRACT

This article presents the metamemory categories in teaching the simplistic language of chemistry for pre-university education. The research question is: How does teachers should encourage students to use a metacognitive strategy in order to improve understanding in chemistry? The research methodology deploys the interdisciplinary expertise and includes a pedagogical experiment carried out at the beginning of module. This experiment allows concluding that for metamemory is better to teach core concepts in a homogenous way.

INTRODUCTION

Metamemory is a type of metacognition. Thus, if metacognition is “knowing about knowing” (Metcalfe & Shimamura, 1994), the metamemory is “the introspective knowledge of one’s own memory capabilities (and strategies that can aid memory) and the processes involved in memory self-monitoring” (Pannu & Kaszniak, 2005). Metamemory is the starting point for selling the knowledge, understanding rules for better memory and decision making, the awareness that some things can be memorized more easily than others. Thus, as was mentioned in Geurthen, Catale and Meulermans (2016, p. 70) the metamemory comprises knowledge of strategies and general knowledge of memory functioning. Actual didactic question how to implement the metamemory strategies in pre-university education cannot be found in literature. However, there are some interested ideas. First, metamemory invokes “metacognitive knowledge” (Pintrich, 2002); “metacognitive ability” (Taber, 2016) and/or “metacognitive language” (Griffiths & Inceyay, 2016; Aydeniz & Dogan, 2016). Second, metamemory is investigated in science, technology, engineering and mathematics (Ostler, 2015; Eichler & Peeples, 2016; Kanematsu & Barry, 2016 etc.). How does teachers should encourage students to use a metacognitive strategy in order to improve understanding of core concepts in chemistry? The specific objective of the article is to investigate the symbolic language of chemistry.

UNDERSTANDING CORE CONCEPTS FOR METAMEMORY

Chemistry is the science of matter and its transformation. The primary “particle” in chemistry is considered the atom. But, let us consider the concept of “big idea”- predictions become more reliable when made from larger than from smaller samples, as was stated by Dierdorp, Bakker, van Maanen and Eijkelhof (2016). The examples of “big ideas” in chemistry are: “all matter is particulate in nature” (Niaz, 2016, p. 4), “what we see and perceive in the macroscopic world is a result of interactions at the atomic level” (Guidelines of American Chemical Society, 2012, p. 6) and others. But, what methods are better to understand big idea in didactics of chemistry? Theoretically, there are two ways: deductive and inductive. In deductive methods information is presented step-by-step in such a way that all students can understand easily. Questions from the audience must be answered helpfully, and the presentation of the information should, in general, be guided by the feedback the audience gives.

Each of the big ideas is composed from the core concepts. These concepts may be better connected through *concept mapping* techniques. But, if the *students have “gaps” in knowledge, the teacher should develop with students an optimal strategies for a functional metamemory*. Such as strategy will include both, deductive and inductive methods. For example, with deductive methods the teacher will explain core concepts and the students will practice understanding of the concepts. However, in special cases the teacher will present examples and the students will explore how these concepts work. Let us explain the role of core concepts for metamemory in pre-university chemistry based on the chemical nomenclature. The chemical nomenclature is a key tool for communication in the chemical science, for computer-based searching in the databases and for regulatory processes. Next, if the teacher starts with a video presentation about the IUPAC (International Union of Pure and Applied Chemistry) and, then, follows with a question about the interdependence between alphabet and the Periodic Table, then students will discover the best way to understand this issue. The guided questions provided by the teacher could help students to make better connections between the alphabet and the “chemical” nomenclature in order to develop a personal strategy for metamemory.

Hopefully, the chemical nomenclature is related on the symbolic language of chemistry. The writing form of the symbolic language of chemistry is based on own “chemical” alphabet, grammar,

orthographies, syntax and semantics. The specific features of this language are: a) the chemical element is distinguished by its atomic number; b) the chemical element has a unique symbol; c) the chemical element may be in a combined or in an un-combined state. Knowing the symbolistic language of chemistry is a proven fact of the effective metamemory. For example, if the teacher will ask students to write all-knowing chemical elements in one minute, the students use metamemory skills. These skills are not developed during one lesson. Students need more time and different learning environments. However, teachers may encourage students to develop metamemory skills in two ways:

- *superficial processing strategies*, based on mechanic memorisation of provided facts;
- *deeper processing strategies*, based on logical integration of core concepts during problem-solving or brainstorming activities.

One of the best educational strategies for deeper processing of the symbolistic language of chemistry may be considered *think-aloud metacognitive strategy*. As was noted by McKeown & Gentilucci (2007, pp.137-138), the think-aloud strategy represents a joint process of teachers and students working together to construct understandings of text as they interact with it. Teacher usually talks the class through her/his thinking as it is tackled a task, like a piece of text with new vocabulary and new orthographic rules. The students who are skilled top-down processors in their native language are forced to “short circuit” into a bottom up orientation when attempting to make meaning from second-language text. Students who are sophisticated readers are oriented neither from bottom-up nor from top-down.

Concept mapping may add a specific note on think-aloud strategy for a better metamemory. Thus, for example when students analyse the correspondence between names & symbols of the chemical elements the teacher uses the inductive method to allow discovering a common rule. For this, it is proposed to fill a two-column table. In the first column will be included names & symbols of the chemical elements, composed from one letter and in the second, from two letters. Deductive method, in this case, is better, to be integrated as a self-assessment computer based quiz.

METAMEMORY IN LEARNING METALS, NON-METALS AND ...

It is well-known that atoms may belong to metals, non-metals or metalloids. In nature 75% of the chemical elements are metals. What category of the teaching methods are better to use: teacher-centered or student-centered, deductive or/and inductive?

If the teacher will ask students to identify and to count metals and non-metals starting from IUPAC version of the Periodic Table, students will easily identify 16 elements situated in the upper side of the Periodic System that belongs to non-metals. Then, the teacher explains the specific features of halogens and inert gases, and finally the students will easily write and present the chemical names and the chemical symbols of H, C, N, O, P, S, Se, Hal and Inert Gases (figure 1).

Legend: Nonmetals (orange), Metals (blue), Metalloids (purple)

Periodic table showing elements color-coded by category: Nonmetals (orange), Metals (blue), and Metalloids (purple). The table includes element symbols, atomic numbers, and names. It also includes separate rows for Lanthanides and Actinides.

Figure 1. Metals, non-metals and metalloids

In a metamemory strategy is important to correctly encode the chemical names & symbols around the key concepts: “metals”, “non-metals” and “metalloids”. For this, in a digital learning environment teacher may use computer-based quizzes or/and didactic games. The other issue is the *chemical entity*, which can be monoatomic, diatomic, triatomic, etc. Thus, according to IUPAC (2015), the name of a homoatomic entity is formed by combining the chemical element name with the appropriate multiplicative prefix (table 1).

Table 1
Chemical names of various entities

Type of molecule	El	Formula	Chemical name (IUPAC)
Diatomic	El ₂	O ₂	Dioxygen
Triatomic	El ₃	O ₃	trioxigen (oxone)
		S ₃	trisulfur
		H ₃	trihydrogen
Pentaatomic	El ₅	P ₅	pentaphosphorous
Eightatomic	El ₈	S ₈	Octasulfur

Some more information for a metamemory strategy. The chemical substances are compound containing atoms of two or more chemical elements. Therefore, if the substances contain atoms of two elements these are *binary compounds*. The name of binary compounds combine the element name and, treating by convention, the element reacted first when following the arrow in the element sequence. The oxide is a binary compound, one element of each is oxygen. The name of the oxide is composed by the name of the chemical element, “oxide” and, only in case of 2 or more elements, the name of multiplicative prefixes, as is shown in table 2.

Table 2

The structure and the name of oxides

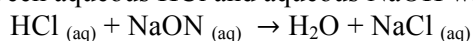
Number of O	Example	Chemical name
1 atom of O	CO	carbon oxide
2 atoms of O	CO ₂	carbon dioxide
3 atoms of O	SO ₃	sulfur trioxide
	Cl ₂ O ₃	Diclortrioxide
4 atoms of O	N ₂ O ₄	dinitrogen tetraoxid
	Cl ₂ O ₄	Diclorotetraoxid

Not all chemical compounds are substances. The chemical substances are products of the chemical reactions. In a chemical reactions molecules or compounds are reengaged to form one or more new substances. If the chemical reaction is produced in water, then water is named *solvent* and the molecule or compound - *solute*. The mixture of two solutes in a solvent form *a solution*. The chemical reaction can be written using the symbolic language of chemistry, which include special symbols. Thus, in writing the chemical processes is used: + for combination of two or more substances or single atom molecules, → to represent the boundary between reagents and reactants for mono directional reactions, ≠ is for non-reactions and ↔ for reversible reactions; but for products: ↑ - r gases that escape from solution and ↓ or (s) is for an insoluble product (i.e. for precipitates).

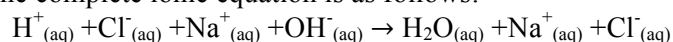
The chemical reactions in solutions can be written in three different forms:

- molecular;
- complete ionic;
- net ionic.

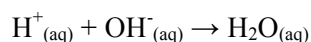
For example, the equation between aqueous HCl and aqueous NaOH will be written:



Ions are the charged particles. The particles have positive or negative charges, named as *cations* [Me]⁺ and *anions* [N-Me]⁻. The complete ionic equation is as follows:

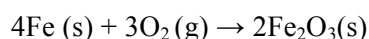


The teacher asks a student to compare the first and the second equation, to identify and to define the term “*spectator ions*”. After the successful answer the student can easier write the correct net ionic equation, as follows:



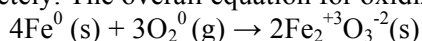
where *aq* is the symbol for aqueous solutions.

One of the interesting question in competence pedagogy rely on topology. In chemistry the significance of the topological questions is highlighted. Thus, it is well known that in aqueous solutions can occur the precipitation reactions, acid-base reactions, or/and the oxidation-reduction reactions. In case of the oxidation-reduction reactions some atoms transfer electrons to other atoms and some atoms gain the similar number of electrons. Therefore, the oxidized reaction of Fe composed two separate steps. The first step is the *oxidation reaction* (e.g. loss of electrons) and the second refers on *reduction reaction* because involves gain of electrons. The sum of two steps gives the *overall equation*, as follows:



Students should note that *in oxidation-reduction reactions atoms transfer electrons*, but *in ionic reactions atoms transfer protons*. In addition, the following mnemonic rule OILRIG: Oxidation Is Loss, Reduction Is Gain may be played. Furthermore, for metamemory it is important to observe that oxidation-reduction reactions have different mechanisms: combination, decomposition, combustion, or displacement. In this case for understanding the differences is better to use the method of opposites. Thus, in a combination reaction two or more substances combines to form a single product, but a decomposition reactions a single product is divided into two or more substances. A special type of redox equation refers on disproportionation reactions, in which an element in one oxidation state is simultaneously oxidized and reduced.

One of the most difficult task in teaching the oxidation-reduction reactions seems to be understanding the concept of *oxidation number*. According to definition, the oxidation number signifies the number of charges the atom would have in a molecule or in ionic compound if electrons were transferred completely. The overall equation for oxidized reaction of Fe can be written as follows:



For students is important to understand the common and the specific features of oxidation number (known also as the *oxidation state*) in order to correctly assign the oxidation numbers to elements in a chemical formula and to balance the chemical equations. However, if the teacher presents the general rule, *the oxidation number is a number assigned to atoms in molecules to show the general distribution of the electrons* and the specific characteristic: *the oxidation state don't actually have physical meaning*, the students will have a good starting point to apply these rules through writing. For example, he/she will observe that in the above mentioned reaction the the oxidation numbers have the value of 0, -2 or +3. The sum of the “transferred” electrons is zero. However, for an effective metamemory, it is important to “discover” the following rules:

1. in uncombined state, each atom has an oxidation number equal on zero;
2. all alkali metals have an oxidation number of +1, all alkaline earth metals have an oxidation number of +2, and aluminium is +3;
3. the oxidation number of oxygen in most compounds is -2 (except $\text{H}_2\text{O}_2^{-1}$ and $[\text{O}_2^{2-}]$);
4. the oxidation number of hydrogen is +1 (except $\text{Li}^{+1}\text{H}^{-1}$, $\text{Na}^{+1}\text{H}^{-1}$, $\text{Ca}^{+2}\text{H}_2^{-1}$);
5. fluorine has an oxidation number of -1 in all compounds; Hal has a positive oxidation number when combined with oxygen;
6. the sum of the oxidation number of neutral molecule is zero, but the sum of polyatomic ion is equal to the charge net of the ion;
7. oxidation number do not have to be integers; i.e. $[\text{O}_2]$ has the oxidation number equal to $\frac{1}{2}$.

Moreover, it is great to guide the students in the ways of discovering that metals have only positive oxidation numbers, but non-metals may have either positive or negative numbers; the lowest oxidation is for alkaline metals, but the highest positive oxidation numbers is for halogens.

GRAMMAR OF CHEMICAL COMPOUNDS

Grammar of the chemical compounds represents the set of structural rules governing the composition of chemical compounds in any language. Based on IUPAC nomenclature, the chemical grammar also refer to the study of rules for names of oxides, acids, salts etc. Thus, the name of oxides is composed by the name of metal/non-metals, charge and the term “oxide”. Therefore,

- BaO – barium(2+)oxide or barium oxide
- BaO₂ – barium(2+)dioxide(2–) or barium peroxide
- FeO – iron(2+) oxide or iron (II)oxide

- Fe_2O_3 – iron(3+) oxide or iron (III)oxide

From the second point of view, chemical grammar is complimented by semantics. Thus, in reaction with water oxides form basics or/and acids. The acid is a substance whose aqueous solutions have sour taste and react with metals, basic oxides, bases and salts to form new salts. Acids may include one, two or three ion of hydrogen. The ion with a negative charge is called anions. All anions have specific names:

- PO_4^{3-} - phosphate ion
- SO_4^{2-} sulphate ion
- NO_3^- - nitrate ion
- CO_3^{2-} carbonate ion
- NO_2^- - nitrite ion

The chemical grammar of salts is similar with the grammar of oxides and acids. Thus, CaCl_2 is for calcium dichloride; $\text{Ca}_3(\text{PO}_4)_2$ is for tricalciumbis(phosphate) and $\text{Ca}_2\text{P}_2\text{O}_7$ is for dicalcium diphosphate.

The same rules are for the names of hydrates, e.g. the hydrated ionic compounds and hydrated salts, according to IUPAC nomenclature, follows the rules of naming ionic binary compounds, as follows:

- $\text{MgSO}_4 \cdot \text{H}_2\text{O}$ - magnesium sulphate **monohydrate**
- $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ - barium chloride **dehydrate**
- $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ - copper sulphate **pentahydrate**
- $\text{MgSO}_4 \cdot 5\text{H}_2\text{O}$ - magnesium sulphate **pentahydrate**
- $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ - magnesium sulphate **heptahydrate**
- $\text{CaSO}_4 \cdot 0.5\text{H}_2\text{O}$ - calcium sulphate **hemihydrate**
- $\text{K}_2\text{CO}_3 \cdot 1.5\text{H}_2\text{O}$ - potassium carbonate **sesquihydrate**

Names of organic compounds depend on formula. Thus, for alkanes, whose formula is $\text{C}_n\text{H}_{2n+2}$, it is the name of radical plus - **ane** (table 3).

Table 3

General formula&chemical name of alkanes

General Formula	Chemical name
CH_4	methane
C_2H_6	ethane
C_3H_8	propane
C_4H_{10}	butane
C_5H_{12}	pentane
C_6H_{14}	hexane
C_7H_{16}	heptane
C_8H_{18}	octane
C_9H_{20}	nonane
$\text{C}_{10}\text{H}_{22}$	decane
$\text{C}_{11}\text{H}_{24}$	undecane
$\text{C}_{12}\text{H}_{26}$	dodecane
$\text{C}_{20}\text{H}_{42}$	icosane
$\text{C}_{21}\text{H}_{44}$	heneicosane
$\text{C}_{30}\text{H}_{62}$	triacontane
$\text{C}_{40}\text{H}_{82}$	tetracontane

ASSESSMENT THE METAMEMORY OF CHEMISTRY

There are multiple forms of assessment that are effective to evaluate the metamemory. In our case 100 students, divided in 6 groups, were asked to write in seven minutes all data related on symbolic language of chemistry. Then, it was evaluated how many data were correct. Thus, it was identified three students that wrote 80, 77 and 71. These data were analysed and represented in figure 2.

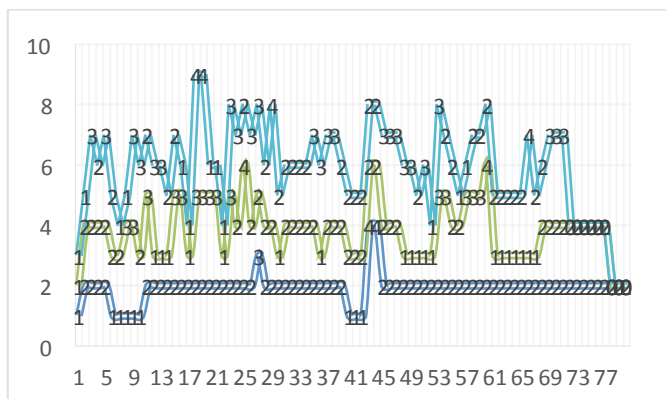


Figure 2: Data analysis of students with the best results

Results shows, that in chemistry, design of learning environment is important for the metamemory strategies development. However, it was observed that students with the best results wrote more homogenous data, which are easier to be recalling from the long term memory. These data contains names of elements and the names of chemical compounds and are more "connected" with the core concepts provided by the teacher than with the content of the school textbook.

CONCLUSION

The metamemory issues investigated in this article indicates that students remember better homogenous concepts. Even the priority of either deductive or inductive methods is not proved, it was hypothesized that metamemory concepts are available to investigation in educational technology aims to foster deeper learning.

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CONTEMPORARY CZECH AND SWEDISH ELEMENTARY SCHOOL – COMPARISON OF SELECTED ASPECTS OF EDUCATIONAL SYSTEMS

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ABSTRACT

Within last 70 years European educational systems have been changing due to the increasing emphasis on multiculturalism, tolerance and inclusion. While the Nordic nations have been the first in reflecting these principles, the Czech Republic has initiated their implementation mainly after the fall of communist regime in 90's. The contribution presents comparison of selected aspects of Swedish and Czech educational system reflecting contemporary curricular reforms, teacher's position and conditions of education with an emphasis on students with special educational needs. Positive evaluation of the latest curricular reforms has been detected in both countries. Some conceptual aspects, however, remained unchanged or were adversely affected. Qualitative data concerning Swedish educational system has been gathered as partial results within the survey focused on conditions of pre-vocational training in Swedish elementary schools. The data monitoring the Czech educational system has been obtained especially from Czech national surveys conducted by the Czech Ministry for Education, Youth and Sport.

THEORETICAL BACKGROUND

In the last sixty years there have been significant changes in the educational system of European countries directly linked to the principles of multiculturalism, tolerance and responsibility. Nordic cultures have been the first to implement these principles into their education systems. In response to these trends the idea of inclusive education has been implemented as well (European Agency for Special Needs and Inclusive Education 2013). The Czech educational system has been at that time mainly affected by communistic regime so the implementation of "Education for all" started after the Velvet revolution in early 90's.

The main aim of presented study is a description of selected aspects of educational systems in the Czech Republic and Sweden with an emphasis on education of students with special educational needs (SEN). Motivation for comparison arose from the general positive opinion in the Czech Republic about Swedish educational system, deeply rooted traditions of inclusive education and competent educators. However, positive impact of inclusive education is nowadays questioned in various studies (Goransson, K., Nilholm, C., Karlsson, K. 2010; Pančocha, K. Vaďurová, H. 2013).

Educational conditions in Sweden and Czech Republic

Equal educational opportunities have to be previously embodied in national curricula. Since both Sweden and Czech Republic are the member of international bodies (OECD, UNESCO, UN, EU) their educational polities are primarily affected by global international declarations, to which national laws are subordinated. Principles emphasized in international declarations are processed in national legislative norms. The key educational norm in Sweden is *The New Education Act – for knowledge, choice and security 2011* (Skollagen). Skollagen defines educational conditions either in traditional educational institutions (elementary and high schools) and also legislative framework for education from early childhood to adulthood (Eurypedia 2010, Skolverket 2011a).

Compulsory school attendance has been implemented in Sweden in 1842. Nowadays, the compulsory schooling in Sweden lasts for 9 years contained 3 levels. Primary school consisted of first three grades, Middle school until 6th grade and Junior Secondary school until the end of 9th grade. The core idea of Swedish education lies in "Education for all". Based on TALIS 2013 results, the average Swedish teacher has 16 years of teaching practice in classrooms with average number of 21 students (TALIS 2013a). In the Czech Republic the core legislation act is *Education Act – law no. 561/2004 on preschool, basic, secondary, tertiary professional and other education as amended*. The Education act defines fundamental educational conditions for each educational level, defines the rights and duties of legal persons involved in education, principles of education of students with special educational needs and gifted students (Education act 2005).

Compulsory Education has been implemented in the Czech during Habsburg Monarchy, reign of Maria Theresa in 1774. Present school attendance takes 9 years and it's divided into two level. Primary school consisted of five grades (till 5th grade), secondary school until 9th grade. Due to the political changes in 20th century and communistic regime educational system has been strictly segregated until early 90's. The idea of integration of students with SEN and inclusive education have been developed in last two decades. Based on Talis 2013 results, the average Czech teacher has 18 years of teacing practice in classrooms with an average number of 20 student (TALIS 2013b).

METHODOLOGY

The study presents comparison of selected aspects of educational systems in the Czech Republic and Sweden with an emphasis on education of students with special educational needs. The idea of comparison came within the results of qualitative study during my study stay in central and north Sweden in 2014 as a part of dissertation research. The aim of qualitative research was analysis of educational conditions of students with SEN, especially during transition from elementary to senior secondary (high) school. Partial research questions were focused on educational conditions on elementary and high schools, admission to high schools and impact of selected aspects of social environment (school, family, pedagogical staff) on secondary school choice. Research realized through structured interviews included 17 informants, mostly teaching staff of various educational institutions. Gathered data has been processed through coding (open, axial, selective). For a comprehensive view of the educational issues the results of contemporary quantitative and qualitative researches in the Czech Republic and Sweden published in the Web of Science database or by individual universities were used.

Tabel 1

Description of Research Sample

Informant	No.	Informant	No.
Special teacher in mainstream school	1	Special elementary school director	10
Primary school teacher	2	Special secondary school director	11
Junior secondary school teacher	3	Special teacher in special school	12
Junior secondary school teacher	4	Classroom teacher of students with SLD in mainstream school	13
Special school teacher	5	Teacher assistant for student with SLD	14
SPSM Counsellor 1	6	Student with SLD (SG)	15
SPSM Counsellor 2	7	Student with SLD (G)	16
Advisor for education of physically impaired students (SPSM)	8	Classroom teacher of student with SLD in grammar school	17
Advisor for secondary school choice	9		

COMPARISON OF SELECTED ASPECTS OF EDUCATIONAL SYSTEM IN THE CZECH REPUBLIC AND SWEDEN

The comparison of educational systems is aimed to implementation of inclusive education, contemporary curricula, students' achievements in PISA, conditions of transition between education levels and teacher's role in education.

Conditions of inclusive education

The effectivity of inclusive education is linked with various factors such as teacher's approach, development of inclusive school setting and redirection of school curricula (srov. Vítková, M. in Bartoňová, M., Vítková, M. et al 2013; Vítková, M. in Pančocha, K., Vítková, M et al. 2013). Compulsory schooling in Sweden is may be accomplished both in mainstream elementary schools and in schools for children with learning disabilities – *särskolor*. There are only 8 special schools in Sweden, 3 public and 5 regional schools mainly focused on students with multiple disability (severely disrupted speech development, visual impairment with associated difficulties and deafblind students). Within school year 2011/2012 only 501 pupils were educated in *särskolor* (Swedish Institute 2012; Skolverket 2014). For pupils with severe disabilities the special classes, *Träningskolor*, are designed. Due to deeply rooted inclusive principles nowadays majority of pupils in age between 6 – 15 years are educated in mainstream schools (Blossing, U., Imesen, G., Moos, L. 2014).

In the Czech Republic, for student with mild mental impairment and weakened cognitive functions the *Practical elementary schools* are designed, for student with severe disability and its combinations the *Special elementary schools* are intended. However, the legislative reforms are planned to be implemented in 2016 causing changes in understanding of special educational needs as well as redefinition of practical elementary schools which are planned to be closed. These massive changes are meant to support inclusive principles in education through greater involvement of students with borderline mental abilities and mild mental impairment in mainstream schools. The term “student with special educational needs” will be substituted by following: Student in need of supportive measures. Thus, the division of student into groups based on their health issues and difficulties (as it used nowadays) will be replaced by seriousness of their needs. Beside Sweden the integration of students with special educational needs into mainstream school or segregated education is more common in the Czech Republic. In the school year 2013/2014 from 827 654 pupils in elementary schools only 5,2% were integrated in mainsteram classrooms and 3,7% students with special needs were educated in special classes in mainstream schools (Hulík, V. 2014).

Curricula in the Czech Republic and Sweden

The latest curricula reform in Sweden has been implemented in 2011 defines common core content. Moreover new grading system for pupils in compulsory education has been presented. Previous grading system has been substituted by letter grading system however some teachers considered new grading system as confused and not enough incentive. For increasing quality of educational system Teacher certification has been implemented as well. The certification clearly shows, which types of school and subjects and which years the teacher is qualified to teach (Skolverket 2014a). Teacher participated in qualitative study considered curricula reform as beneficial however teacher certification could negatively effects quality of education in northern areas where is a lack of properly trained teachers.

The curricula for preschool, elementary and leisure time education in Sweden is defined by *Curriculum for the compulsory school, preschool class and recreation centre 2011*. It specifies values and tasks of educational institutions, main objectives and syllabus of twenty courses accompanied by knowledge requirements in the various level of education (Skolverket 2011b). Goals and aims of *särskolor* and *träningskolor* are defined in *Curriculum for compulsory education for pupils with learning disabilities* (Skolverket 2014b).

The latest curricula reform in the Czech Republic has been introduced in 2007 by *Framework Education Programme for Compulsory Education* (MEYS 2007). *Framework Education Programme* represents new education strategy, which emphasises key competencies, their interconnectedness with the educational content and application of the acquired knowledge and skills in real life. The MEYS survey in the area of teachers' evaluation of new curricula proves, that its implementation allowed teachers to apply greater freedom in preparing and implementing lessons that thrive to develop skills and knowledge (MEYS 2009a). The curricula for Practical elementary school is defined in appendix of Framework Education programme for Compulsory Education. However, in 2016 the changes of structure of education system as well as abrogation of curricula appendix are planned. For Special elementary school the educational content is defined in *Framework Education Programme for Special schools*.

Supportive measures for students with special educational needs in mainstream schools

For student with special educational need in Sweden supportive measures are provided by counsellors in school. Those are special educators who support student individually or in group remediation. Direct support is provided by teacher assistants in classrooms. Career counselling is provided by Study counsellor. Overall provision is provided by National resource centres (4 in Sweden) and Special Educational needs Coordinators who manage the provision of support (SPSM 2015).

In the Czech Republic the support is provided by counselling organizations and counsellors in school. Pedagogical-psychological centre (89 centres in the Czech Republic) provides provision mainly for student with learning disabilities or in risk of school failure. Beside comprehensive diagnostics the career counselling, individual support and remediation of learning disabilities are provided. Special Educational centres (111 in the Czech Republic) support students with various types of disabilities. Despite all previously mentioned activities which are provided by Pedagogical Psychological centres, Special Education centres offer also specialized measures and activities focused on disrupted functions according to the type of disability. Centres usually support students from the age of 3 until 18 years. In every school, Educational consultant and School preventist must be employed. Counselling team in school should consist also of school special educator and school psychologist, however, it's not obligatory. Within the legislation changes, however, the position of school special educator will become mandatory. In classrooms, direct support may be provided by teacher assistants as well. Every teacher assistant has to graduate assistant teacher certified course. The requirements for the position of teachers assistant varies by complexity of activities (Euro Guidance 2014).

Students' achievements in international testing

The quality of education should have been connected with adequate governmental support. With sufficient support from competent pedagogical staff and appropriate educational conditions the quality of education should have been reflected by students' achievements. For this reason some of OECD figures concerning governmental expenditures and other factors have been compared.

In both countries, governmental expenditures to education has increased in last decade, nevertheless, in 2011 in Sweden the investment into education expressed as a percentage of GDP were 6,33 % which is one and half percent more than in the Czech (4,33 % of GDP). Annual expenditures per students in Sweden were 9 524 USD compare to 5 831 USD in the Czech in 2011. There have been also detected differences in average teachers' salaries. Though in both countries the average teacher salary is below OECD average, there is a gap between salaries of Czech primary and secondary school teachers compare to salaries of Swedish teachers (app. 20 700 USD in Czech compare to app. 35 900

USD in Sweden on both primary and secondary school levels). Controversial are the requirements for teacher's professional development which is obligatory only in the Czech, not in Sweden (OECD 2014). Although, in Sweden governmental investments into education are higher than in the Czech, student's achievements in international testing are lower.

Table 2
PISA Reading Achievements

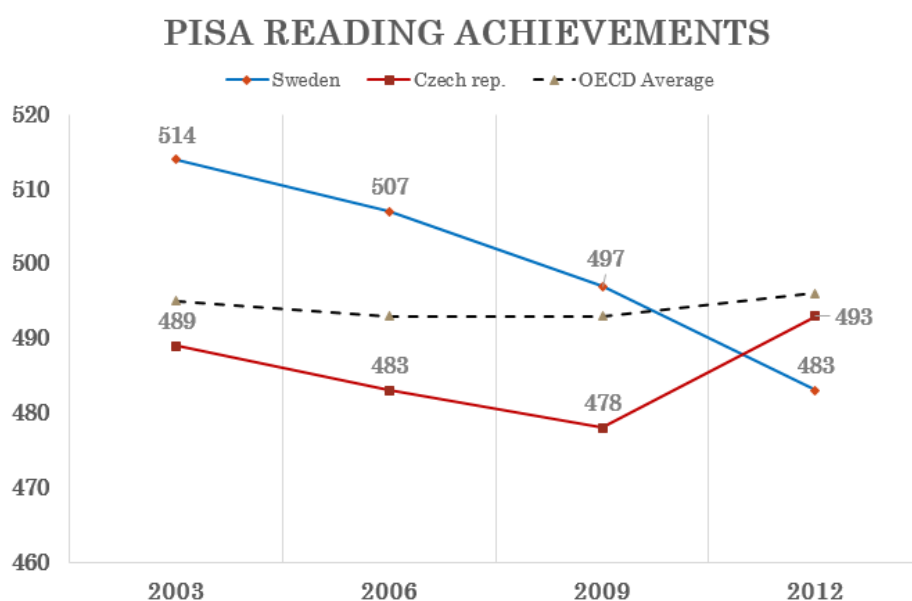


Table 3
PISA Mathematic achievements

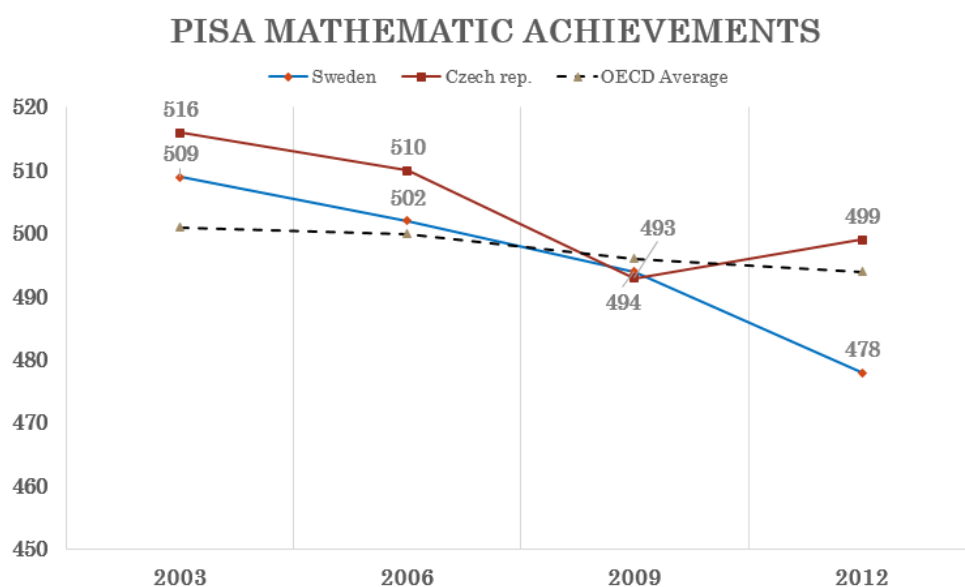
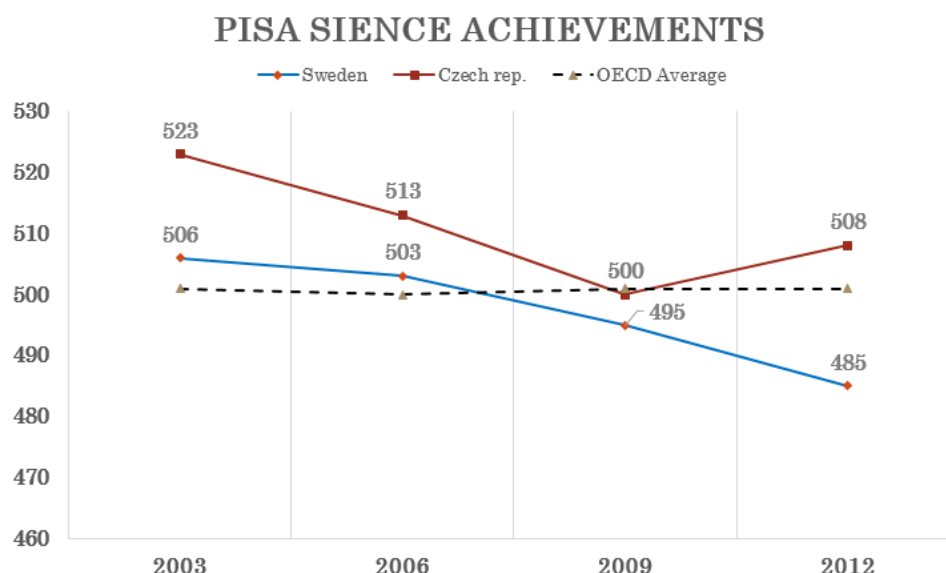


Table 4
PISA Science achievements



As all charts shows, the achievements of Swedish students have declining trends. In the last PISA testing the result of Swedish students have been under the OECD average while the results of Czech students has increasing tendency.

Prevocational preparation and transition to senior secondary schools in Sweden and in the Czech Republic

Professions and choice of educational path is cross-curricula theme in both countries. A key position in the process of pre-vocational training and professional orientation of students with SEN in Swedish mainstream schools holds the *study counsellor*. They support the students from the 8th grade onwards. Frequently (as the qualitative investigation showed), the advisor has to put the student's vision into perspective. Prevocational training is stressed from 8th grade in which every student has a consultations with study counsellors. In the 9th grade the visits and practice in various study field may be arranged. The practice lasts for 1 – 10 weeks and provides student information about requirements and common student duties.

Advices within secondary school choice for students in Czech schools are provided by Educational consultants in schools. For student with special educational needs the career counselling ensure Pedagogical Psychological Centres (for individuals with learning disabilities and in risk of school failure) and Special Educational Centres (for students with health disadvantage and disability). As in Sweden prevocational training in the Czech is accented from 8th grade however only short visits to secondary schools are managed. Direct support with secondary school choice may be provided by class teachers of teacher assistants in both countries. Usually, first decisions about school choice are affected by peers. Based on qualitative research results, the secondary school choice of Swedish student is mainly affected by mother's opinion. For an admission to secondary school apart from successful completion of compulsory schooling the Swedish student should also get a certain grading in selected subjects depending on the field of study. If the student does not obtain the required assessments in the subjects which are crucial for the chosen field, he or she can be admitted conditionally. However, the required evaluation has to be completed in the next year.

In the Czech Republic the secondary school admission is usually linked with certain testing in Czech language, Math and other courses depending on study field. Admission may be in some cases based on study average lower than predetermined value.

The teachers and pedagogical staff in Swedish and Czech schools

As some of contemporary studies presented, the traditional teacher's role is changing, in Sweden as well in the Czech. Pearsson (2012) stressed, the traditional authoritative teacher role is lost.

„Teacher's role as the authoritative adult with a store of knowledge to share is lost“ Pearsson (2012)

Similarly, the quantitative research study of Czech Ministry of Education (MEYS 2009) has shown some changes in subjective perceiving of teacher's position not from the view of students but their parents. Effectivity of inclusive education is connected with sufficient provision in school providing by various pedagogical staff. One of those who directly support students with SEN are teacher assistants. Although, in Sweden there aren't settled any requirements for educational level for teacher assistant so as qualitative research revealed, their insufficient number and lack of competencies may affect the effectivity of inclusive education. In contrast, in the Czech Republic every teacher assistant has to graduate at least the assistant teacher certified course. The requirements for the position of teachers assistant varies by complexity of activities.

School and society in Sweden and in the Czech Republic

Adequate disciplinary measures are often discussed topic in both countries. Changes in perception of teacher's role may also affects the teacher's authority. In Sweden there are no such disciplinary measures as a note for subordination as in the Czech. In case of student's misbehaviour, school may suggest the exclusion of student from school (cultural) activities or due to serious violations of behaviour standards in school the suggestion for change of educational institution.

On the other hands in the Czech Republic, the note for subordination and grading are most common tools for punishing misbehaviour. Grading system in the Czech, based on traditional number scale (1-5), is used from 1st grade and it's used also for evaluation of behaviour. Although, the effectivity of these disciplinary measures may be questioned. Society attitudes towards education reflects nowadays the teacher's role as well. As some of researches suggest, the effectivity of inclusive education in Sweden is questioned and stipulates exclusion of those who have been already included (Berganu, G. 2010)

„Swedish state policy is not as inclusive as is often stated. Celebration of difference seems to be hard to achieve“. Göransson, Nilholm, Karlsson (2011)

Although, in the Czech Republic, the integration of students with special educational needs is more common, contemporary legislation changes are meant to support idea and implementation of inclusive education. Unfortunately, the society attitude is not consistent. Recent researches reflect diverse attitudes towards pupils with different types of disabilities.

„The most accepted group from inclusive education are students with physical impairment. The least accepted are students with mental impairment“. Pančocha, Vaďurová (2013)

CONCLUSION

Within comparative study of contemporary Czech and Swedish elementary schools some common features have been detected. In both countries the main curricula consists of common core content in which profession is adopted as a cross curricula subject. Provisions for students with special educational needs are provided directly in mainstream schools by class teachers, teachers assistant and other counsellors whose help and support is necessary for sufficient education and equal opportunities. As some of included researches shown, there have been detected changes in traditional teacher's role. Both countries nowadays face different challenges. In Sweden the effectivity of inclusive education is questioned as well as gradual changes in teacher's authority and sufficient disciplinary measures. Newly presented grading system has been within qualitative research study considered as confusing and not enough empowering. Due to low requirements on teacher assistants in some case these positions are held by unqualified staff.

In the Czech Republic has been during 2015 taken legislation measures for support inclusive education in mainstream schools. However, there are still not enough counsellors and teacher assistants in school whose support of student with special educational needs is crucial for successful "Education for all" (UPOL 2015). Still there can be detected less positive society attitude towards common education of mainstream students with mentally disabled students. Despite all difficulties, in both countries the readiness and willingness of pedagogical staff for providing quality education is a permanent feature of educational systems.

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EXPLORING TEACHERS' BELIEFS FOR FORMATIVE ASSESSMENT IN MATHEMATICS TEACHING AND LEARNING IN CYPRUS AND ITALY⁵⁵

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ABSTRACT

This contribution concerns the description of some first results of a European research program (FAMT&L) about the use of formative assessment (F.A) in the teaching and learning of mathematics. The results are based on data collected through a questionnaire for tracing lower secondary teachers' beliefs regarding the purpose, the use and the results of F.A in mathematics teaching and learning. The discussion of results concerns 65 Cypriot and 39 Italian teachers. The relations between the teachers' beliefs for F.A reveal factors that influence the teachers' beliefs about the application of F.A in mathematics teaching and learning. Similarities and differences in the teachers' beliefs between the two countries are also discussed.

⁵⁵ The paper has been designed and shared in all its parts by all the four authors. In particular, §1 is by Ira Vannini, §2 is by Stefania Lovece, §3, §4 and §5 by Paraskevi Michael-Chrysanthou and Athanasios Gagatsis.

INTRODUCTION

This contribution is part of the research activities of the LLP Comenius Project FAMT & L⁵⁶, (Formative assessment for teaching and learning mathematics) which aims to promote the use of formative assessment as an element that can improve mathematics education, as it is evident for many years that the levels of success in mathematics are limited. In the theoretical orientation phase of the research project, the partner members have done a careful reflection on the training of teachers in service, based especially on some of the latest research focused on methods of training courses that use a collaborative approach in the medium-long term (Palincsar, Magnusson, Marano, Ford & Brown, 1998; Vannini, 2012). In particular, methodologies of reflective perspective that have a positive effect on teachers' ability for becoming aware of their beliefs (Cherubini, 2002) and for conducting a critical analysis of teaching practices that can be assessed as effective or ineffective (Vannini, 2012) have been adopted. To promote what is called "reflexive competence" of teachers, it was necessary to start the project by the recognition of the beliefs and daily teaching practices, according to which we can identify the training needs to be answered through the creation of training models and tools, which should promote critical reflection and the subsequent adoption of the most effective teaching methods.

Thus, the study of teachers' conceptions of assessment is important because evidence exists that teachers' conceptions of teaching, learning, and curricula influence strongly how they teach and what students learn or achieve (Thompson, 1992). Furthermore, teachers have also a remarkable influence on students' construction of their beliefs through the ways in which they present the subject, the kinds of task they set, the assessment methods, procedures and criteria (Pehkonen, 1998). In relation to these, the main objectives of this study consist in realizing a survey on the mathematics teachers' beliefs and practices concerning formative assessment in classroom. The results of this study will be used for developing a model of training courses for secondary school mathematics teachers, for improving their skills in using formative assessment. In this contribution the discussion will be developed according to the following questions:

1. What are the teachers' beliefs on F.A in mathematics in Cyprus and Italy?
2. What are the factors influencing the teachers' beliefs on F.A in mathematics?
3. How do factors influencing the teachers' beliefs on F.A in mathematics differentiate between Cyprus and Italy?

THEORETICAL FRAMEWORK

Before describing the results of the survey, it is useful to mention the reflection on theoretical and methodological aspects that guide the project and serve as a frame of reference for all research activities. The concept of assessment on which we will meet in this paper is related to the learning assessment and, in particular, its ability to be able to state monitoring and constant regulation of learning paths, in the view of achieving the curriculum objectives (Vannini, 2009, pp. 195-196). Specifically, the evaluation is useful to teachers, because it accompanies all phases of the design and operational process of teaching. Formative evaluation of learning should be an essential part in all phases of the process of teaching and learning. Research shows that assessment must be formed for learning and not of learning, as children have a central role in this process (Harlen, 2000, p.112). Van

⁵⁶ [538971-LLP-1-2013-1-IT-COMENIUS-CMP

De Walle, Karp and Bay-Williams (2013) define formative assessment as an along the way evaluation that monitors who is learning and who is not and helps teachers to form the next lesson. Wiliam (2007) claims also that “to be formative, assessment must include a recipe for future action” (p.41). As formative evaluation aims to provide feedback and information to the teacher, who can then steps to promote learning of his students, it is also characterized by the fact that it does not implement the explication of an opinion or a vote, but it is rather characterized by a significant valorisation of errors and considered as a resource for improving the quality of the course in progress (Giovannini, 1994; 1995; Gagatsis & Christou, 1997; Gagatsis & Kyriakides, 2000; Zan, 2007). However, nowadays formative assessment is a subject of interest and considered as extremely complex and never fully acquired in the practice of school teachers (Vannini, 2009). In fact, the assessment carried out by the teacher has an impact at different levels: on the quality of teaching, the school and the whole educational system. This requires that teachers have a specific scientific professional expertise and reliable procedures and processes to manage such a systematic evaluation (Vannini, 2009). Thus, there is a need for reformation of traditional ways of assessment in education and teaching (Qassim, 2008).

Early studies on the evaluation have allowed us to establish the characteristics that assessment must have to be defined as formative. Since the late nineties some studies have permitted to collect empirical evidence that could prove, for example, that the systematic use of the ongoing evaluation of the progress of students generate significant increases in their final performance, especially and most significantly for the weakest ones. It was also shown that the quality of feedback, the active participation of students in the evaluation process, some aspects of verbal interaction in the classroom, the effects of assessment on self-esteem and motivation, are crucial for the effectiveness of formative assessment to promote learning (Scallan 1985; Black & William, 1998). So, the student takes on an important active and responsible role in the evaluation process and, through the sharing of learning objectives with the teacher and using feedback, he can act to adopt the most effective strategies for achieving objectives and to exercise their metacognitive skills and self-assessment in the process and the outcomes of their learning (Scalera, 2009).

In relation to the above, Nicol and Macfarlane-Dick (2004) argued that formative assessment should be an integral part of teaching and learning in higher education. We agree with this opinion, because of the fact that formative assessment is useful in the learning process; it explains how well the process progresses and it guides students what they wish to learn. In addition, we agree with the aforementioned opinion, emphasizing that the use of formative assessment in teaching can have many benefits on one hand on improving the students' mathematical learning but also the development of positive beliefs towards the learning of mathematics, and on the other hand in helping the teachers in doing proper adjustments according to their students' needs. Summarizing, a definition for formative assessment that combines all the points stressed previously is the one provided by Popham (2008, p.5), who characterizes formative assessment as “a process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes”.

METHODOLOGY

The participants were 65 Cypriot and 39 Italian lower secondary mathematics teachers. A questionnaire for examining the teachers' beliefs regarding the purpose and use of formative assessment in mathematics was developed, based on an extensive literature review in mathematics education in relation to F.A and teachers' educational beliefs (Michael – Chrysanthou, Gagatsis &

Vannini, 2014). The questionnaire includes 44 statements for which teachers had to express their opinion on a 4-point Likert scale (1=strongly disagree, 4=strongly agree). These statements reflected not only beliefs about F.A, but were also about particular assessment practices used by the teachers. This structure allows not only tracing the teachers' beliefs for F.A, but also to examine the relations between particular practices and the formation of positive or negative beliefs. The 44 statements were grouped according to four dimensions of F.A, based on the results of our literature review. In fact, there were 10 statements about the purpose of F.A, 8 statements about the use of F.A techniques, 6 statements regarding the use of F.A results and 20 statements about the role of each stakeholder (students, teachers, parents) in the F.A process.

For tracing the relations between these different categories of beliefs, the implicative statistical analysis (Gras, Régnier, Marinica & Guillet, 2013) was performed using the software CHIC (Classification Hiérarchique, Implicative et Cohésitive) (Bodin, Coutourier, & Gras, 2000). These methods of analysis determine the implicative relations of the variables (Gras, Suzuki, Guillet & Spagnolo, 2008). This analysis actually aims at giving a statistical meaning to expressions like: "if we observe variable A in a subject, then in general we observe variable B in the same subject". Thus, the underlying principle of the implicative analysis is based on the quasi-implication: "if A is true, then B is more or less true". An implicative diagram represents graphically the network of the quasi-implicative relations among the variables of the set V. In this study the implicative diagrams contain implicative relations, indicating whether the existence of a particular belief implies an effect on the creation of another belief.

RESULTS

Implicative relations for the Italian teachers' beliefs

The following implicative diagram (Figure 1) indicates the Italian teachers' beliefs about F.A. in this diagram we can distinguish three groups of implications. The first implicative chain in the first group of implications contains beliefs mainly about the F.A techniques. The first relation is observed between three variables representing the factors that affect teachers' expectations about their students' future assessment. In particular, students' *current scores* (T19b), their *previous certificates* (T19a) and the students' *personal behaviors* (T19d) are among these factors. Important relations are noticed between the variables in the second chain of this group. These relations represent the teachers' beliefs about the effectiveness of formative assessment. More specifically, *formative assessment is most effective when students have a clear idea of what the teachers expect of them* (T13) is related to the belief that *providing clear expectations enables students to set realistic, attainable goals* (T15). The statement T15 is also related to the belief that *teachers can improve the clarity of student learning targets by providing examples of both weak and stellar mathematical work* (T14). All the above opinions about the students' improvement through clear goals influence teachers' belief about the purpose of formative assessment. In this chain, the belief that *the purpose of formative assessment is to help students improve themselves in mathematics* (P7) is also involved. This shows that the purpose of F.A is related to the students' improvement in mathematics.

The second implicative group contains statements mainly about formative assessment techniques. This group can be considered as divided in two sub-groups of variables. The first sub-group contains seven variables regarding the formative assessment techniques. Actually, teachers' belief about their *skill to apply students' peer-assessment* (T21i) is related with their belief to apply *students' self-assessment*

(T21h) and *classroom observation* (T21b). The statement T21i is also related with the teachers' belief that the *personal motivation to learn* (T19e) and *the interest in classroom assignments* (T19f) are considered as factors that form their expectations about their students' future assessment. Another relation is observed between the statement T19f and the statement T19g, which supports the *interest in homework assignments* as another factor which forms teachers' expectations about their students' future assessment. Therefore, teachers' beliefs about their skills to apply formative assessment techniques influence their beliefs about the factors which form their expectations about their students' future assessment.

The second sub-group includes eight variables. At a first glance, the most important relation emerges between different techniques of formative assessment. In particular, teachers' beliefs about their *skill to apply students' self-assessment* (T21h) is related with their *skill to apply individual activities* (T21d). Teachers' ability to apply students' self-assessment is also related with their beliefs about the following statements: *some characteristics of assessment are embodied in a number of processes like providing feedback that helps students to identify how to improve in mathematics* (T12b), *both the teacher and the students reviewing and reflecting on their performance and progress* (T12c) and *students learning self-assessment techniques to discover mathematical abilities they need to further work on* (T12d). The same statement (T21h) is associated with the teachers' belief that *performance test for each pupil* (T11e) is an appropriate technique to be used in the teaching of mathematics and the belief that *formative assessment is most effective when teachers encourage student's self-assessment* (T17). The statement T11e and T17 are related with the teachers' belief that *formative assessment is most effective when they offer feedback about the students' progress toward meeting particular learning targets* (T16).

The third implicative group is formed by four distinct implicative chains. The first one shows that teachers' beliefs about the formative assessment results influence their beliefs about the purpose of formative assessment. In particular teachers' belief that *the results' of formative assessment should be announced to the whole class* (R2a) is related to their opinion that *providing feedback to a student can be achieved by providing a verbal statement about the quality of work itself (the reasons for the judgment and ways in which some of the shortcomings could be remedied)* (R1a). These statements influence teachers' beliefs that *formative assessment identifies the students' strong and weak abilities in mathematics* (P2). Therefore, feedback should be focused on students' strengths and weaknesses in mathematics.

The next implicative relation is observed between the statement which supports that *errors are due to previous correct knowledge which is not appropriate in a new situation* (R16) and the belief that *the different assessment methods aim to assess the students' ability to organize mathematical ideas altogether to form a complete image that has meaning (synthesis)* (P6d). This relation shows that teachers' beliefs about the results of formative assessment affect their opinions about the purpose of formative assessment.

The third implicative chain includes three variables related with formative assessment results. This chain starts with the belief that *formative assessment works best when the teacher avoids grading practices and comments that show students how their performance compares to other students* (R3). This statement related with the belief that *the results' of formative assessment should be discussed between the pupil and the teacher* (R2c) and with the belief that *formative assessment during instruction provides feedback that help students correct their errors* (R6.) Thus, the assessment

without grades aims to a discussion between the student and the teacher, for providing formative feedback.

A last implicative chain is noticed between two assessment techniques: *classroom discussion* (T21a) and *participation in classroom activities* (T19c). In particular, teachers' belief about their skill to apply classroom discussion is related to their belief that the participation in classroom activities is a factor which forms their expectations about their students' future assessment.

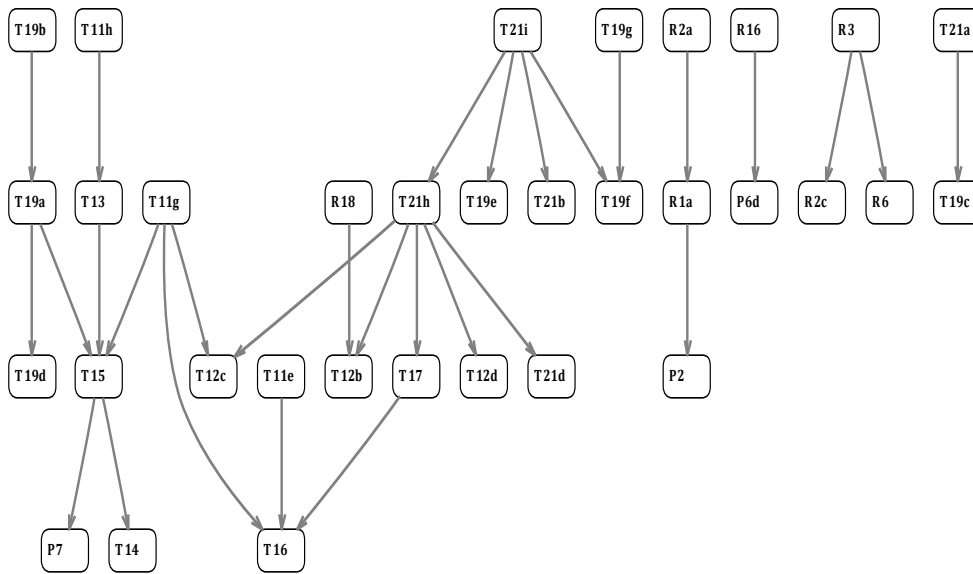


Figure 1. Implicative diagram for the Italian teachers' beliefs

Implicative relations for the Cypriot teachers' beliefs

In the implicative diagram of the Cypriot teachers' beliefs (Figure 2) we can distinguish five groups of implications. A first implicative chain is formed by three variables. At the top of this chain there is the teachers' belief that *students can develop a deeper understanding of their learning when they are given opportunities to discuss the learning process with their teacher and their peers* (S3). This belief is related to the belief that *while teachers provide feedback, they can encourage self-assessment by asking students questions that help them to focus on self-monitoring* (S4). So this relation reveals the important relations between teachers' and peer feedback, which also develop the students' abilities for assessing themselves. The second relation in this chain is between the statement S3 and a belief about the source of errors. In fact this belief express that *errors are associated with student's attitude towards mathematics* (R11). Thus, this relation indicates that by providing feedback from teachers', but also peer feedback, we can have an influence on the students' beliefs about mathematics.

The second implicative chain contains beliefs about the results of formative assessment and particularly about the dimension of providing feedback to students. The chain starts with the belief that *formative assessment works best when the teacher avoids grading practices and comments that show students how their performance compares to other students* (R3). This statement relates with the belief that *formative assessment during instruction helps the teachers identify and implement instructional correctives* (R7). Thus, this relation relates the use of formative assessment as a mean for modifying

learning with the use of qualitative feedback. The next relation is also about the use of feedback in the same sense, as teachers express that *formative assessment during instruction provides feedback that help students correct their errors* (R6). The influence of feedback is not only revealed to be on modifying teaching and improving the students' knowledge, but also on the students' affective domain, as *feedback about the students' progress in learning mathematics gives hope and positive expectations for themselves* (R5). Therefore, this implicative chain highlights the importance of feedback for formative assessment, which is related to positive influence on the teaching process, but also on the students' cognitive and affective domain.

The third implicative chain contains statements also mainly about feedback. This chain can be considered as divided in three parts. The first part of this chain reveals some important aspects about the purpose and the characteristics of good feedback, whereas the second part highlights some techniques for giving feedback. Regarding the first chain, it starts with the belief about using errors for providing feedback (R1b: *Providing feedback to a student can be achieved by showing students' specific misunderstandings or errors that frequently occur in a particular mathematical content area or a skill set*). Using errors is related to the positive influence on the students' affective domain, as mentioned in the statement R5, but also to the belief that *errors are associated with the way the student studies and prepares himself/herself* (R10). Feedback through *showing students how they can adjust their approach to the task* (R1c) is also related to statement R1b. Thus, we can see that when teachers use their students' errors for providing them feedback, they also consider that this can help the students study and prepare themselves in a more effective way for improving their understanding and eliminating their errors.

The statement R1b is also related to statement T20e, revealing a limitation for teachers for providing feedback based on their students' errors. In fact, the teacher express that *the insufficient teaching time* is a factor that affect your ability to apply different assessment methods, feedback in this case. The influence of time to the use of feedback is also evident by a next relation between the statements R1b and R4, according to which *the quality of feedback increases when providing feedback right after a submission* (R4). A last relation found in the first part of this implicative chain is between the use formative use of errors for feedback and students' self-assessment (T12d). Thus, feedback based on the students' errors helps them develop their self-assessment *techniques to discover mathematical abilities they need to further work on*.

This part of the implicative chain ends us with the implication between statements expressing the teachers' beliefs about the purpose of assessment in mathematics. According to these statements the different assessment methods aim to assess the students' *comprehension and understanding (the ability to perceive mathematical meaning and to transform mathematical ideas from one form to another – P6b)*, *Analysis (the ability to analyze information and to arrive to mathematical conclusions – P6c)* and *Synthesis (the ability to organize mathematical ideas altogether to form a complete image that has meaning – P6d)*.

The second part of this chain reveals the importance of basing feedback on predefined criteria. According to the teachers beliefs *formative assessment is more effective when teachers offer feedback about the students' progress toward meeting particular learning targets* (T16) and this leads to the students' improvement, as it is related to the statements that express that *formative assessment provides feedback that strengthens motivation and leads to improvement in mathematical knowledge and abilities* (T18d) and *helps students to identify how to improve in mathematics* (T12b). This last statement is also related to another four statements, which reveal the relation of providing feedback for

improving students in mathematics with other important aspects of formative assessment, such as self-assessment and sharing learning goals. Actually, statement T12b is related to the belief that *formative assessment is more effective when teachers encourage student's self-assessment* (T17), as a processes embodied in formative assessment is *both the teacher and the students reviewing and reflecting on their performance and progress* (T12c). Another related process is *sharing learning mathematical goals with students* (T12a). Feedback in relation to particular goals is related to the belief that *formative assessment should assess the students' ability to apply mathematics in unfamiliar everyday situations* (P5). Thus, the goals of mathematics learning should be related to everyday life and the ability to apply mathematics in real life should be also assessed.

The fourth implicative chain is formed by implications between different assessment techniques for which teachers were asked to define their importance. These implications are actually between the use of *multiple choice tasks* (T11f), *sentence completion tasks* (T11h), *matching questions* (T11g), *performance test for each pupil* (T11e) and *oral questions and answers* (T11b). In fact, the use of *oral questions and answers* (T11b) is related to the statement that *if a teacher does not commit itself in identifying the weakness and strengths of the students since the beginning of the school year, then he/she cannot certainly fill in the students' gaps* (T7). Therefore, oral questioning appears as a technique for diagnostic assessment of the students at the beginning of the school years. It is interesting that these techniques, which are mainly related to tests, are discriminated from other forms of assessment, such as self-assessment or observation. In fact the use of *structured observation* (T11c) is found in another relation outside the previous implicative chain, in which it is related to the statement T18a: *High-quality formative assessment takes many forms, but it always emphasizes to the quality rather than the quantity of student mathematical work*. Thus, teachers relate the use of structured observation as a mean to assess the students' quality of work.

A fifth implicative chain is distinguished, which is mainly formed by relations between the teachers' skills in using different assessment techniques. These relations reveal that when the teacher feel skilled in *assessing students' group activities* (T21e) they also fell skilled in *assessing students' presentation skills* (T21g), *students' individual activities* (T21d) and also in using *classroom observation* (T21b). Teachers express that they feel able to assess through classroom observation also when they fell skilled in assessing through *classroom discussions* (T21a). Furthermore the teachers' belief that *the results' of formative assessment should be discussed between the pupil and the teacher* (R2c) is related to assessment through *classroom observation* (T21b).

A last relation is found at the end of this implicative diagram, between two statements expressing the teachers' beliefs about the source of students' errors. Actually when teachers believe that *errors are due to the limited capabilities of students* (R14) they also believe that *errors are due to wrong or incomplete knowledge about a concept taught previously* (R15). It is thus obvious that these teachers manly attribute errors to the factors related to the students, such as their capacities in learning.

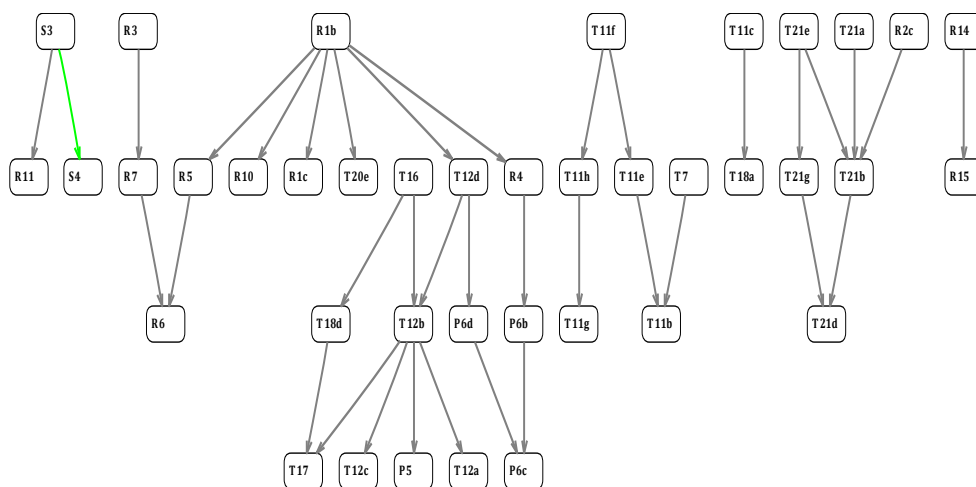


Figure 2. Implicative diagram for the Cypriot teachers' beliefs

CONCLUSIONS AND DISCUSSION

The examination of mathematics teachers' beliefs and practices concerning formative assessment in classroom was among the main emphasis of the study described above. As mentioned, the design of a teachers' training model for developing their skills in using formative assessment will be based on these results. The analysis of the implicative relations between the different teachers' beliefs in Italy and Cyprus revealed factors that seem to influence the formation of these beliefs. These factors are mostly common between the two countries, but differentiations are also traced.

Actually, the Italian teachers' beliefs about the purpose of formative assessment are formed in relation to their beliefs about the way formative assessment results should be used and about the role of setting clear goals in students' improvement. In fact, Nicol and Macfarlane-Dick (2004) stress that formative assessment provides a framework for sharing educational objectives with students and for charting their progress. Furthermore, teachers' beliefs about how skilled they are in applying formative assessment influence their future expectations about their students' assessment. In particular, teachers' beliefs about their skills in applying classroom discussion are related to their belief that students' participation in classroom activities is a factor that determines their future assessment. In relation to this belief, the discussion between the teacher and the students is considered as a mean for providing formative feedback, as it is not related to grading. Consequently, they believe that feedback should be focused on students' strengths and weaknesses in mathematics. This is in line with Black and Wiliam (1998) that stress the effect of formative assessment on modifying learning in relation to the students' needs.

For the Cypriot teachers the factors that appear to influence their beliefs about the purpose of F.A are mostly related to the use of qualitative feedback and the use of students' errors. In fact, they believe that feedback from teachers and peers can develop their students' abilities in assessing themselves and can also have an impact on the students' beliefs about mathematics. Therefore, the influence of feedback is not only on modifying teaching and improving the students' knowledge, but also on the students' affective domain. In addition, using errors is also related to a positive influence on the students' affective domain. Thus, if teachers provide feedback using their students' errors, they also

believe that this is a way for supporting the effectiveness of students' preparation for improving their understanding and overcoming their difficulties. For the Cypriot teachers the use of formative feedback in relation to the formative use of the students' errors and students' self-assessment are important aspects for the students' assessment of their conceptual understanding and not their procedural knowledge and memorization. Thus, the teachers that focus on the development of conceptual understanding of mathematics seem to consider more important providing high quality feedback to the students, using their students' errors for improving their learning and letting the students assess themselves. In this sense, Black and Wiliam (1998) stressed that formative assessment develops fully autonomous learners, who can self-assess their work, make meaningful inferences from it and plan the next steps for further progress. It should be also stressed that the Cypriot teachers focus also on the use of the students' everyday life experiences, as they consider that the ability to apply mathematics in real life should be also assessed.

Despite the fact that the two groups of teachers highlight some common factors that influence the implementation of F.A through their beliefs, we also observed some differences between them. Specifically, the Italian teachers' self efficacy beliefs in using several formative assessment techniques and the way of exploiting F.A results occur as important factor that influence the formation of other beliefs about F.A. Actually, self efficacy beliefs act as a filter through which teachers make their decisions rather than just relying on their pedagogical knowledge or curriculum guidelines (Clark & Peterson, 1986). On the other hand, the Cypriot teachers emphasize on the students' affective domain, which they consider that it can be positively influenced when using F.A. In accordance to this, Harlen (2000) turns the focus to the students and points out that "children have a role in assessment for this purpose since it is, after all, the children who do the learning" (p.112). That is why many researchers stress that assessment must be formed "for" learning and not "of" learning, as it is generally acknowledged that increased use of formative assessment (or assessment for learning) leads to higher quality learning (Wiliam, Lee, Harrison & Black, 2004). Furthermore, the Cypriot teachers seem to be mainly focused on the use of qualitative feedback and the use of students' errors, whereas the Italian teachers stress the use of feedback related to the strong and weak points of the students and the technique of setting clear learning goals for the students.

In combining the results from the two countries, the relations between the teachers' assessment and teaching practices and their beliefs on F.A indicate several factors that influence the implementation of F.A in the teaching and learning of mathematics (Figure 3). The way the teachers use the F.A results for modifying their teaching influence the construction of their beliefs about the purpose of F.A. Actually, the importance of feedback for formative assessment is highlighted, as it is related to positive influence on the teaching process, but also on the students' cognitive and affective domain. And when teachers use their students' errors for providing them feedback, they also consider that this can help the students study and prepare themselves in a more effective way, for improving their understanding and eliminating their errors and this can also have a positive influence on their affective domain.

Indeed, the identification of mistakes helps teachers decide how to identify and meet pupils' learning needs and how to use their teaching time and their resources (Kyriakides, 1999). The reason on which the teachers attribute the errors will affect their decisions for their future intervention teaching practices. Therefore, the students' errors can have a formative use, as the teachers can exploit this information for modifying their future actions (Gagatsis & Kyriakides, 2000). Consequently, formative feedback and the use of students' errors are factors that seem to be important for the effective use of F.A and have an impact on the teachers' practices and beliefs, but also on the students' cognitive and affective domain. Thus, our results support other opinions that describe formative

assessment as a strategic process which uses evidence regarding the extent of student knowledge and skills to support further learning (Clark, 2011) and as such increases student motivation, engagement and achievement (Cauley & McMillan, 2010).

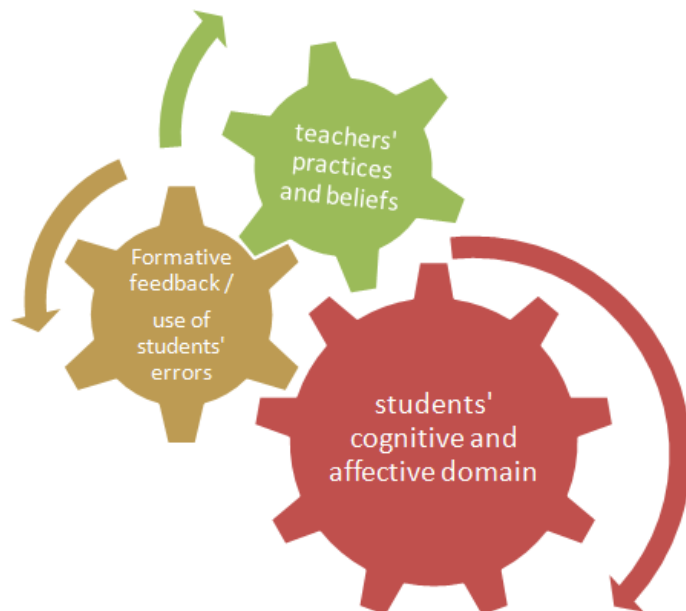


Figure 3. Factors that influence the implementation of F.A

Based on the above, gaining access to the teachers' beliefs will give us the opportunity to design relevant teaching material for our future teacher-training program, based on their needs. In this way, we will have the chance to achieve a change in classroom practices towards the effective implementation of formative assessment. This is important, as teachers' beliefs and practices influence the construction of their students' beliefs. Thus, the development of our training model give the teachers the chance to increase their professional development. The aim of our teacher-training program will be to foster among teachers a proper use of formative assessment in mathematics education. External grounding of the pilot training courses in the associated schools is at the heart of the external justification of the project. The method adopted for the courses uses the analysis of video sequences recorded in class and support the same video in the training program. So in these training courses special emphasis will be given in the use of videos, through video-analysis with the participants.

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