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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 traning 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 2020 Conference as well as some afterglow moments of the 2019 Conference can be found on our conference website <u>http://www.eapril.org</u>.

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EPISTEMICALLY TUNED-IN?

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ABSTRACT

Existing research from several decades indicate that students' deep learning does not always evolve as expected within higher education. Further, there is consensus that so-called epistemic beliefs influence the way students learn.

The purpose of the current study is to explore the epistemic beliefs of students entering higher education, and to investigate if their epistemic beliefs differ across study programmes. This information is the basis for future research about a possible connection between epistemic beliefs and deep learning with the purpose of supporting deep learning approaches within higher education.

The data was collected using a web-based survey about epistemic beliefs among 521 new students representing a broad variety of study programmes. The results reveal statistically significant differences in the epistemic mind-sets of the students across the study programmes although, at the time of data collection, students had not yet been exposed to any kind of pedagogical influences. Thus, the results suggest that the students seem to have "tuned in" their epistemic mind-sets prior to entering the university.

This pilot study focuses on describing the differences, but does not shed light on the reasons and background for them. The results raise questions for further research such as: How exactly and why do the epistemic mind-sets differ across and within study programmes? To what extent do students tune in to adequately match their own epistemic mindsets with the programme or subject specific epistemologies? Is an epistemic change a possible way to enhance deep learning?

INTRODUCTION

Deep learning is broadly regarded as the essence of higher education. However, in a review study covering 43 longitudinal studies published between the years 1977 and 2016, Asikainen & Gijbels (2017) describe that less than half of the studies reported a positive development of the deep approach. These findings are in line with the anecdotal evidence provided by teachers that some students learn successfully and exhibit signs of a deep learning level, whereas some students simply "don't get it" and seem to learn only on a superficial level.

At Arcada University of Applied Sciences, we have been conducting research on the so-called epistemic beliefs and observed a large variation in them on a general level. Furthermore, there is a wide consensus that students' epistemic beliefs influence the way they learn (e.g. Lee, Liang, & Tsai, 2016). This suggests that a connection between epistemic beliefs and learning success should be investigated. Importantly, a better understanding of students' epistemic beliefs could generate potential ideas for how to support or facilitate deep learning.

THEORETICAL BACKGROUND

Learning within higher education has often been explored using theories and models about learning styles. Over the past years, this branch of research has been criticized (e.g. Kirschner, 2017), opening avenues for alternative approaches. One such approach is the one suggested by Dai & Cromley (2014), focussing on how students' epistemic preferences match with their epistemic beliefs.

Epistemic beliefs dimensions

According to one line of investigation, epistemic beliefs are defined as a person's perceptions and beliefs about the epistemic characteristics of knowledge, and described as a set of dimensions expressing aspects of knowledge, such as knowledge being certain or stemming from an authority. Marlene Schommer introduced the first self-report instrument SEQ (Schommer Epistemological Questionnaire) to capture these dimensions (Schommer, 1990), and described epistemic beliefs as a set of five dimensions labelled Simple/structure of/ knowledge, Certain/certainty of/ knowledge, Source of knowledge/Omniscient authority, Innate ability to learn and Learning speed.

The SEQ instrument and its successors (FEE by Moschner & Gruber, 2017; EBI by Schraw, Bendixen, & Dunkle, 2002; EBS by Wood & Kardash, 2002) were constructed as self-report questionnaires where the items were expressed as bidirectional statements presented on Likert-type scales, where the poles express a



naïve vs. sophisticated orientation. The items were factor analysed to create factors, describing the dimensions mentioned above.

Domain specificity

Using a shortened version of Schommer's SEQ-instrument supplemented with a discipline-focused questionnaire, Hofer (2000) identified disciplinary differences in 1st year students. The domain-specificity of epistemic beliefs has later been largely corroborated (Aditomo, 2018; Iordanou, Muis, & Kendeou, 2019; Muis, Bendixen, & Haerle, 2006).

Epistemic change

The intervention study by Muis & Duffy (2013) shows that epistemic beliefs are malleable. Change can be supported by an appropriate epistemic climate and enculturation, i.e. a process where students' knowledge views adjust to the surrounding perspectives occurring in the social settings of the academic community (e.g. Bråten, 2016; Muis & Duffy, 2013; Trautwein & Lüdtke, 2007). Epistemic change and specifically development of a criterialist stance (as opposed to an absolutist or relativist stance) can also be induced by exposing students to conflicting information, as reported by Mierwald, Lehmann, & Brauch (2018) in the domain of history.

Beliefs, preferences and competence

Dai & Cromley (2014) subscribe to Schommer's definition of epistemic beliefs but as an addition, they introduce the concept of epistemic *preferences*, defined as students' preferences for the epistemological characteristics (e.g. structure or certainty of knowledge) of a subject domain. In their study, they found matching preferences and beliefs to be connected to better achievement in a chemistry course. Besides matching preferences and beliefs, Dai & Cromley also suggest paying attention to match and mismatch between other epistemic components in the learning process, i.e. domain and classroom epistemology.

The results reported by Aditomo (2018) suggest a connection between academic performance and some of the epistemic belief dimensions, depending on the nature of the discipline in terms of hard vs. soft sciences.

During the past decades, the discussion around epistemic beliefs has become broader, deeper and more nuanced, acknowledging for instance that a sophisticated stance is not necessarily superior to a naïve stance. Instead, Grossnickle Peterson et al. (2017, p. 256) introduce the concept of epistemic competence which can be



interpreted as the competence to choose the appropriate epistemic stance depending on subject, task and context.

RESEARCH PROBLEM

As mentioned above, students studying different fields seem to have differing, domain-specific epistemic beliefs already in the first year. Furthermore, there seems to be a connection between academic performance, the domain and epistemic beliefs. Hence, this study seeks to establish:

- What kind of epistemic beliefs do the students hold when entering professionally oriented higher education?
- Do their epistemic beliefs differ across study programmes?

Responding to these questions generates a baseline in preparation for future research (see section).

DATA COLLECTION

Sample

Data were collected among a cohort of new students (N=678) entering Arcada University of Applied Sciences in Helsinki. The students represented 14 bachelor level study programmes, out of which three were offered parallelly in Swedish and English.

Instrument

In this pilot study, we used an extended instrument that was based on previous instruments: in addition to the previously identified four dimensions Omniscient authority, Structure of knowledge, Certainty of knowledge and Learning ability, the extended instrument contained three new dimensions labelled Constructivist approach, Internet reliance and Learning by dialogue (Ståhl, 2019). The dimension Internet reliance was included to capture the googling approach that has raised concern among both parents and educators during the past decades.

The instrument was distributed as a web-based questionnaire containing 40 epistemic statements on a 6-point Likert-type scale ranging from 1 (completely disagree) to 6 (completely agree). The scale also offered two non-substantial options (don't understand and don't know) so as not to compel the respondent to express an unfounded opinion. The 40 items were distributed over nine pages, and page order was randomized in order to mitigate the effects of response fatigue (cf. Cape, 2010).



Each anticipated dimension was represented by five to seven items. The questionnaire items were consistently generic (not domain- or discipline-specific), and the written and oral instructions did in no way refer to relating the responses to any specific subject, academic field or context. In addition to epistemic items, the survey contained items measuring study motivation and critical thinking which are, however, not used in the present study.

Procedure

In order to get a baseline measure of the students' epistemic beliefs, data collection was organised during the very first week of the semester, prior to exposing students to study subjects or pedagogical influences at the university. The students were invited to participate over personal email invitations, and data collection was organised in scheduled sessions in order to have the opportunity to inform the students both orally and in writing but above all, to motivate participation. The students were informed that participation was voluntary but that the purpose was to develop the education they enrolled in. Further, that data was to be managed anonymously as declared in the publicly available privacy notice regarding scientific research (GDPR, 2016, articles 12-14).

ANALYSIS AND RESULTS

Sample and data descriptives

Out of all students, 77% (n=521) completed the survey although on the study programme level, the response activity varied between 53% and 100%. Genders were represented in the sample in the same proportion as in the population, as was the case for the average age (23.8 / 23.1). Compared to the population, domestic students were slightly over-represented in the sample (86.8% / 85.5%).

On item level, the responses ranged over the whole scale (1 .. 6) for practically all 40 epistemic items; only three items collected no "totally disagree" responses. Offering non-substantial response options contributed to a good data quality and to assessing item functionality: only five items exhibited a non-response rate over 7% and in general, the items contained substantial responses to an average of 97%.

Epistemic dimensions

In previous studies, exploratory factor analysis was used for extracting the factors representing the epistemic dimensions (Ståhl, 2019). The replication of previously identified exploratory factor analysis models has, however, often failed (see Schraw,

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2013) as was the case with the current material, which excluded the use of factor scores. Instead, we chose to compute subscale scores as unweighted mean scores of the items associated with each subscale. Prior to computing them, we analysed the internal consistencies of the anticipated subscales in order to decide, which items to include in each subscale.

As a result, each dimension was represented by three to six items, altogether 27 items. After this, we used the reduced item set to compute the subscale scores as "qualified" averages using the mean.x function (SPSS, 2016). By qualified average we express that a subscale score value was computed only when the respondent provided enough substantial item responses for that particular subscale, which guaranteed that a subscale score value was never based on a single or very few items. Thus, e.g. the Constructivist approach subscale score required substantial values for at least five out of six items whereas those subscales represented by only three items required all three items to contain substantial values.

Results

The first part of the current research task was to describe the epistemic beliefs of students entering professionally oriented university education. For this purpose, we analysed the distribution of the subscale scores as illustrated in Figure 1.

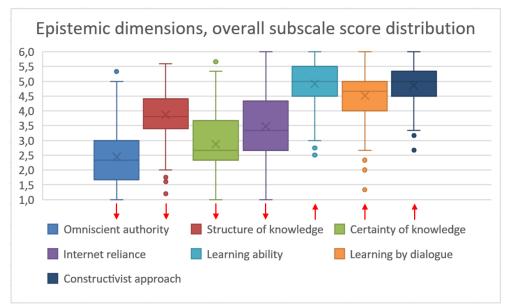


Figure 1. Overall distribution of epistemic dimension subscale scores. Red arrows at x-axis denote the sophisticated orientation for each dimension.

On a general level, the students seem rather sophistically oriented regarding the dimensions Omniscient authority, Certainty of knowledge, Learning ability, Constructivist approach and Learning by dialogue, whereas the scores regarding Structure of knowledge and Internet reliance are more towards the naïve. As was the case with item responses, also the subscale scores are rather widely distributed.

The results above indicate that the mostly sophisticated orientations suggest that in general, the students should be prepared for higher education studies. On the other hand, the wide distribution indicates a strong heterogeneity regarding almost all dimensions, suggesting that some students may regard knowledge in a too naïve manner, less appropriate for higher education studies. The wide distribution also suggests that it should also be possible to identify differences across groups, as anticipated in the second research task.

To respond to the second research task, we explored possible differences in epistemic beliefs across study programmes using the One-way Anova test. The study programmes were entered as independent variables and the subscale score means as dependent variables. Throughout the analyses, a significance level of .05 was used for the statistical tests (Coolican, 2014, pp 570-586; SPSS, 2016).

Subscale	F	sig.
<i>Omniscient authority (3/3)</i>	2.482	0.001
Structure of knowledge (4/5)	2.316	0.003
Certainty of knowledge (3/3)	1.746	0.037
Internet reliance (3/3)	3.440	0.000
Learning ability (3/4)	2.133	0.006
Learning by dialogue (3/3)	1.493	0.098
Constructivist approach (5/6)	2.605	0.001*

Table 1.Summary of subscale score means comparison across study programmes using the One-way Anova test.

All df=16; **p*<.001

The results, based on the current material, indicate statistically significant intergroup differences for six out of seven dimensions (Table 1).

DISCUSSION

When building up the instrument presented in a previous study (Ståhl, 2019), we sought inspiration both from Schommer's (1990) original SEQ and from its successors (Moschner & Gruber, 2017; Schraw et al., 2002; Wood & Kardash, 2002). Thus, the study was built on concepts and instruments presented in numerous previous studies within the line of investigation, where epistemic beliefs are regarded



as a set of independent dimensions. This study was the first to test our extended instrument containing new dimensions.

The findings corroborate previous findings regarding early disciplinary differences (Hofer, 2000) and domain-specificity of epistemic beliefs (Aditomo, 2018; Iordanou et al., 2019; Muis et al., 2006). Notable in the current study is that the new students may have tuned in their epistemic mindsets to align with their perceptions of the epistemologies in their fields, prior to being exposed to any kind of enculturation at their study programme or at the university.

Since the sample consisted of new students at a single university of applied sciences, generalizability is limited. The target population, containing students from a broad variety of study programmes, is a strength whereas the linguistic, cultural and geographical distribution is limited. Still, the results are clear enough to encourage further investigation along this line but naturally with a larger population, including students at science universities, from other parts of the country, and also from universities in other countries.

When planning data collection, we acknowledged that achieving enough response activity is an ever-growing challenge. Therefore, instead of publishing a general invitation on some public channel or some open space, we chose to address the students through personal invitations and to organize data collection as scheduled sessions, which proved successful. We believe that the high response activity can be attributed to this procedure. Thus, one lesson learnt from this study, important for all researchers conducting especially web-based data collection, is that, even when collecting data within e.g. an educational institution offering easy access to the respondents, one cannot expect respondents to participate based on an impersonal invitation. High respondent engagement requires addressing the respondents in a more personal way, which in practice implies meeting them face-to-face.

From a technical point of view, the instrument functioned smoothly and as expected, and the page randomization contributed to distribute non-response evenly over all items. Thus, none of the items suffered from considerable non-response.

CONCLUSIONS

Consequences for educational practice

Students having different epistemic mind-sets before they even enter the university is an interesting finding per se, suggesting that already during the process of considering, choosing and applying to a study programme, the students seem to "tune in" their epistemic beliefs.



Further, the broad distribution within study programmes is also a finding, indicating a heterogeneity within the group and suggesting that some students may tune in whereas others may not. Thus, the question is: have they tuned in to the appropriate mode or do some students suffer from an epistemic mis-match, that is, a mis-aligned tuning in relation to the discipline-specific epistemology and the epistemic climate (cf. Dai & Cromley, 2014)?

Identifying new students' epistemic mind-sets may enable choosing interventions for epistemic change (cf. Bråten, 2016; Muis & Duffy, 2013; Trautwein & Lüdtke, 2007). Further, acknowledging the level of sophistication for each dimension for the current context, topic and study level may support the teacher in choosing the appropriate epistemic level and learning activities, i.e. what Dai & Cromley (2014) describe as matching the classroom epistemology.

Further, an epistemic awareness might help the teacher in selecting appropriate pedagogic activities to support the enculturation of students' epistemic beliefs. The pedagogic activities would then be guided by epistemic matching (cf. Dai & Cromley, 2014) and go hand-in-hand with developing the students' epistemic competence (cf. Grossnickle Peterson et al., 2017).

Future research

The findings suggest that the development towards deep learning could be facilitated by having better information about the students' epistemic mind-sets. This would require systematically measuring students' epistemic beliefs with both baseline and follow-up measures.

The results indicate heterogeneity in epistemic beliefs and therefore, future research should explore in more depth how students' epistemic mind-sets differ across and within study programmes, and which background factors may contribute to these differences.

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MATHEMATICS IN PLAY

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ABSTRACT

The research project 'Mathematics in play' searches for characteristics of the interaction between preschool/kindergarten teachers and preschoolers (2-6 years) that are helpful for stimulating young children's language and mathematical development in the context of spontaneous play. This research has a design based approach and is cooperatively performed in heterogeneous PLC's (professional learning communities) consisting of professionals in preschool and kindergarten and educational researchers. An aim of the project is to understand the processes of collective learning in these PLC's. Findings of the study show that observing, connecting and enriching (OCE) are crucial in stimulating young children's development in mathematics, and (2) a heterogeneous PLC helps professionals in preschool and kindergarten recognizing mathematics in children's learning environment. However, professionals experience difficulty in recognizing proportional reasoning and representation in children's play.

CONTEXT

Professionals in preschool and kindergarten in the Netherlands are required to accomplish set goals for mathematics (SLO, 2019). In doing so these professionals often organize isolated mathematics activities for their children as they assume this is the only way for them to reach these goals. However, most professionals would rather adopt a more play-based approach to the learning of young children. They



want to promote children's spontaneous play, but they do not know how this play could stimulate children's mathematical development.

Professionals participating in 'Mathematics in play' have a majority of children in their group who speak Dutch as a second language. Because of that, the professionals in the recent past mainly focused on language learning. Their main strategy in this respect was telling children how objects and situations they come across are named and emphasizing words they want the child to learn. For example, when a child puts a bead in a basket, the professional describes the situation, emphasizing the words 'bead'and 'basket'. Doing so, the focus on language results in isolated activities. In an earlier project we therefore explored how children's language production could be stimulated, by connecting to children's spontaneous play (Van der Zalm, Boland, & Damhuis, 2018). Professionals in preschool and kindergarten consider this a natural setting for learning language. They wonder whether mathematics learning can also be facilitated in such a natural way.

Researchers from iPabo University of Applied Sciences and from Marnix University of Applied Sciences are involved in continuous dialogue with professionals in preschool and kindergarten. The problematic situation accomplishing mathematics goals was discussed and explored in the context of this dialogue in 2016 and 2017. Researchers here talked about their projects on spontaneous play (Van der Zalm, Boland, & Damhuis, 2018). Professionals and researchers developed the idea that spontaneous play could well be used for stimulating children's mathematical development. This sets the scene for the project 'Mathematics in play', wherein professionals and researchers decided to together explore how to embed mathematics in children's spontaneous play.

BACKGROUND

This research combines two theoretical perspectives. The first perspective is the perspective of stimulating spontaneous play. A sequence and specification of interaction strategies in play guidance was developed in the research project 'Interaction in play' (Van der Zalm, Boland, & Damhuis, 2018), which focused on stimulating language production and complex thinking in make-believe play and built forth on work of De Haan (2012). De Haan formulated considerations on the learning environment. Moreover, she suggested that stimulating children's play firstly involves observing the child. The professional then sees (mathematical) activities and decides whether further stimulation is relevant. If this is so, she may decide to connect to the play. In connecting to the child's play she plays along with the child as a fellow child would do. In doing so she is not taking the role of the adult, but follows the child's lead confirming the child's play. The professional, next, can decide to enrich the play. When doing so she introduces new elements. Typical activities here include introducing a variation on what was already played, adding new materials, elicit complex reasoning or propose to visualize information in schemes. It is important that in enriching the spontaneous play the child remains



involved in the play. Professionals tune pace, and consider creating space for children and children's mathematical perspective. This, for example, means that enriching is different from leading the child up to a specified outcome.

The second perspective in this research is that of mathematics learning. Here we follow Freudenthal who introduced mathematics learning as children's mathematizing: organizing one's world in a mathematical way (Gravemeijer & Terwel, 2000). This mathematical exploration also takes place in spontaneous play. Since mathematics developed over the ages, children, in a sense, reinvent the mathematics. The professional's task is to guide this process (Freudenthal, 1991). In supporting children reinventing mathematics through spontaneous play the professional's task is observing the play from the children's mathematical point of view. In other words, the professional needs to be professionally mathematical literacy implies good understanding of mathematics, especially in the domains number, measurement, geometry, ratio and proportion, and, graphs and representations, as these are the domains wherein nationwide goals are set for 3-5 year olds (SLO, 2019).

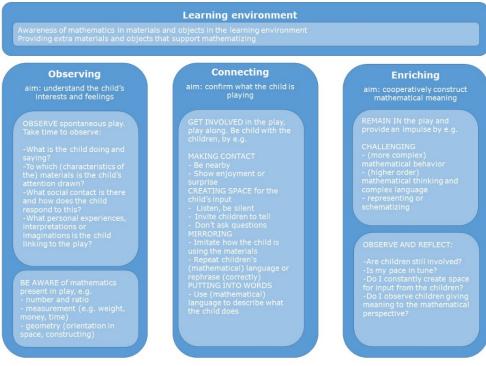


Figure 1. OCE-scheme

Researchers and professionals brought the two perspectives together in the scheme depicted in figure 1, the OCE-scheme (observing, connecting, enriching). The top bar in the scheme shows arguments for professionals for introducing specific materials in the learning environment. The next layer in figure 1 in the scheme depicts what happens when children are engaged in spontaneous play. Here we see observing, connecting, and enriching, as described above.

RESEARCH QUESTION

This study aims at designing a learning environment for children in order to stimulate language and mathematical development in the context of spontaneous play. This brings us to the following research question:

Which characteristics of the interaction between preschool/kindergarten teachers and preschoolers (2-6 years) are useful for professionals in order to stimulate young children's language and mathematical development in the context of play?

METHOD

The research question is a typical question for a design study (Van den Akker, Gravemeijer, Mc Kenney, & Nieveen, 2006). Design studies aim at finding solutions for educational problems. In this case the educational problem is that isolated teacher-directed activities are typical for educational practice, but are often meaningless to the children. In a cyclic approach researchers and professionals develop alternatives for these isolated activities which are tested in practice and redesigned as a result of reflection on experiences in practice.

Setting

Professional learning communities (PLC's) are created, wherein professionals from kindergarten and pre-school, researchers, and teacher educators in both early childhood education and mathematics education cooperatively discuss practice and develop alternatives for this practice. Typical activities in these PLC's are sharing video and pictures from practice and reflecting on experiences presented. In this reflection two perspectives are dominant, namely the OCE-perspective which is used to structure the discussion on interaction in children's spontaneous play, and the mathematics perspective which is used to support the observation of mathematics in the child's play. In the PLC's the mathematical perspective is related to domains and goals that are part of the Dutch national curriculum for children up to six years of age (SLO, 2019).

The PLC's are formed in two preschools in the Dutch cities Amsterdam and Zaandam. Within a period of five months, the PLC's met five to seven times for two



to three hours. In between PLC-meetings professionals experiment in their group using the knowledge and insights that are co-constructed in the PLC.

Data collection

All PLC-meetings are video recorded as in the PLC's experiences of the professionals are shared and discussed. When professionals and researchers work in small groups during PLC-meetings, dialogue in these small groups is recorded on audio or video. During PLC-meetings professionals share narratives from their practice in the form of video and images. These video's and images (often embedded in a PowerPoint-presentation) are a second data source.

The professionals are interviewed twice, at the start of the study and just after the last PLC-meeting. The first interview is used to establish the initial situation of each professional. This interview is recorded on audio. The second interview focuses on lessons learned from the trajectory. These interviews are recorded on video.

Researchers discuss experiences in the PLC's in separate meetings. Notes from these meetings include arguments on solving the educational problem at stake in this study. These notes therefore form an additional data source.

Analysis

First, the transcripts from the video and audio material of the PLC-meetings were analysed. Purposive sampling was applied to select important information (Lavrakas, 2008). From all transcripts only those fragments were selected:

(1) in which a professional describes a concrete situation in her own teaching where she tries to stimulate mathematics in spontaneous play, or

(2) in which the professional or researcher summarizing group discussions speaks explicitly about a child's or children's mathematical activity.

The selected fragments were encoded for type of interaction, using the perspective from interaction in play, namely observing, connecting and enriching (De Haan, 2012). Besides, the mathematical domains included in the fragments were encoded, namely number, measurement, geometry and proportion (SLO, 2018a; SLO, 2018b). From all transcribed video from the PLC-meetings in both locations 31 video clips were selected, of which 13 video clips described a situation in a preschool (2-4 year) and 18 clips dealt with a situation in kindergarten (4-6 year). Video clip differ in length from a two minute discussion to discussion in the PLC lasting about a half hour.

Second, the interviews were analysed. The first interview was summarized and this summary was approved by the professional. In the final interview professionals describe their development in de PLC's and how they developed their practice. This interview was transcribed.



The interviews and findings from analyses of the PLC clips were combined. Conclusions from both PLC's and interviews are enriched with narratives from professionals' practice, providing paradigmatic examples of mathematics combined with interaction in play.

RESULTS

Narratives

In every PLC-meeting professionals shared their experiences of stimulating mathematics in children's spontaneous play. Usually this sharing was prepared by the professional, who told about what the children did and what she did. The narrative was supported by video images or photos from the children or from children's work. After the presentation of the narrative, it was discussed in the PLC from the perspective of the OCE-model and the mathematical perspective. In the latter case the focus was on mathematics domains and national goals. We here describe a typical example of a narrative, that is about building a mosque. Other narratives, that are published elsewhere, include narratives on tug-of-war, playing in the sandbox, and experimenting with paint and water (Keijzer, Van der Zalm, & Boland, 2019; Logtenberg & Weisbeek, 2019; Van Schaik & Van der Zalm, 2019).

Professionals in one of the PLC's are from an Islamic primary school. In the situation at stake, it is Ramadan, the Muslim month in which adults fast during daytime and visit the local mosque more often than regular. Breaking the fast and festivities at night makes that children experience Ramadan as a joyful period. In kindergarten, attention is paid to the special period of Ramadan as well. The professional introduces blocks of different sizes and forms in the learning environment. Two children are interested in the blocks and choose them to play with. They decide to build a mosque (Keijzer & Hazewinkel, in press).

The professional observes the children's play. She sees that they use a black block as Kaaba. The Kaaba is the large black holy structure within Mecca's Great Mosque pilgrims walk around. The children know about the Kaaba from television. The professional also observes that the mosque of the children resembles the mosque their parents visit. While playing along and connecting with the children, she asks where the mosque is. The children think about it, and decide to build their parents' mosque. They remove the black block and start building a mosque with four minarets. When the minarets are ready, the professional enriches the play and asks herself where the visitors of the mosque are and where they live. The children respond to this question and add a number of people and some houses (figure 2). Still playing along with the children the professional points at the people and the size of the mosque door. The children know the people are unable to enter through the mosque's door. They decide the mosque needs to be altered.



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Figure 2. The mosque, mosque visitors and their houses

Professionals and researchers in the PLC share their ideas about this experience from practice. They see how the professional uses the OCE-model, by first observing. She connects to the children's play by talking – within the play – what mosque is actually build. She enriches the play by introducing mosque visitors in the play and by



remarking that these visitors are unable entering the mosque. By playing along the professional offers impulses that are interesting to the children and helps them to remain in their play. When the professional decides to enrich the play, by introducing a new problem, they immediately make plans for solving the problem.

PLC-members also discuss mathematics in the narrative. Both professionals and researchers notice that the children are exploring geometry in their play. First, the children consider how the mosque should be built and what blocks are needed for specific parts of the mosque and how these are formed. Measurement is recognized by all PLC-members, when the professional tells that the children compared the blocks in size and also the size of the people and the opening in the mosque. A professional mentions number, as the people could be counted. Not all PLC-members agree on this, because counting the people does not seem meaningful to the children at that moment. One of the researchers explicates the children might be engaged in proportional reasoning. This comes forward when children are comparing people's size and the mosque's door. Here, the children in fact experience they used different scaling, which they articulate as people being too big.

Clips from PLC-meetings

Narratives as the one described in the previous paragraph were selected from the transcripts and encoded in two ways. First we coded how professionals interpreted children's play from the perspective of the OCE-model and how professionals interpreted the children's play from the perspective of mathematical domains. Table 1 provides an overview of clips selected from the two PLC's.

interaction ->	learning			
math. domain	environment	observing	connecting	enriching
number	5 (0)	3 (1)	4 (0)	6(1)
measurement	7 (2)	13 (7)	15 (3)	10 (3)
geometry	4 (2)	12 (6)	13 (6)	7 (3)
ratio and proportion	0 (0)	0 (0)	0 (0)	0 (0)
graphs and	0 (0)	0 (0)	0 (0)	0 (0)
representations				

Table 1. Interaction characteristics and domains in all 31 video clips (2-4 year olds in parenthesis)

A clip is coded in one or more of the cells in table 1, if professionals explicated the combination the cell represents. For example if one or more professionals discussing a specific narrative tell about at least one aspect in the learning environment in relation to stimulating measurement in spontaneous play, a hit is recorded in the cell



'learning environment/measurement'. As the dialogue on the narratives usually concerns more than one element from the OCE-scheme and often includes more than one mathematics domain, a narrative could be represented by several hits in the table. The mosque-narrative for example loads on all cells for geometry and measurement, and the cell combining enriching/number. Proportion is not coded, as this is introduced by one of the researchers and did not come forward from the professionals.

In table 1 the numbers without parenthesis represent utterances from professionals in both kindergarten (4-6 year olds) as preschool (2-4 years olds). From the table we read that these professionals mainly see spontaneous play in measurement and geometry, where they are observing and connecting. They also recognize number in spontaneous play, but less often. Moreover, here the focus is more on enriching the play. Analysing professionals in preschool's utterances we see a similar pattern. However number is not prominent in mathematics in preschool.

For both preschool and kindergarten we see that professionals do not describe their experiences in terms of proportional reasoning or ratio, or in terms of graphs and representations.

Interviews

We interviewed professionals participating in one of the PLC's at the start of the trajectory. These semi-structured interviews addressed the following topics:

- professional's educational background,
- children's language,
- mathematics,
- spontaneous play,
- goals in the project.

Due to last minute changes in the PLC, we interviewed 13 of the 16 participants. These 13 participant are all experienced professionals in preschool of kindergarten, with an average professional experience of 21,6 years, ranging from 2 to 45 years in the profession, where seven of the 13 participants having more than 20 years of experience in preschool or kindergarten. All these professionals tell about the focus in their teaching on language, especially concerning extending children's vocabulary, usually by constantly naming objects and situations children are involved in. Both language and mathematics are typically related to the group's (periodically changing) theme. For language new words for children are embedded in the theme, whereas attention for mathematics is mainly in isolated activities. Professionals differ with respect to their knowledge of and experiences with



stimulating children's spontaneous play. Six professionals in some way use ideas from stimulating spontaneous play in their teaching. These ideas include:

- develop learning environment stimulating spontaneous play, usually aimed at specific mathematics domains,
- considering mathematics learning as being language learning,
- relating spontaneous play and theme from a mathematical perspective.

In the final PLC-meeting we again interviewed the participants. These semistructured interviews were small group interviews, with two or three groups per PLC. In these interviews we asked the participants to tell about their development during the trajectory. In the interviews all professionals mentioned that participating in the PLC's made that mathematics had become a major focus in their teaching, next to focussing on extending children's vocabulary. Whereas, at the start of the trajectory, they did have a limited view of mathematics in children's spontaneous play, at the end they recognized mathematics more. They experienced that mathematics is omnipresent in children's environment. Moreover, these experience made that children's mathematics became a regular topic for spontaneous professional dialogue.

DISCUSSION

The study reported upon in this paper deals with developing strategies for stimulating young children's language and mathematical development in the context of play. However, collecting data systematically in preschool and kindergarten groups in this study appeared basically unfeasible, as consent from all parents involved, is necessary. In solving this methodological issue we choose for data collection in PLCsettings, where professionals' experiences from practice in preschool and kindergarten are discussed. But, as professionals select and communicate their narratives, this leads to filtered information. This filter may be considered a disadvantage in this research, but in fact it is not. In a context where researchers and professionals cooperatively are involved in designing strategies for stimulating children's development, makes that professionals articulate their notions on children's language and mathematics. This professionals' idea formulation can be seen as constructing strategies for stimulating children's language and mathematical development, as is the study's goal. Namely, in articulating these strategies professionals and researchers together operationalise how these strategies stem from practitioners' narratives.

This is essential as it centralizes the professionals role in this research. For example it is clear that where researchers in the child's play observed graphs and representation or ratio and proportion, the professionals did not. This central role for practitioners also made that limitations for spontaneous play were discussed,



whereby professionals indicated that they included daily classroom routines in observing mathematics and considered explicating these routines as connecting to the child's play or enriching the play.

CONCLUSION

The research question in this research is: which characteristics of the interaction between preschool/kindergarten teachers and preschoolers (2-6 years) are useful for professionals in order to stimulate young children's language and mathematical development in the context of play? We found that relating notions from the OCE-model and from mathematical domains is a means for professionals in stimulating young children's language and mathematical development in the context of play. Moreover, we found that characteristic for professionals in preschool and kindergarten stimulating young children's language and mathematical development is being aware of mathematics is omnipresent in children's spontaneous play. This notion enables professionals to observe children's play from a mathematical point of view. Doing so, these professionals should consider mathematics as communication and language. Moreover, this mathematical point of view is especially important when observing and connecting, as first two steps in the OCE-model.

Generally speaking this study focuses on combining ideas from interaction in preschool and kindergarten and ideas in learning mathematics. We conclude that combining these ideas is fruitful. It supports professionals in supporting children in their development in both language and mathematics.

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TEACHING FRENCH THROUGH DYNAMIC ASSESSMENT: THE CASE OF THE FIRST YEAR UNDERGRADUATE STUDENTS F.L.E

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ABSTRACT

It is well established that at the university, one forms the critical spirit, the spirit of analysis and the spirit of synthesis. What we advocate is a spirit of evaluation. The process we followed is part of a problematic of teaching French and especially in didactics of writing. We have implemented an experimental device in our teaching practice. This is the dynamic evaluation. This evaluation allows the measurement of the initial level of achievement of a written production. And also the introduction of elements likely to help the subject to modify his usual strategies involved in the realization of a failed written production. But above all the appreciation of the way new strategies are involved. It's a four-phase experience that lasted a whole year. We first put our sample audience to a pre-test, then with them we determined the teaching objectives, then we set up the training workshops for the dynamic assessment, and finally we closed the process with a final test of measurement and evaluation. Two questionnaires were used and an observation grid.

Keywords: dynamic assessment, learning potential, skills, transferable macrocompetence, strategies, mediation.



INTRODUCTION

We are interested in the problem of mediation and the impact of evaluation tools on the activity of those who evaluate. The choice to work on these emanates from the fact that students and future teachers, who arrive at the university in first year are far from achieving in all writing situations a "correct" production in French. Indeed, there are many errors or more objectively dysfunctions that occur in the written productions of these learners and attest to their lack of scriptural competence. These errors affect both the formal and semantic rules of language as well as the rules of textual coherence and cohesion.

We consider that the dynamic evaluation integrated into a didactic sequence of the writing can not only considerably improve the competence of the oral of these students but especially their competence with the writing. According to Professor FEUERSTEIN (1979), effective mediation leads to change and alleviates dysfunctions. Mediation is nothing more than a quality of interaction between the mediator and the learner. This interaction so that it is of quality and can produce changes must meet specific criteria such as intentionality, transcendence and meaning. The mediator explains, identifies, and formulates the learner's difficulties, approves and encourages him to help him overcome his dysfunctions. It is the mediation of meaning.

The method of dynamic assessment of the potential of learning is based on the principles of the theory of modifiability and cognitive educability. LOARER (1998, p.121) gives cognitive education the following definition: for him, "we speak of cognitive education when we explicitly seek, through the implementation of a training process, to improve intellectual functioning of people ". In fact, it is a question of measuring, through the use of tests, the extent and quality of learning potential. It is a method of assessing thought processes, perception and problem solving. It highlights the subject's ability to develop his or her effectiveness in performing a task when he or she accepts mediation. The mediator, whether he is the teacher or the learner, makes the learner aware of the errors he may have made by responding to the instructions in the proposed matrix, particularly in writing. This complicity in diagnosing inadequacies allows the learner to evaluate for himself, to value himself and to improve himself. In general, the evaluation process implemented by the teacher (the expert) and the responsible, effective and meaningful participation of the trained (peers) in this process ensures this awareness and allows real learning. According to Laurier, Tousignat and Morissette (2005, p.37), "evaluation is a collective approach. In the same way that learning is a process



that feeds on exchanges within the group, evaluation should also appeal to the group."

METHODOLOGY

Research Protocol

To carry out our experiment, we used two research questionnaires in order to describe the teaching practices and the evaluation of the writing from the point of view of the 1st year FLE students. Our first research questionnaire included 28 questions, including 27 closed questions and an open question in Arabic as well. Our second research questionnaire consisted of 23 questions, 22 closed and one open. The five questions that were removed from the first questionnaire related to the teaching and writing practices that students had experienced since entering high school. We consider that it was useless to ask these questions again in the second questionnaire since the data would not have changed in this one. With regard to the results of the question that is part of the two questionnaires, and finally the results relating to the written assessment grid focusing on linguistic, discursive and communicative dimension

We used a second data collection mode which is the observation grid. We present here the observations of three subjects that we compared during the first and the second presentation of their written productions. We present, first, the one who is in a situation of language insecurity learning (score = 5/20 in writing), then the subject in situation of language stability unstable learning (score = 10 / 20 in writing) and finally, one who is in a stable and easy learning situation (score obtained = 13/20 in writing) in this order. We analyze and interpret the results of these three subjects under the prism of linguistic, discursive and communicative competences.

The experimentation:

We have adopted a four-phase approach

The survey

Two questionnaires were used (one at the beginning and the other at the end of the experiment)

The pre-test

A pre-test assessed the level of notional acquisition and scriptural abilities.



Mediation

It is a phase of training or mediated learning. The teacher (the expert) and the trained ones (the peers) play a very important role. Throughout the formative workshops, the didactic sequence takes all its meaning and the multiple interventions of the peers (the trained ones) in posture sometimes of evaluator and sometimes of evaluation of their written productions provide a certain number of aids, and guide the activity of the learner so that it solves itself the task previously failed.

The final test

A final test makes it possible to measure the acquired gain and its stability on a case by case basis.

ANALYSIS AND INTERPRETATION OF RESULTS

Comparative results

We now compare the answers of the first questionnaire to the answers of the second questionnaire. The results of the first questionnaire are represented in the graph by a black band while the results of the second questionnaire are represented by a gray band.

Results of Question

Question 14

The results of this question clearly demonstrate a significant change in the students' view that evaluating students in their writing group can help improve future written productions, after there was peer review. Indeed, in the second questionnaire, we noted a decrease in the number of students who did not know while the number of students in favor increased significantly. Dolz and Schneuwly (1998) believe that evaluating one's peers allows one to become aware of how others make oral or written production and thereby their own way of doing things. For Durand and Chouinard (2006), assessing peers helps the learner become more independent and able to recognize strengths and weaknesses. In addition, according to Topping (1998), peer assessment engages the learner in a number of complex cognitive activities (clarify, summarize, etc.) that can enable integration, consolidation, and deepening of understanding. Gibbs (2006) also points out that pressure from peer reviewers may encourage learners to work more carefully than if the work was for

the sole teacher. According to him, the internalization of the criteria for the correction of the works of the peers also contributes to the control of these aspects in their own productions.

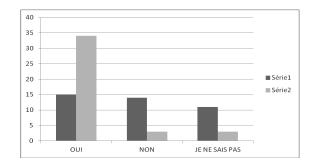


Figure 11: Students' view that evaluating students in their writing group can help improve future written productions based on the number of students.

Results of Question

Question 28

Question 28, according to you, what can it bring you that the learners of your group participate in the evaluation of your written production?, Was an open question given in Arabic too. By this open question, we wanted to know the learners' perspective on the effects of peer evaluation. We present here some answers obtained by comparing them from one questionnaire to another. Based on the results we obtained, we found that students found several benefits to peer assessment. Among other things, they mentioned that doing peer assessment when evaluating written productions allows for a better ability to express oneself in a general way.

This is a consequence reported by Topping (1998). Indeed, the latter states that peer evaluation develops the skills to communicate, it requires the learner to be precise and understandable. Gibbs (2006, p.35) also states that "the fact of explaining to the other request to structure well and articulate one's own knowledge".

The students also reported that the mutual evaluation allows a more authentic evaluation. This is what Durand and Chouinard (2006) argue by saying that peer assessment leads learners to be more critical of them and helps them to develop better judgment when assessing their peers. Gibbs (2006, p.34) agrees with the statement that, through peer review, "the subject learns (...) to develop critical thinking and use it constructively".

Peer review has also highlighted the benefit of having a more empathic assessment. Doré, Michaud and Mukarugagi (2002, p.17) argue that peer assessment "allows learners to refer to the ideas of others, to consult without fear a comrade about some work, to exchange with peers on the strategies used to solve a problem. " Topping (1998) and Lussier and Turner also argue that peer evaluation promotes interaction among peers.

Brown, Rust and Gibbs (1994, in Durand and Chouinard, 2006, p.244) state that peer assessment is a good preparation for working life and "develops several reusable skills in a subsequent career". The students came to the same conclusion because they told us that the peer review will have repercussions in their future teaching career. Laurier, Toussignant and Morissette (2005, p.136) also state that peer assessment "develops a transferrable ability out of the classroom". The students came to the same conclusion because they told us that peer assessment "develops a transferrable ability out of the classroom". The students came to the same conclusion because they told us that peer evaluation will have repercussions in the world of work.

In addition, students reported that doing peer assessment led them to see that there is something positive about writing. This confirms Bailey (1998) who argues that it is good to comment on the presentation of a learner who has just produced since it allows to bring out positive comments that are essential to the individual. Also, the students said that practicing peer assessment promotes an increase in self-confidence. This finding from students confirms Topping's (1998) claim that doing peer assessment can improve self-esteem.

Finally, the students responded that the fact that their colleagues participated in the evaluation of their written productions allowed them to learn. This finding confirms what several authors have said about the benefits of peer assessment of learning. Gibbs (2006) argues that peer assessment helps the learner to improve learning through peer interaction. Bailey (1998) also argues that mutual evaluation promotes learning among learners and Facciol and Kjartansson (2005) argue that doing peer assessment improves performance in the learning process. and learners become more integrated.

ANALYSIS AND INTERPRETATION OF THE RESULTS RELATING TO THE OBSERVATION GRID

Linguistic competence - language

With regard to the language component of linguistic competence, we observed in subject S2A only negative traits with respect to the morphosyntax. Indeed, there was

no respect of the genre and agreements of the kind, nor respect of the number and the agreements, he had poor mastery of the verbal conjugation and the concordance of the times and his connections were incorrect. In terms of syntax, in general, there was ungrammaticality of utterances. For the lexicon, this subject had used vague and imprecise terms and too many repetitions which had nothing to do with the instructions of his written production. At the second presentation of his written production. we have seen an improvement. Positive traits have appeared, especially in morphosyntax. There is, in general, respect of the genre and the agreements of the kind, the number and the agreements of the number, it showed a more or less control of the verbal conjugation and even the concordance of the times and its connections were more or less correct. As far as the lexicon is concerned, this subject has used more or less precise terms and has not repeated the same terms much, on the contrary there was a variety in the terms.

With regard to the subject S5A, we have been able to observe several negative traits in morphosyntax. Indeed, several times in the presentation of his written production, we have observed a lack of respect for gender and gender agreements and poorly constructed sentences. The links were however correct. On the lexicon side, the vocabulary was generally varied even if some terms were often repeated. In the second presentation of his written production, this subject has well respected the morphology. In general, he respected the genre and the agreements of the genre, the number and the agreements of the number, he mastered well the verbal conjugation and the concordance of the times. The connections were once again well done. As for the lexicon, we observed that it was varied and the terms more precise.

With regard to the language component of linguistic competence, we observed in the subject S13A, some negative traits related to the morphosyntax. Indeed, we observed a non-respect of the genre and agreements of the kind as well as the nonrespect of the number and agreements of the number. The links were done correctly. The syntax as to it was, generally respected, there was thus grammaticality of the statements. As for the lexicon, the vocabulary was quite rich and there was no repetition. During the second presentation of his written production, we observed a very great improvement of the morphosyntax. This subject generally respected more genera and agreements of the kind, the number and the chords of the number, it mastered the verbal conjugation and the concordance of the times and its connections were once again correct. There was also grammaticality of statements. Regarding the lexicon, his vocabulary was more precise and varied.



Discursive competence

With regard to the discourse competence of the subject S2A, we were able to observe several negative traits during the first presentation of the written production. Indeed, the speech of this subject was not structured at all and there was no final situation. All the text did not exceed seven lines. There was also a lack of highlighting of the important aspects of the story and a lack of articulation between the ideas. In addition, we observed a poverty in the intensity of the information to be transmitted. The theme of the story was poorly defined. As for the relevance and credibility of the story, we observed that the subject had a dubious understanding and lacked a lot of imagination. The information he gave was poor. He did not establish a relationship between the characters, the processes of the narration are totally absent, the trigger of the story does not exist. We do not know exactly the status of the narrator, nor his point of view. The dialogues were totally absent from the production. However, we observed that this subject used a time indicator. At the presentation of the second written production, we observed some improvement. And some positive traits have appeared. Regarding the organization of the speech, there was a highlighting of important points of storytelling, there was also a clear articulation between ideas and relationship markers were well used. There was a lot of consistency in the comments. We could observe an organization of the story according to the intention of communication, a richness in the information. There is no more confusion between narrator and character, the places are clearly specified. We have also been able to observe much more imagination and the narrative processes are varied. Indeed, the narration was shared between prose and dialogue.

With regard to the subject S5A, we observed during the first presentation of the written production that the content of the story told was poorly structured. Indeed, there was no modifying element of the story, the initial situation did not contain all the elements that were to compose it, there was a total absence of temporal articulators. There was a lack of highlighting of the important points of the story told which generated an inconsistency. There was not enough relevance and credibility for the information that was staked in the story told. The status of the narrator was not defined enough. There was no character and even the descriptions were totally absent. The subject restricted himself to using prose as a narrative process, no dialogue was observed. The subject however organized his speech according to the intention of communication. In the second presentation of the written production, we observed a very great improvement in discourse competence. Indeed, in terms of the organization of the speech the content was well structured and there was a highlighting of the important points of the story. The narrative schema was present,

the trigger of the events is well marked. An articulation between the ideas and the temporal and relationship markers were correctly used. The theme of the story was clearly expressed through the feelings and relationships between the characters. Moreover, in terms of relevance and credibility, the discourse was organized according to the intention of communication. Finally, the text is much longer. The subject was very imaginative.

Regarding the subject S13A, we observed, during the first presentation of the written production that despite a well-structured content, there was a lack of highlighting important aspects, a lack of articulation between ideas and a fairly good use of time markers. Indeed, the narrative scheme in all its dimension was used. The relationship between the characters in the story was marked. There was coherence. The text was more or less long. The instruction was respected. The theme of written production was well circumscribed. In terms of relevance and credibility, we have seen a number of positive features. The speech was organized according to an intention of communication. The subject S13A had a lot of imagination, he knew his subject well. The ideas and information he provided were of high quality and the narrative procedures were used appropriately. We observed two negative elements. It was a confusion in the status of the narrator and lacked descriptions of either places or characters. At the second presentation of the written production, we were able to observe a very great improvement of this skill. As for the organization of the speech, the content was rigorously structured. There was still a highlighting of the important points, an articulation between the ideas and a good use of the temporal markers. The theme was well circumscribed in relation to what is asked in the instructions. Regarding the relevance, credibility and coherence in the remarks, we have the same positive elements as in the first presentation of the written production.

Communicative competence

With respect to the S2A topic, her first oral presentation of her written production contained several negative traits related to communicative competence, that is, while being evaluated as an evaluator. Indeed, generally in terms of interaction, we observed that the subject watched, head down, constantly his notes, it closed to the audience. The words came out of his mouth very hard. As for the non-verbal, a lack of spontaneity, a lot of uneasiness were observed and enormously nervousness. Indeed, the subject had several nervous twitches and a fleeting look .. in terms of posture, the subject was rigid and did not move. We could see that he was putting his hand on his head and he closed his eyes. He did not do anything. At the second presentation of the written production while being evaluated evaluator, the subject

S2A had a better interaction, that is to say a better relation with the public. It showed an open to the audience and a concern to arouse the interest of the public. As for the nonverbal, the subject showed a fairly good ease and a greater naturalness. His posture was more adequate and balanced. The words came out of his mouth more easily and he also showed a certain self-confidence. Finally, he had gestures that more or less supported his speech, a more authentic look and he looked at least several of his comrades closest to him.

Regarding the subject S5A, his first presentation of his written production had several negative features. Indeed, in terms of interaction, we observed that the subject was constantly looking at his notes and that he showed a certain indifference to the audience. His non-verbal indicated a lack of enthusiasm and gave the impression of being elsewhere. He spoke and he stopped constantly and he also seemed to look for his words a few times. He only watched his notes and never the audience. It showed some signs of nervousness and discomfort. His presentation was also punctuated with spurious gestures and his eyes were fleeing. In his second presentation, while being in a position sometimes as an evaluator and sometimes as an evaluator, the interaction between this subject and his audience was better. The subject was open to the audience. As for the nonverbal, it is quite remarkable that the nervousness was gone and the subject seems really comfortable in his remarks and he shows a lot of confidence in himself. Finally, we could see that the parasitic gestures had completely disappeared and the subject seems in harmony with his speech and knowing his subject perfectly.

Finally, with regard to the subject S13A, we also observed several negative traits during the first oral presentation of his written production. As for the interaction, that is to say, of its interaction with its audience, we were able to observe a certain opening to the audience but a more or less constant look at the sheets. Regarding the non-verbal the subject seems uncomfortable but it showed enthusiasm and spontaneity. He watched his audience discreetly. The gesture supported his speech but seemed to be a little poorly controlled. However, he had a certain self-confidence and a lot of conviction. At the second presentation of the written production, we noticed that the subject has improved a lot. It looks like he has found his marks. He smiled all the time and scanned his audience from top to bottom. Indeed, the interaction between this subject and the audience was very different. The subject was this time an opening to his audience. He showed a concern to arouse interest and motivation for his audience. He exuded a lot of spontaneity and enthusiasm. As for the non-verbal, the subject had a much better body. It allowed a lot more authenticity and naturalness to appear. He was constantly watching his audience and in a



sustained way. Finally, the few and uncontrolled gestures that appeared during his first presentation had disappeared.

CONCLUSION

In conclusion, we will be able to affirm that the experimental system of teaching / learning French through dynamic assessment has demonstrated that learning subjects with learning difficulties have improved and previously noticed dysfunctions have lessened. The dynamic method is very effective in the development of scriptural skill. It has allowed our audience to update its macro-skills to cross-search a strategy of solving problems related to writing by anticipation, comparison, planning and control and by the same to change and to improve and allowed us to measure cognitive abilities such as the ability to learn, adapt and change behavior through mediation.

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RESEARCH ON THE LEARNING HISTORY AND LEARNING MOTIVATION IN THE INTERNET UNIVERSITY

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ABSTRACT

A hundred-year lifespan requires a shift from the traditional three-stage model (education, work, and retirement) to a multistage model. By providing opportunities to learn at Internet universities, online education can play a role in facilitating continuous learning, job change, promotion, and switching/starting a new stage. Continuous learning motivation is one of the key factors for student success at Internet universities. When working adults undertake Internet university studies in order to relearn and improve their skills, students' self-management is integral to continuous learning motivation. This research clarifies student support methods that encourage the completion of Internet university education. Students' learning history and their completion rates were analysed, and it was found that certain e-mentoring messages could influence students' learning activities and reduce the dropout rate. A preliminary study of the utilisation of wearable devices with biometric student data was tested and future possibilities were discussed.

INTRODUCTION

Various factors such as better medical care, an adequate food supply, a more appropriate environment, and so on will contribute to the extension of the human lifespan. As a result, Japan and many other countries around the world are quickly approaching a hundred-year lifespan (Gratton & Scott, 2016). It is predicted that 50% of the Japanese people who were born in 1997 will live to be centenarians. However, despite the prospect of a hundred-year lifespan, the current retirement age in most cases in Japan is 60 or 65. What, then, do we do for about 40 years post-



retirement? Is it possible to enjoy a comfortable retirement life for that long? For Japan, the answer might be very pessimistic considering increasing social security costs and the younger population's annual decline.

In the context of a traditional lifestyle, the three-stage model is popular (Gratton & Scott, 2016). Given that the three stages—namely education, work, and retirement—occur consecutively, the model might prove difficult to execute over 100 years of life due to a poorly-funded retirement period that is too long or a long working life that yields low wages. We should therefore pursue the multistage life, which involves a series of shorter stages or a mix of traditional working patterns (Gratton & Scott, 2016).

Under such circumstances, online learning is one key factor in accommodating the 100-year lifespan. It enables us to learn while working anywhere and anytime we want. More education leads to better employment and more money. Distance education has a relatively long history. As in any other learning environment, there are advantages and disadvantages involved. One of the biggest issues that affect online learning is students' motivation to learn and the maintenance of that motivation in the interest of encouraging continuous learning.

In this paper, the relationship between student learning history and the student support that online university faculty or university staff provide was analysed, and student motivation was investigated via questionnaire surveys. Finally, issues and possibilities in the context of Internet university were discussed, including the use of biometric student learning data.

LITERATURE REVIEW

Online learning's higher dropout rate is one of its biggest problems. Consequently, for online universities, reducing the dropout rate is an especially important mission. It has been reported that 60% of online students drop out; however, of those who continued enrolment until the final examination, most finished and passed their courses (Simpson, 2006). Another article indicated that 40% of students dropped out of e-learning classes in favour of commuting. Typical dropouts had a rushed or intensive learning style; however, the dropout rate was relatively low among students who studied regularly and consistently (Nodera & Nakamura, 2016). Although massive open online courses (MOOCs) do not constitute formal education, they are globally proliferative, and many people have taken at least one. However, 89% of MOOC students drop out (MOOCs@Edinburgh Group, 2013).

With regard to MOOCs, implementing learner mentorship resulted in a higher completion rate by motivating learners to continue until final achievement (Dhorne et al., 2017). Thus, mentoring students is one possible solution for reducing the

online learning dropout rate. It is important to note, however, that traditional mentoring differs from mentoring online learners. We call this new mentoring concept e-mentoring, and it is defined as a computer mediated, mutually beneficial relationship between a mentor and an apprentice that provides learning, advice, encouragement, promotion, and modelling in a manner that is often boundaryless, egalitarian, and qualitatively different than traditional face-to-face mentoring (Bierema & Merriam, 2002).

RESEARCH QUESTIONS

My research questions are as follows:

What motivates online students to learn?

What e-mentoring instructor/staff actions are effective for continuous student learning?

What venue and time is appropriate for instructor/staff e-mentoring interactions with online students?

Is self-management a key factor in online learner success?

At our online university, e-mentoring is a mentoring process or activity that is founded on the mentor-mentee (instructor-online student) relationship using computer-mediated communication (CMC) such as e-mail, e-portfolio, a learning management system (LMS), chat, video chat, a social networking service (SNS), etc.

INTERNET UNIVERSITY

Tokyo Online University was established in Apr. 2018. It is currently in its second year of operation. There are two faculties: information and management, and human welfare. In each year, about 400 students have joined each faculty. The faculties offer fully online bachelor's degrees with some face-to-face practical elective courses. Roughly 80% of students hold fulltime jobs while a minority attend the university directly after high school. Students range from 18 to 80 years old. They live all over Japan and abroad. Although the university accepts foreigners, all classes are conducted entirely in Japanese.

Classes at Tokyo Online University can be briefly explained as follows. Figure 1 shows that one class unit consists of four 15-minute asynchronous video sessions with preparation and review study, and one quiz session. One class unit reaches about 90 minutes in total. Some classes feature online discussion or a report assignment instead of a quiz.





Figure 1. The structure of a class

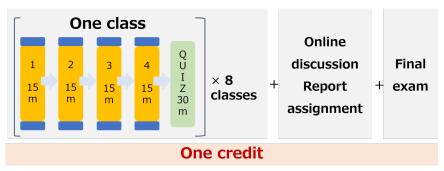


Figure 2. The structure of a credit unit

Figure 2 shows that one credit unit consists of eight class units, online discussion, a report assignment, and a final examination. Tokyo Online University uses an academic quarter system. Most courses open twice a year.

Figure 3 shows the special class delivery pattern that was used in the first term of 2019. Students can take every class from the first week of the first term. The usual delivery period differs from this pattern. This pattern only applies to this course, which I analysed in this paper in terms of student learning history and the student support that the instructor provided. This is an omnibus course, and the order of classes are independent of each other. One term consists of seven weeks of class delivery and one week of final examination. Students can take the online final exam during a week of their choice.



	1 st quarter, 2019									
	1W	2W	3W	4W	5W	6W	7W	8W	9W	
1	10/Apr~7/May									
2	10/Apr ~7/May									
3	10/Apr ~14/May									
4	10/Apr ~14/May									
5	10/Apr ~21/May									
6	10/Apr ~21/May									
7	10/Apr ~29/May									
8	10/Apr ~29/May									
Final exam								29/May- 7/Jun	Addition al 8/Ju- 13/Jun	
Evaluation									8/Jun- 17/Jun	
Grades released										21/J

Figure 3. The special class delivery pattern

LEARNING HISTORY

Figure 4 shows course completion rates for the first term of 2019 in which more than 800 students registered. This course is a liberal arts class that is mandatory in both faculties. In Figure 4, in the left bottom portion, 1-1 means the first video in the first class unit. The 1-1 video was finished by 790 students, and 92% of those finished the remaining three videos in the first class unit. Figure 4 shows that from the first to the fourth class, 3% to 7% of students dropped out or stopped learning without finishing each class unit. Once students reached the fourth class, however, they completed the course.



Figure 5 shows a completion rate comparison by final grade. Grades S, A, B, and C are passing grades, and grade F indicates failure. Students who lost credit after taking the final examination had an about 90% completion rate.

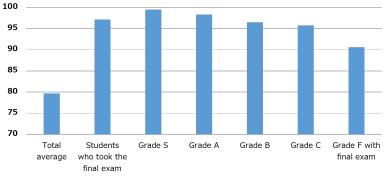


Figure 5. The final completion rate

Figure 6 shows all students' average weekly progress (%). The first term incorporated several major Japanese holidays in the third and fourth weeks. The red line that can be seen a little above 14% marks the average completion rate goal for one week since there are seven weeks over which student work is valued at 100%.

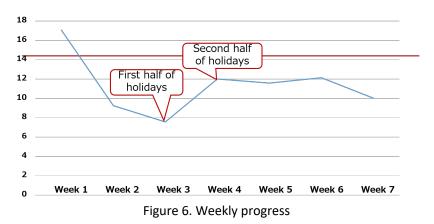
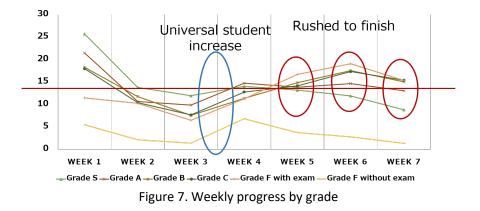


Figure 7 shows each student's average weekly progress (%) for each grade. In the third and fourth weeks, all students' average weekly progress increased. During the last three weeks, students who took the final examination and obtained F (fail) grades, rushed to finish classes when compared to other groups.



STUDENT SUPPORT

Table 1 lists first-term student support. Week 0 refers to the week before the course started. During Week 0, instructors and mentors sent greetings to their students. In Week 4, instructors sent encouraging messages to delayed students only. In Week 5, university staff made calls or sent paper mail to students who had not logged in to any school system in the past four weeks. Finally, during Weeks 6 and 7, teaching assistants sent encouraging messages to registered students.

Timeline	Who	Whom	What	
Week 0	Instructor	Course participants	Greetings	
Week 0	Mentor	Students in charge	Greetings	
Week 4	Instructor	Delayed students	Encouragement	
Week 5	Staff	Students with no logins	Encouragement	
Week 6	Teaching assistant	Course participants	Encouragement	
Week 7	Teaching assistant	Course participants	Encouragement	

Table 1. Student support

Figure 8 demonstrates all the e-mentoring points that were previously explained in Table 1. During the fourth week, which spans Weeks 3 to 4, all students showed increased learning progress. Instructors' encouraging messages during Week 4 may have enhanced students' motivation and positively affected their behaviour.



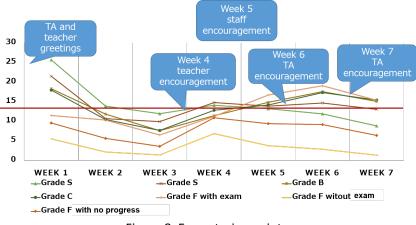


Figure 8. E-mentoring points

LEARNING MOTIVATION

Learning motivation was surveyed in two different types of students: the traditional commuter university student and the online student who does not attend face-to-face classes. These surveys were preliminary studies.

The learning motivation survey for commuter university students

This survey was conducted with the participation of eight senior students. There were five questions. The results are as follows:

'Feel happy while learning?' – Avg. 3.25 (from 1 *not very happy* to 5 *very happy*) 'Concentration while learning?' – Avg. 2.75 (from 1 *poor concentration* to 5 *very good concentration*)

'Where do you best concentrate on learning materials?' - Library and cafe (63%)

'What concentration techniques do you use?' – With music or radio (75%)

'What disturbs your learning?' - Smartphone (88%)

The learning motivation survey for online university students

This survey was conducted with the participation of eleven sophomore students who performed relatively well academically in their freshman year. They received the following prompt: 'Please tell us your own ideas and points to sustain continuous learning for successful study.' Their answers were written in free format via web survey. Using KH Coder 3, quantitative text analysis was performed on the words that the students chose in their free format responses (Higuchi, 2016).

Figure 9 shows the co-occurrence networks that KH Coder 3 produced. It represents a network diagram in which words with similar appearance patterns and high degrees of co-occurrence are connected by lines. Bigger circles mean higher frequency. Some words that were shown to be closely related include 'time', 'work', and 'balance'; 'plan', 'build', and 'schedule'; 'exchange', 'SNS', and 'learning'; 'I', 'think', and 'continue'; etc.

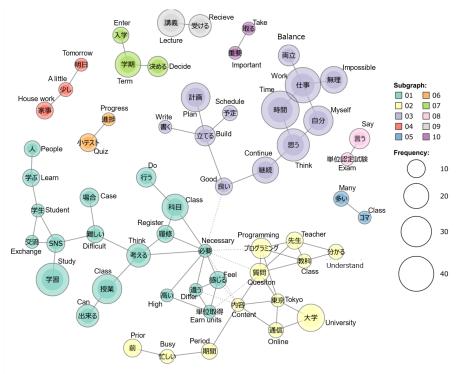


Figure 9. Co-occurrence network analysis

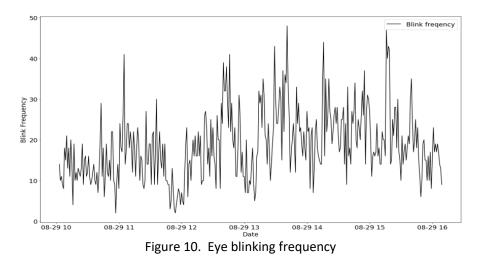
BIOMETRICAL WEARABLE DEVICES

This is a preliminary study of biometrical wearable devices for online learners. These devices are not designed to be used for evaluating student performance; rather, they enable students to ascertain their current biological status and conditions. As a result, students are able to reflect and reorganise their learning activities based on biometric data. They can choose purpose-appropriate devices to improve their self-managed, self-directed, and self-regulated learning skills. This research tested three devices for future use and integration into the learning management system and its applications.



The glasses-type measurement device

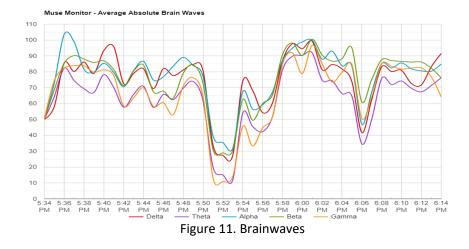
This glasses-type device can measure eye blinking frequency as well as three-axisacceleration. Figure 10 presents the test data for per minute blinking frequency. It is said that greater concentration levels produce less blinking (Uema & Inoue, 2017).



The headband-type brainwave device

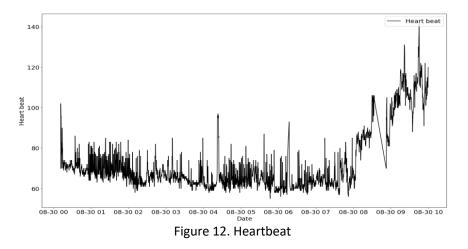
The headband-type device can measure brainwaves (EEG) as well as three-axisacceleration. This simple, lightweight device is not intended for medical use. Its features are suitable for meditation, and it can also be used as a research tool (Surangsrirat & Intarapanich, 2015). Figure 11 presents test data that shows the brainwave of each frequency. The Delta wave is represented from 1 to 4 Hz, the Theta wave from 4 to 8 Hz, the Alpha wave from 8 to 14 Hz, the Beta wave from 14 to 38 Hz, and finally, the gamma wave from 26 to 70 Hz. The Beta wave would be prevalent in the presence of a stressor. Meanwhile, when a subject is relaxed, the alpha wave would dominate (Kovacevic et al., 2015). Since brainwaves vary among students, it is said that in the context of learning, it is more effective to estimate a situation by recording individual characteristics rather than performing an analysis using big data (Qu et al., 2018).





The watch-type activity meter

The watch-type device can measure heartrate as well as three-axis-acceleration. Since the device is not designed for medical use, it cannot yield precise heartbeat data. Figure 12 presents test data for per minute heartbeat. It is said that if you are nervous, heartrate variability will be reduced; however, it was difficult to increase the device's accuracy with regard to measuring heartrate variability.



FINDINGS

Based on the trial involving the Internet university's online course, appropriate messages (timing and content) from instructors, university staff, or teaching



assistants have the potential to reduce the dropout rate. Some Internet university students prefer more communication from instructors while others prefer less. As such, a careful, thoughtful design is needed to execute appropriate student-teacher communication via messages. Too many messages will reduce student motivation, and too few messages will fail to yield improvements. Suitable communication frequency, timing, and content are required to reduce the dropout rate.

Based on the questionnaire survey results, high-performing online learners maintain an appropriate work-study-private life balance. They manage their "time" by creating a sensible schedule. They also utilise SNS very well to share their learning experiences and complaints, e.g., 'This course is too difficult', etc.

Biometrical data can aid students' self-management. The glasses-type and headbandtype devices have significant potential, but the watch-type device is not suitable for capturing data during learning activities and is better suited to tracking exercise and sleep. However, the watch-type device may be useful when used simultaneously with other devices.

DISCUSSION

Questions have been raised about what types of support, other than messaging, can be used to motivate students to learn. Messaging as e-mentoring is one solution; however, more solutions need to be pursued to increase student motivation. If freedoms and constraints are balanced, students will be able to demonstrate their abilities. It is obvious that continued support for students will spoil their willingness. There should be an appropriate way to reduce scaffolding for each student. This presents a big challenge for Internet universities. One possibility is to give students the opportunity to customise their preferences such as how often they receive messages from instructors, etc.

Figure 13 shows a screen capture of current students' learning progress. Each course is listed and consists of eight or sixteen classes. Blue circles indicate that the class was completed by the deadline, orange circles indicate a delay in completion, green circles indicate current delivery, and grey circles indicate before delivery. Students can also check attendance rates for each course. Students with attendance that is less than 66% will not be eligible for the final examination for that class.

Figure 14 displays a future (not yet implemented) student screen that shows each student's concentration level according to wearable device data. Based on students' private biometric wearable device data, they can view average flow rate (high-level concentration), concentration, and distraction during class study. The top of the figure shows the overall average concentration level for all courses, and the right side of the figure shows the average concentration level for each course.





Figure 13. The current student screen

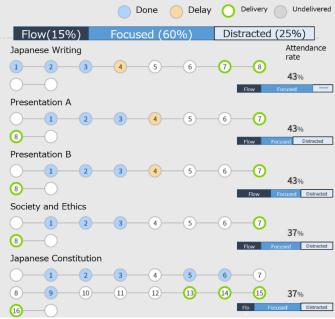


Figure 14. The future student screen



ACKNOWLEDGEMENTS

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THE PROMOTING AND INHIBITING FACTORS OF THE STUDENT`S THESIS PROCESS DURING THE SOCIAL AND HEALTH CARE STUDIES

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ABSTRACT

The aim of the studies at the universities of applied sciences in Finland include basic, vocational and free-choice studies, as well as professional training and thesis. The purpose of this practice-based research is to study the factors which promote and inhibit students' thesis process during the social and health care studies from the perspective of students, and their supervisors from the faculty and from workplace using multiple cases and data acquisition methods. The central research question was to find out the factors which promote and inhibit the student's thesis process. The data was collected from sixteen students and three supervisors from the faculty of social and health care, and two supervisors from workplace either by interviewing or by questionnaire. In addition, there was data collected during the EAPRIL2019 Conference Roundtable session where fourteen participators discussed in three subgroups. One subgroup looked the thesis process from the student's, the second teacher's and the last subscriber's perspective. The discussions and open questions were analyzed qualitatively using the thematic analysis. We conclude that thesis is a complex task that has a discrete beginning and ending, and it requires considerable professional construction and learning to be accomplished. The students engage in the process holistically, with an interplay of thoughts, feelings and actions. There are three principles (searching, holistic experience, uncertainty in the initiation stage) in process, which can be perceived widely in other learning processes. The principle of uncertainty included six corollaries: process, formulation, redundancy, mood, prediction and interest.



INTRODUCTION AND BACKGROUND

The purpose of this EAPRIL 2019 Conference Proceedings paper is to point out the conducive and critical factors and elements during thesis process in the field of social and health care sector in higher education. We developed the processes of two Finnish universities of applied sciences (Lahti and Saimaa), which merged at the turn of the year 2019, establishing the new LAB University of Applied Sciences (LAB). This "Enhancing work-integrated process for graduation theses in the social and health care" study (Figure 1.) is a part of the "Integrating Education and Work in Higher Education (WORKPEDA): Development of professional expertise, agency and generic skills" research project (https://www.tyopeda.fi/eng) which is based on the Model of Integrative Pedagogy (Tynjälä, Virtanen, Klemola, Kostiainen, & Rasku-Puttonen, 2016). The aim of the WORKPEDA project is to create new models for developing working life skills in students, for support and guidance in work-integrated studies, for renewal of curricula from the work perspective, and for integrating research, development and innovation into studies.

The first part of this paper is based on the "Group Counseling and Group Support in the Thesis Process" Lahti University of Applied Sciences (Lahti UAS) pilot project implemented by Lahtinen (2017), and our article published in the online Journal of the Libraries of the Finnish Universities of Applied Sciences (Väänänen & Lahtinen, 2019). The latter part of the paper is based on the previously unpublished empirical data, and the notes from the group discussions during the "Monitoring and Evaluating Students' Learning Processes" EAPRIL2019 Roundtable Session.

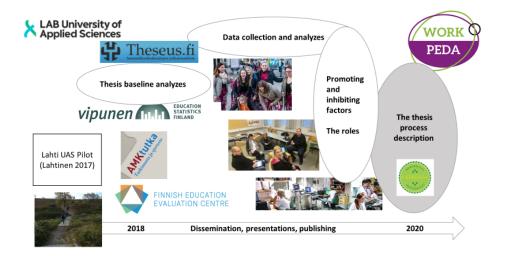


Figure 1: The road map of the enhancing the work-integrated thesis process in social and health care studies at LAB University of Applied Sciences, Finland.



Bachelor studies in Finnish Universities of Applied Sciences

The aim of the Bachelor studies in Finnish Universities of Applied Sciences (UASs) is that the graduate has

- wide-ranging practical basic knowledge and skills, as well as theoretical criteria, to work in the field of expertise in one's own field
- ability to monitor and promote the development of one's own professional field
- the conditions for developing one's own skills and lifelong learning; and
- adequate communication and language skills for the tasks in their field and international activities and cooperation.
- (Government Degree on Universities of Applied Sciences 1129/2014, 5 §).

To the studies leading to the Bachelor degree include basic, vocational and freechoice studies, as well as professional training and thesis (Government Decree on Universities of Applied Sciences 1129/2014, 2 §).

The bachelor thesis is a last step towards the graduation in higher education and the student develops his/her skills useable for future work during the thesis process (Nouri, Larsson & Saqr 2019; Roca, Gros & Canet 2018). Lundgren and Robertsson (2013) have studied nurses and e.g. their self-perceptions of the knowledge and skills they had obtained while thesis process, their experience of the extent of transfer and utilization in their current work. Almost everyone (37/42) had many examples of the good practical application of the knowledge and skills.

The student will also become conversant with the principles of research and development activity with the thesis process. Toraman, Hamaratçilar, Tülü and Erkin (2017) have studied the effect of writing a bachelor's thesis on nursing students' attitudes towards research and development in nursing. According the results of the study writing a thesis has positive influence on nursing students' attitudes towards and awareness of research and development in nursing.

In Sweden the researchers Bjerså, Shams, and Olsén (2019) studied by qualitative interviews undergraduate physiotherapist students' experiences of the examination sessions of their bachelor's thesis. The researchers found three categories after analysis: Beneficial, what means, that the students saw the examination session as a good learning experience. The students in this category were also interested in further studies. The other category was named Demotivating. The students in this category e.g. had experiences of unfairness and unnecessary aspects. The third category was Improvement, were propositions were made based on the students' experiences of take the exam session with devastating and beneficial elements. One of the conclusions in this research was that the students could see examination



sessions like the insight into scientific work, and as a forum with possibilities for develop of their thesis.

Mäenpää (2014) studied in Finland public health nurse student's professional development in thesis process. Personal growth by improvement of verbal skills and independent skill to work was described. The students appreciated their working life partners. They had been supporters of professional development of students. The students also described increased of knowledge to obtain information and enhanced knowledge of the thesis topic. The understanding of the core task of a profession was deeper after the thesis process. There were also challenges in the thesis process. The students told that different timetables between them and working life partners and different perceptions of commitment were challenging. The students brought up that it should be clearer operating principles and the exact scheduling, so it would be more effective to work in multidisciplinary group.

Thesis and thesis process at the Faculty of Social and Health Care in Lahti UAS

In Lahti UAS the bachelor's thesis the student deepens his/her know-how in his/her field of specialization and shows that he/she can be capable of putting the theoretical knowledge and skills into practice. (LAB University of Applied Sciences, 2020.)

The aim in the thesis process is to develop the student's ability to apply the acquired theoretical knowledge to the problems and phenomena of the working life. In many fields, the thesis is done in partnership with the world of work and the thesis is also a good opportunity for the student show to employer what he/she has done. The student can solve problems, organize and perceive wholes and work interactively, tenaciously and systematically. Through the thesis the student works according to the practices of his/her own line of trade. Working during thesis process helps to enhance gather information and evaluate sources critically. The student develops his/her ability to report on the work orally, in writing and visually. (Lahti University of Applied Sciences, 2019.)

At LAB University of Applied Sciences, the bachelor's thesis can be either a research-based project or a so-called functional thesis project. The aim of the thesis project is to broaden and deepen the student's professional expertise and provide with expertise needed to operate in development tasks in student's field. Thesis project improves the student's information retrieval and problem-solving skills. The thesis can be conducted as a project commissioned by an external organization or as a part of a development project. At its best, the thesis project can serve as a pathway to the student's career. (LAB University of Applied Sciences, 2020.)



The number of the theses in the social and health care sector at Lahti UAS in the period 2016 - 2019, and their distribution to the work-related and those which are not, is presented in table 1. There have been increasing number of thesis during the last four years period in the social and health care sector at Lahti UAS. Most of them (71-87%) have been work-related which requires that thesis should have a written agreement between the two-contracting party, and that agreement must be made before starting the process. A thesis is work-related when one or more of the following criteria of the data collection manual published by the Finnish Ministry of Education and Culture (e.g. OKM:n ammattikorkeakoulujen tiedonkeruukäsikirja 2016, 2016, 58) is met:

- Working life pays either the UAS or the student to do the work.
- A representative of the working life has been appointed supervisor for the thesis.
- The purpose of the work community is from the outset to utilize the results of the thesis in their own activities.

Table 1.

The number of theses and the distribution (%) to the work-related and not in the social and health care sector at Lahti UAS in the period 2016 - 2019 (2016 - 2018 Vipunen - Education Statistics Finland; 2019 unofficial data).

Year	Work-related	Not work-related	All
2016	182 (71%)	76 (29%)	258
2017	290 (87%)	42 (13%)	332
2018	344 (84%)	64 (16%)	408
2019	227 (81%)	52 (19%)	279

Thesis Process at the Faculty of Social and Health Care

There has been a year-long bachelor's thesis project the Faculty of Social and Health Care in Lahti UAS where the thesis counseling model in multidisciplinary groups was developed in co-operation with students and world of work. Since this project, the multidisciplinary cooperation in social and health care studies has been important in groups where students meet their supervisor throughout the thesis process. The thesis process at Lahti UAS to the end of the year 2019 is presented in figure 3, and the details of the process at the Faculty of the Social and Health Care are opened later in the text.



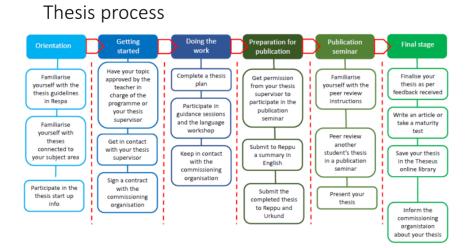


Figure 3: The thesis process in Lahti UAS to the end of the year 2019.

Orientation and information

First step in the thesis process is the thesis start up info the student must participate. The student can choose the thesis topic e.g. from Lahti UAS ongoing projects or topics that have emerged from project and work-life connections. The thesis group on social and health care approves the topic and appoints a supervisor for the thesis. Students will be sent an e-mail about the thesis supervisor.

Getting started, doing the work and preparation for publication

The student will get guidance for his/her thesis in his/her supervisor's own group, where he/she get peer support from other students. Co-operation also with the client /a commissioning organization throughout the thesis process is essential. The student can present the thesis work plan in this group upon agreement with his/her supervisor. The student discus with his/her supervisor when the thesis is ready for the release publishing seminar. Then he/she sends the thesis by e-mail to the supervisor, the second reviewer and peer reviewer at least two weeks before the publication seminar. The student uploads the thesis in Turnitin in Moodle (Reppu) platform of his/her thesis supervisor.



Final stage

The student can complete the maturity test when the thesis is ready for presentation and his/her supervisor gives permission to take the test. The maturity test is a written release, article or essay. Publication is not a prerequisite for articles. Alternatively, students can take a conventional maturity test in a supervised exam setting if preferred. Students save an electronic copy of the approved thesis including the abstracts (in PDF format) in Theseus, the open repository of Finnish universities of applied sciences after having obtained permission from the supervisor. The thesis is evaluated by the supervisor and the other evaluator (teacher).

PURPOSE AND RESEARCH QUESTIONS

The purpose of this practice-based case study is to study the holistic model of the thesis process from the perspective of students, and their supervisors from the faculty and from workplace using multiple cases and data acquisition methods. The two main research questions were:

- 1. Which factors promote the student's thesis process
- 2. Which factors inhibit the student's thesis process

METHODS

Seven students and three supervisors from the faculty of social and health care, and two supervisors from workplace were interviewed individually. In addition, nine students answered to the questionnaire. The discussions and open questions were analyzed qualitatively by using the thematic analysis (Braun & Clark, 2006) driven by the theoretical and analytic interest based on Kuhlthau's (2004) theory of Information Search Process Model (ISP). In addition, the data to the research questions were collected during the 45 minutes "Monitoring and Evaluating Students' Learning Processes" Roundtable Session during the EAPRIL2019 Conference where fourteen participators discussed in three subgroups. One subgroup (n=4) looked the thesis process from the student's, the second (n=6) teacher's and the last (n=4) subscriber's perspective. They wrote the promoting and inhibiting elements and factors to the Post-it Notes and after 15 minutes of co-working they share their results to the other roundtable members. In the end of each subgroup presentation there was a conclusion of the topics which was documented in writing by the senior researcher. The data collection and the number of the informants were presented in figure 2. The results are presented as user-generated content by WordArt.com.



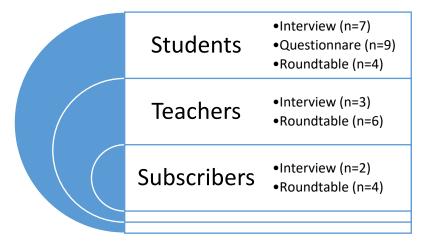


Figure 2: The data collection and the number of informants.

RESULTS

There were three common elements of experience identified during the thesis process: the affective (feelings), the cognitive (thoughts) and the physical (actions). Central to this process is the notion that uncertainty, both affective and cognitive, increases and decreases within it.

The following three themes, which promote the student's thesis process were identified

- Collaboration with the subscriber, and between the other students (multiprofessionals thesis groups)
- Thesis supervisor (support and feedback)
- The instructions and chart of the thesis process

There were identified three themes, which inhibit the student's thesis process

- Lack of time
- Communicational ambiguities
- Unclear roles



In the EAPRIL2019 Roundtable session the participants from across the Europe gave valuable insight on how they see the promoting and inhibiting factors from both student's, teacher's and subscriber's perspective which are presented in figures 4 and 5. On the top is the student, and down in the left corner the teacher and the subscriber in the right. The same elements which were mentioned to be promoting were mentioned to inhibit if there is a lack of them e.g. time, feedback, communication, peer students, monitoring, engagement, motivation, personal interests.

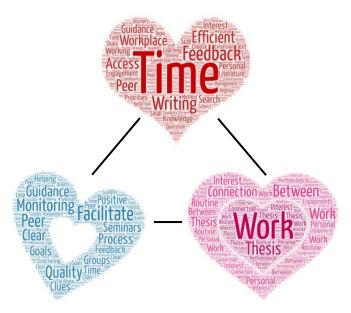


Figure 4: The user-generated content of the factors which promote the student's thesis process from student's, teacher's and subscriber's perspective by WordArt.com.





Figure 5: The user-generated content of the factors which inhibit the student's thesis process from student's, teacher's and subscriber's perspective by WordArt.com.

CONCLUSION AND INTERPRETATION

The mission of Finnish UASs is to provide higher education for professional expert jobs based on the requirements of working life and its development. There are annually over 27 000 theses implemented in Finnish UASs. During the last years (2016 - 2018) three out of four (76%) have been work life integrated which means annually nearly 300 000 ECTS credits. (Vipunen - Education Statistics Finland.)

Thesis is a complex task that has a discrete beginning and ending. It requires considerable professional construction and learning to be accomplished. It constructs a learning process in which a student is seeking meaning in the course of knowledge (co-)creation. There were identified six stages (initiation selection, exploration, formulation, collection, and presentation) during the thesis process. The students engaged in the process holistically, with an interplay of thoughts, feelings and actions. There were found three general principles (searching, holistic experience, and uncertainty in the initiation stage) in the process. The principle of uncertainty included six corollaries: process, formulation, redundancy, mood, prediction and interest. At LAB University of Applied Sciences there will be annually over 740



theses in the new Well-being Unit and therefore it is very important quality factor that the thesis process is clearly identified and well documented.

Lahti area needs more skilled, educated workforce: skilled workers, residents and entrepreneurs in the region. Along with strong and employing industry and service industries, Lahti area needs workers who have completed Master degrees in new growth areas, such as well-being. In addition, there is another thesis development project going on at the same time in Lahti area. The main goal of that Gradukiihdyttämö (http://www.lahdenyliopistokampus.fi/gradu -project kiihdyttamo) is to create and pilot the Urban Growth Activity Model, which will accelerate the completion of the Master's degree and the smooth transition of students to the local working life. The operating model significantly changes the way and depth of cooperation between companies and university students in the large Lahti area. The students of Lappeenranta University of Technology and the University of Helsinki will be attached to Lahti business life during the studies, which will require the creation of completely new career guidance elements. The business model helps to make university and business co-operation more systematic, while understanding the need for companies' skills to grow.

The purpose of this practice-based case study was to study the holistic model of the thesis process from the perspective of students, and their supervisors from the faculty and from workplace using multiple cases and data acquisition methods. It will benefit anyone involved directly in the knowledge creation and learning processes (students, supervisors, researchers, practitioners and academic libraries) to understand more the holistic information seeking process during the thesis process, and the factors which promote and inhibit the student's thesis process. The three principles and six uncertainties can be utilized extensively in other professional learning processes and educational practices than thesis, too. Every student does during her or his studies some kind of learning task in one or in another way, where she or he and school personnel as well as the supervisors at the work places can use the results of this study. In the near future the thesis process in LAB University of Applied Science will be formulated based on this WORKPEDA research project.

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INTEGRATING MATHEMATICS AND GEOGRAPHY IN AN EVERYDAY LIFE CONTEXT FOR PRIMARY SCHOOL STUDENTS

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ABSTRACT

Preparing students for lifelong learning is an aim in primary and secondary education (Platvorm Onderwijs 2032, 2016). This meaningful future based education asks for integrating school subjects rather than teaching separate school subjects (Gresnigt, 2018). Integrating school subjects here is considered as changing perspective from one domain to the other. Hereby teachers need adequate support (Hotze & Keijzer, 2017). This research focuses on mathematics and geography. It aims at learning students asking relevant questions about their own environment using the perspective of both domains and answering these questions using domain specific strategies from both mathematics and geography.

The underlying research question which is answered in this paper is: What is characteristic for a learning environment supporting primary school students integrated learning in mathematics and geography? Two experimental settings revealed that students avoid using and developing mathematics and geography, if there is no clear focus on these domains, from both the teacher as the context itself.

INTRODUCTION

Living in today's world asks for coping with complex problems (OECD, 2018). Not only should teachers prepare students with enough knowledge but also teach them how to develop as a person and how to participate in a rapidly changing society. Teachers should prepare them for lifelong learning and to prepare them for the future means they should be able to learn, to be able to make things, to research, to be able to work together and to communicate (Platform Onderwijs2032, 2016). This shift from knowledge based learning to more competence based learning has specific consequences for the curriculum. Teaching for the future should advance an inquisitive attitude from students, learn them to ask relevant questions about their environment and teach them strategies to find the answers to these questions. This meaningful future based learning asks for integrating school subjects. Many primary schools made a start doing so, working with projects or themes. The danger in doing so, is that they forget to include domain specific perspectives in these projects. New curricula require integrated learning with foci from various domain specific perspectives (Curriculum.nu, 2018).

In this paper we focus on a research of integrating the domains mathematics and geography, both domains focus on the fast changing world around us. 'Geography is a vital subject resource for 21st century global citizens, enabling us to face questions of what it means to live sustainably in a interdependent world' (International Geographical Union, in Blankman & Bakker, 2017, p. 42). Mathematics used in daily life has changed due to machines doing most of the calculations, availability of huge amounts of (mathematical) data and various new representations generated by digital tools (Gravemeijer, Stephan, Julie, Lin, & Ohtani, 2017).

Mathematics and geography are omnipresent in daily life. Problematizing this daily life environment in a specific way may result in a rich learning environment for both domains. In the study described in this paper we present two educational designs as learning environments for geography and mathematics. In analysing the learning environments we will focus on how these environments stimulate teachers and students changing perspectives between the two domains. Doing this we hope we will contribute to more meaningful learning in mathematics and geography.

BACKGROUND

Crossing boundaries between (traditional) school subjects is considered typical for 21th century learning (Akkerman & Bakker, 2011; Platvorm Onderwijs 2032, 2016). Integration between traditional school subjects has been studied before, for example in the MACE project (Brinkman, Miedema, & Schreuder, 2017) and in integrating mathematics and science (Hotze & Keijzer, 2017; Gresnigt, 2018). In this study we focus on the subjects mathematics and geography. In the first research stage we elaborated on domain specific characteristics for the two domains.

Mathematics

Mathematics is a human activity, which can be typified as mathematizing meaningful situations (Freudenthal, 1991). These meaningful situations could come forward from daily life experiences, but also from mathematics itself. The mathematical activity which results from mathematizing includes modelling and representing, algorithmic thinking and mathematical problem solving, Moreover, the process of mathematizing on the one hand results in mathematics knowledge and



skills in various subdomains, but on the other hand emphasises subdomains' intertwinement (Treffers, De Moor, & Feijs, 1989).

Geography

The school subject geography 'is a way of looking at the world that focuses our learning on what places and the environment are like, why they are important to us, how they are changing and how they might develop in the future.' (Catling, 2010, p. 75). In our daily life we are becoming more and more aware of how we are affecting the environment, for example using resources more wisely, and how we are global citizens. Geography encompasses all of this and teaching geography is concerned with knowing about and understanding the earth and developing the skills to do so. This is called geographical awareness. Geographical awareness consists of (1) acquiring a geographical worldview, (2) acquiring knowledge and insight in environmental issues and (3) learning to use a geographical approach (Van der Vaart, 2001, in Blankman & Bakker, 2017).

A student, who wants to know for instance where one in his country can find high levels of air pollution, needs to ask questions like: What is it? Where is it? How did it come to be like this? How is it changing? How does it compare to other similar or different examples? (Catling, 2010, p. 79).

Two perspectives combined

Observing the world with these geographical questions in mind, is just one possible perspective, because at the same time students for example can take a mathematical perspective. The objective in this research is clarify how students can be stimulated in relevant contexts to change between these two perspectives. This changing of perspective includes taking a geographical or mathematical point of view. But that is not all. Students should also be able to use geographical and mathematical skills and knowledge in reading and interpreting texts and domain specific representations, like maps or schemes.

Overview

The metaphor of changing perspectives, is only helpful when the domains' main characteristics are established. We formulated these characteristics from literature and shared the findings in a Delphi study with teacher educators with expertise in one of the two domains. 'The Delphi method is a forecasting process framework based on the results of multiple rounds of questionnaires sent to a panel of experts. Several rounds of questionnaires are sent out to the group of experts, and the anonymous responses are aggregated and shared with the group after each round. The experts are allowed to adjust their answers in subsequent rounds, based on how they interpret the "group response" that has been provided to them. Since multiple rounds of questions are asked and the panel is told what the group thinks as a whole, the Delphi method seeks to reach the correct response through consensus.' (Twin,



2019). The Delphi-method is not a quantitative method, the number of experts is irrelevant, however the experts should be as diverse as possible. We established this diversity by interviewing 18 teacher educators from different universities of applied sciences in the Netherlands.

The teacher educators were asked what the characteristics, constrictions and challenges are for mathematics and geography in primary education. This domain specific survey under mathematics and geography teacher educators formulating characteristics, constrictions and challenges for the domains mathematics and geography revealed that teacher educators teaching these domains were hardly able to comment on the other subject and its characteristics. A consequence may be that student teachers probably are unable finding a model in their institute for integrating domains (Rijborz, 2018). Table 1 summarizes theoretical notions for both domains together with educators' reactions on 'their' domains in primary education. When asked about their opinion about integrating the two domains most of the teacher educators said that before integrating the subjects students should have more subject knowledge and teachers need more support to help their students in order to be able to change between the two perspectives of mathematics and geography.

Table 1. Characteristics, constrictions and challenges for mathematics and geography in primary schools

	MATHEMATICS	GEOGRAPHY
CHARACTERISTICS OF THE SUBJECTS	Mathematising everyday life context, stimulating the mathematical attitude and negotiating about meanings.	Developing geographical awareness and learning geographical skills.
CONSTRICTIONS IN THE LEARNING PROCESS CHALLENGES IN PRIMARY SCHOOLS	Learning to see the world with mathematical perspectives. Coping with differences between students. Unleashing from the textbook and focus on reproduction. Seeing mathematics as a domain for inquiry based learning and problem solving.	Learning to ask geographical questions, using different scale levels and perspectives. Unleashing from the textbook to change from reading comprehension to more meaningful learning for students by using their own everyday life context and actuality.

In this research we will focus on the challenges in both domains. We thus take what is considered problematic for both domains as a start. Doing so we replace teaching directed by a textbook by teaching which starts in a daily life context. Changing between the perspectives of the two domains is proposed to contribute to more meaningful learning and growth of domain specific knowledge.



RESEARCH QUESTIONS

This research focuses on supporting teachers in integrating the domains mathematics and geography. Integrating school subjects should prepare students for the future. Teachers find it difficult to achieve this in their teaching, for example because they lack flexible learning strands knowledge. Moreover, they are unable connecting domain knowledge to everyday life contexts. In this study we search for a rich learning environment helping students to learn about mathematics and geography. In doing so, we will answer the following questions:

- What is characteristic for a learning environment supporting primary school students integrated learning in mathematics and geography?
- What are domain specific characteristics supporting integrated learning in mathematics and geography?

METHOD

This research focuses an educational problem in teachers' professional development, namely the difficulties these teachers experience in integrated teaching mathematics and geography. Here design research is an appropriate research method (Van den Akker, Gravemeijer, McKenney, & Nieveen, 2006). Design research consists of one or more research cycles wherein a prototypical design is developed and tested, and where next results from try-outs are analyzed in order to adapt the prototypical design. Field notes and results of students from the designs are analyzed from above mentioned perspectives, to thus determine to what extend it meets the set expectations.

Procedure

An initial design was constructed from initial design principles. The problem should be open and elicit the use of mathematical and geographical notions (see below for more details). We hypothesized students would use these notions correctly in their work. Testing our hypothesis we analysed student work, where we established how students show their perspective from both mathematics and geography. More precisely we scored the use of 'measurement', 'scale', 'modelling', 'climate and landscape', 'perspective', and 'geographical objects'. We scored 0 if the use was insufficient, 50 if the use contained a number of acceptable aspects (but not all), and 100 if the use was correct. The researcher with expertise in mathematics scored the mathematics aspects in the student work, the researcher with expertise in geography scored the geography aspects. Both researchers, this paper's authors, discussed all scoring until full agreement was reached.

We adapted our design principles using test results from the first try. In the second round we emphasised the students providing mathematically and geographical correct answers. Moreover, we established that the second design should be more



meaningful for students, in the sense that it relates to common experiences for students (see below for more details). We hypothesized students in the second design in their work would show more mathematical and geographical notions.

The scoring procedure for the second design was equal to the one used for the initial design. For both designs we calculated the mean score per aspect, e.g. a mean score for 'measurement'. These mean scores can be interpreted as the percentage of students showing the aforementioned foci.

Instruments and data

In this study we ran through two design research cycles. In the first cycle we presented an open problem that was familiar for the students. In the weeks before the design was tested they had already learned about all the plastic in the oceans. In the design we asked them to elaborate on the problem by designing an island from all the plastic in the oceans and seas. In the second cycle we also presented an open problem that was familiar for the students. We related this second educational design to the theme of the 'kinderboekenweek' (children's book promotion week). Both cycles were designed for 10 to 12 year old students (Dutch grade 7 and 8).

TWO DESIGNS

Design 1

We designed a context from everyday life where mathematics and geography meet. Students were asked to create an island from waste plastic in the oceans. We provided several ideas for working on the problem from a geographical perspective and from a mathematical perspective (Figure 1). The problem and the ideas, formulated as hints, were presented on a poster. The teachers were free in introducing the problem, but were stimulated to keep students' pre-knowledge in mind.

Design your own island

You are going to design your own island. Your island will be made of all the plastic soup floating in the Great Pacific. The island is your creation but must be realistic. Designing your island you must realise that you should think about a name, a map, the landscape, roads, work, houses, etc. It's your island so design whatever you like but we also give you some hints. You will present your island on a poster. In that way you can convince others that it should really be build.

Hints:

- 1: How big is your island?
- 2: What can we find on your island?
- 3: Where is your island located?
- 4: What will your island look like?
- 5: How does your island look like on a map?

Figure 1. Assignment in first design

The students loved the assignment. They developed all sorts of fantasy islands. However, in expressing their creativity most students did not use the hints on the poster. Several students did not refer to the plastic their island should be made of. As a consequence in the developed islands and explanations we did only observe little perspectives from mathematics and geography (Table 2).

Table 2.	Student coor	a in	first	dagion
Table 2.	Student score	es m	msı	design

	measurement	scale	modelling	climate and landscape	perspective	geographical objects
design 1	5,00	6,25	73,75	17,50	58,75	35,00
(N=40)	(15,191)	(20,215)	(39,203)	(26,675)	(40,648)	(44,144)

Reflection

Although we stimulated a focus from both domains, a first analysis shows that students consider the task as creating a fantasy island only. They hardly consider geographical and mathematical notions, except for modelling (Figure 2). Nearly all islands were too big. Students did not use the context of plastic. Even more, teacher interventions pointing at the hints on the poster rather seems to disturb student's creative activity than enhance geographical or mathematical reasoning. Moreover, teachers are unwilling or are unable to critical reflect on student work, making the activity focused on making a drawing only.



Figure 2. Students work: island with flag and an army (*leger*), airport (*vliegveld*), roads, mosque and sport fields. [Scored:0-0-100-0-50-0]



Design 2

We used experiences from the first design in constructing a second one. Here we changed some of the design characteristics. In the second design the problem should still be an open problem, without any domain specific instructions. Again we would provide hints. However, we emphasized for the students that their work should be geographical and mathematical correct.

In the second design students were asked to design a cycling trip. The idea was that students have to think of how many kilometres you can cycle in a day, taking for example the landscape into account. As we emphasized that the trip should be realistic, we limited fantasy solutions somewhat. We formulated hints on the poster somewhat more compulsory and teachers were told not to communicate everything is good, but instead inform whether if the trip is really possible (Figure 3). As an introduction the teacher read a story about a girl who planned a trip around the IJsselmeer (a big lake in the Netherlands). Students were asked to calculate her speed in kilometre per hour (Woltz, 2019).

Come and join us on a trip?

Where have you been on holiday? And were you able to decide for yourself? If so, you already have experience on planning a holiday. To plan a cycling trip you have to select the destination, the route, the things you want to visit, the amount of luggage, the costs, etc. You can make your own decisions but you also get hints. You will present your trip in a flyer. In that way you can convince people to go on your trip.

Hints:

- 1: Choose a destination.
- 2: Think of a route.
- 3: What should you take with you?

4: How much does the trip cost?

5: How does the route look like on a map?

Figure 3. Assignment in second design

In creating the cycling trip most students used Google maps. Although this was allowed and provided an adequate solution to the problem, this application also prevented students thinking about their route, as Google maps automatically provides distance and cycling time. In using Google maps therefore several students concluded that 330 kilometres in 22 hours can be done in 1 day, as a day has 24 hours (Figure 4). The student of which the work is presented in figure 5 makes an exception in this. He suggested four biking days, biking 5½ hours each day. We observed that students did not really focused on the environment where people would have to cycle. Table 3 summarizes the students' work in the second design.



Table 3: Student scores in second design						
	measurement	scale	modelling	climate and	perspective	geographical objects
						objects
				landscape		
design 2	35,58	3,85	61,54	10,58	53,85	10,58
(N=52)	(40,020)	(16,704)	(47,087)	(20,619)	(44,110)	(30,255)

Reflection

The students' work reflects context in the problem. Some students explored the sights you can see during the trip, they looked for hotels and the costs of the hotels. What was missing was a link with the real environment, e.g. the landscape was rarely considered. Geographical questions, like where am I, what is there to see and how is the route (e.g. mountains), were seldom asked. The maps were not as good as the maps of the islands. The routes were represented by small lines only. References to landscapes or buildings were often absent. This resulted in a low score on the geographical objects (Table 3).

Taking the mathematics perspective, the second design elicited modelling more or less equally as the first design. However, the second design stimulated students more taking measurement into account as compared to the first design. Moreover, the second design did not made students explicitly take scale into account.



Figure 4. Students work: cycling trip from Rome to Florence, nice view, 3 nights, beautiful trip in Italy for 2 persons, in 3 star hotels, you can also rest at the beach. Every day cycling for 5½ hours. [Scored:100-0-0-0-0]



Overview

In total 92 students and five teachers participated in this study. We observed differences between what students do in both designs. In the first design students score high on modelling for mathematics, with an average of 73,75%, and on perspective for geography, with an average score of 58,75%. The second design was developed in order to realize higher scores for measurement and scale. The context in this second design was familiar enough that students would notice when their design was invalid. Namely, making a cycling trip one should realize the distance one can cycle per day. Table 4, where table 2 and 3 are merged, shows that this worked because the score raised significantly from 5% to 35,58%. Unfortunately the score for geographical objects reduced significantly from first to second. We observed this in students' work not having any map and only some pictures of a hotel or monument (Figure 4).

Table 4: Student scores in both designs

	measurement	scale	modelling	climate and	perspective	geographical objects
				landscape		
design 1	5,00	6,25	73,75	17,50	58,75	35,00
(N=40)	(15,191)*	(20,215)	(39,203)	(26,675)	(40,648)	(44,144)*
design 2	35,58	3,85	61,54	10,58	53,85	10,58
(N=52)	(40,020)*	(16,704)	(47,087)	(20,619)	(44,110)	(30,255)*

* differences between designs sign. p<.001

CONCLUSION AND DISCUSSION

In this study we tried to answer two research questions. We looked into the characteristics for a learning environment supporting primary school students integrated learning in mathematics and geography. We found that this learning environment should make reasoning both mathematically and geographically necessary. Moreover, the teacher, as part of the learning environment needs to emphasize taking all relevant domain specific aspects of the context into account. The second research question focused on domain specific characteristics supporting integrated learning in mathematics and geography. We found that these characteristics includes familiar context for students and focus on subdomains and/or aspects from mathematics and geography, like measurement, scale, climate and landscape and geographical objects.

As the designs presented in this paper did not meet all of these characteristics, the results maybe a bit disappointing. However, they are not. We learned a lot about opportunities of integrating mathematics and geography. Experiences with both designs indicate that there were enough mathematical and geographical perspectives to work with. Domain specific perspectives are omnipresent in both designs. The two learning environments provide thorough domain specific exploration but it



turned out that this exploration is difficult for the students. And, more important, it is difficult for teachers. The teachers did not elaborate on the meaning of the context from both domains. This is true for the very open first design, but also for the second design where we also provided a meaningful introduction from an everyday life context. Our observations made clear the teachers supported students very limited from domain specific perspectives. They hardly elaborated the contexts from a geographical or mathematical point of view. This raises the question how we, as teacher educators, may support teachers. What support do they need enabling them interacting in a more domain specific way with their students.

In the Netherlands we see more and more schools integrating various school domains in projects or themes in the school. One could consider this as a first step in realizing integrating domains like geography and mathematics. However, as in these projects teachers show unable taking domain specific perspectives, one could wonder to what extend this projects will contribute in learning geography or mathematics. This study shows that developing primary education and professionalizing teachers should go hand in hand in this respect.

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VIDEO-SUPPORTED COLLABORATIVE LEARNING: INSIGHTS IN THE STATE OF THE ART IN EVERYDAY EDUCATIONAL PRACTICE WITHIN THE VISUAL-PROJECT EXPERIMENTS.

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ABSTRACT

Most teachers do not use video tools in a way that contributes to developing conceptual thinking and problem solving skills as relevant work-life competences of the knowledge worker. Europe-wide, there is a need for e-competent teachers in utilizing e-learning with leading digital collaborative solutions. The same holds for pedagogical knowledge of designers in educational technology companies. Videobased e-learning and knowledge building are critical 21st century approaches; the modernization of European higher education institutions calls for a workable pedagogy and skilled teachers to take on the up-to-date video supported collaborative solutions for creative teamwork in online environments.

Video-Supported Education Alliance (VISUAL) is an Alliance of 6 HEIs-Teacher Education (HEIs-TE) and 6 Educational Technology Designers (ETDs) co-creating an evidence-based pedagogical model for Video-Supported Collaborative Learning. The developed solution enhances students' critical thinking and problem solving skills that are important for navigating the increasingly turbulent, knowledgeintensive and entrepreneurial work-life scenarios. The model bridges school and practice, which is important for vocational education and training (VET) and teacher-educators (TE). Furthermore, it will encourage video content creation and sharing as a rising work-life competence. The models will be used and taught in teachers education (TE) so that teacher-students become familiar with Video-Supported Collaborative Learning as an educational tool.

This paper summarizes the results of a cycle of experiments lead by the VISUAL partners from autumn 2018 until spring 2019. The second cycle experiments are being conducted in the VISUAL project from autumn 2018 until spring 2020.

INTRODUCTION

Video-supported collaborative learning: an overview of the research *Theoretical background*

Theoretical background

In teacher education there is a lack of a workable pedagogy for the use of video tools to support collaborative learning and knowledge building, as a way to become knowledge competent in professional development as well as to prepare students for a sustainable knowledge-based economy and society. Teacher education (TE) and training institutions are not providing full adequate pedagogical and technical guidance to use the video tools for collaborative learning and knowledge building yet.



Students are visual thinkers, observational learners and thus social learners (Bruner, 1969), therefore the employment of visuals in education is promising. However, these benefits are not yet fully exploited in the practice. Most teachers do not know how to use videos systematically in teaching (Rutkowski, 2013). Just showing a video is not enough (Van Gog, 2014) for learning from it. The potential of video-supported collaborative learning has not been fully exploited in teacher education (Hobbs, 2006), although many experiences do exist within teacher education (Gaudin, 2015). Education lacks pedagogical models and structures to promote collaborative learning from and with videos (Krauskopf, 2014).

One of the aims of VISUAL (Video-Supported Education Alliance), is to develop, test, and validate pedagogical models and practices for video-supported collaborative learning (VSCL), primarily in the teacher education and teacher professionalization (primary, secondary and VET education).

Theoretical framework is provided by learning sciences scholars (Sawyer, 2014) showing evidence that students who learn together, in pedagogical approaches such as 'knowledge building'(Scardamalia, 2014), computer supported collaborative learning (CSCL) (Stahl, 2014) and responsive learning (de Jong, 2015), outperform students whose teachers use frontal, 'knowledge telling' pedagogy. However, this does not make CSCL a favourite pedagogy in practice and certainly not in combination with video [Johnson, 2014)]. VISUAL project overcomes this lacking practices in the use of modern ICT technology (Zahn, 2012).

Research questions

In our experiments, Video-Supported Collaborative Learning (VSCL) is promoted through evidence-based pedagogical video use and CSCL. We argue that video can be an excellent learning tool when combined with collaborative learning (Krauskopf, 2010). It develops students' critical thinking and problem-solving skills that are important for the development of entrepreneurial skills and attitudes (UNESCO, 2017). Video seems also to be a promising tool to bridge theory and practice, which is crucial in the vocational education and training (VET) system, and for teacher-educators (TE) as well (Ramos, 2018).

Given the theoretical framework above, with the current paper we aim to answer two main research questions.

RQ1: What works in practice in order to generate a hands-on VSCL-pedagogical model?

RQ2: What works in a co-creative partnership between Higher Education Institutions (HEIs) and companies?

Answering such questions will help us to ground the development of a VSCL pedagogical model. The model can be used in TE so that teacher-students become familiar with Video-Supported Collaborative Learning as an educational tool (Gaudin, 2015). At the same time, working with companies is needed in order to capitalize on the latest video solutions and, at the same time, to improve them based on workable pedagogical insights.

Design and method

Experiments were conducted in 5 European countries (Finland, Estonia, the Netherlands, Switzerland and Portugal). The design is that of a multiple case-based research (Yin, 1984). In each case the same instruments and design were used.

Instrumentation includes experimental descriptions, storyboards, teacherexperimenter interviews and a questionnaire on technology, human impact and teacher professional development are used as pre-measure for good case descriptions.

The questionnaire was also used as pre-post-test in a student version in cases where subjects are student-teachers.

In each case complementary data were gathered on the experimentations in the form of video-ethnographies. During the experiments, Videoblogs of key intervention activities and flow in the classrooms were video recorded.

Appreciative interviews were held with the teacher-experimenters at the end of the experiments.

On top of that, additional measures can be used in single cases.

The analysis focuses on the possible contextual factors related to what works and what does not work in the VSCL-pedagogy. These VSCL-pedagogical practices differ along the cases because of the cultural, educational, institutional and national characteristics of the countries involved.

Results

Preliminary results of all the conducted pre-experimentations reveals the emerging of innovative pedagogical models for video-supported collaborative learning. We briefly describe each of the experiments and emerging models for using video to support collaborative learning and knowledge building.



Building up new pedagogical models for video- supported collaborative learning

Collaborative video problem-solving in primary education

This experimentation was conducted in the University of Évora, Portugal. The main goal of the experiment was to explore innovative approaches for collaborative learning by using video as a digital resource to present a problem to the students.

Designed within the VISUAL research methodology this experiment was conducted in a primary school educational context that already use *Escola Virtual* (Virtual School), a digital platform from Bloco Grafico, a content provider and a VISUAL partner company, which is available for schools, students and teachers of all levels in Portugal.

The type of the videos already available in this virtual platform is mostly content centred and within a pedagogical approach based on knowledge transmission. The main goal of this experiment was to explore innovative approaches for collaborative learning by using video as a digital resource to present a problem to the students.

This experiment involved teachers and students from 3 primary classrooms. Technology was used as a trigger and a resource to and promote problem solving through collaborative learning and knowledge building. The video was used to present the educational scenario of the problem and to identify sources of information that the students tried to enrich with suggestions of their own. Data from the experiment was gathered through classroom observations (video recording some activities) and interviews to the classroom teachers. Researcher notes were used for observation on classroom practices.

Preliminary results show that this approach increased student engagement and collaborative learning, skills related to the quest and selection of information, motivation, responsibility and autonomy.

The pedagogical approach based on video problem solving proved to be a very positive experience for teachers and students, demonstrating that Escola Virtual from Bloco Grafico, can successfully be used to create learning video content in the primary school setting.

What is expected in using Virtual School is that individuals watch the video and learn with its content. Alternatives for using video may be needed to develop different pedagogical approaches.

Will the use of video, as a digital tool to launch problem-solving tasks and present resources to assist in its resolution, help develop collaborative learning skills and knowledge-building among the students?

This experiment involved teachers and students from three primary classes. The VISUAL researchers team worked directly with the teachers in order to create a video-prototype.



The video was used to present the educational scenario of the problem and to identify sources of information that the students tried to enrich with suggestions of their own in order to be able to find an answer for the problem presented to them. Teachers gave support to the students.

The students choose the presentation formats (theatre, video, poster) to show their conclusions to the classroom.

Difficulties were reported within the groups when organizing tasks by themselves. This happened when the teacher allowed the students to independently choose how to constitute the groups.

Another challenge concerned the capacity and autonomy level of the teachers to develop this kind of experiments by themselves.

The involvement of the research team was very important in the development of this experiment and gave the teachers the support they needed to be able to carry on with their ideas.

Overall, a pedagogical approach based on video problem-solving was reported to be a very positive experience for teachers and students alike.

Collaborative annotated feedback on video-recorded teaching practices in vocational education

The goal is the enhancement of reflective skills among in-service vocational teachers, and finally the betterment of teaching practice through collaborative peer-to-peer and tutor's feedback on video-recorded teaching practices. The assumption is that delivering and receiving feedback through peer-to-peer, expert-to-novice, and group analysis interaction and collaboration can foster reflection on professional practice, thus consolidating effective teaching but most of all improving teaching practice and developing a critical perspective on one's own professional behaviour. Moreover, the design of the intervention is thought progressively and iteratively, so to provide participants with methodological tools for the analysis of practice and the formulation of feedback.

The study took place within the vocational teacher-training education program at the Swiss Federal Institute for Vocational Education and Training and involved 36 in-service teacher students. *

Feedback delivery was supported by the use of the video-annotation feature embedded in the ivideo.education software ((www.ivideo.education).

The iterative intervention (the seminar lasted four semesters, with a half training-day per semester) foresaw first to analyse the teaching practices of an unknown teacher, then those of a peer (twice) and finally one's own.



Each time the analysis – which took the form of contextualized feedback formulation – was focused on two main teaching activities and applied to real classes video-recording, through three steps: 1. peer-to-peer analysis; 2. Integrative tutors' feedback; 3. collaborative in-class discussion with the whole group.

The sample was split into two conditions: half of the sample provided feedback on their peer's video-recorded lessons through video-annotation.

The remaining participants delivered feedback by writing a report based on in-class direct observation of their peers.

After the self-analysis, a final task involved all the teachers analysing and providing feedback on the lesson of an unknown teacher.

Perceived usability (in terms of ease of use, usefulness for learning, acceptance from the teachers' point of view and adequacy for collaborative learning) and effectiveness in terms of impact on teachers' reflective skills (quality of the feedbacks delivered to peers and quality of the self-directed feedbacks), were measured respectively through a self-reported questionnaire and through the analysis of the quality and quantity of the feedbacks delivered to the peers.

Findings show that teachers in the video-annotation condition evaluated the training experience in a very positive way, witnessing its general usefulness, its specific usefulness for improving teaching practice, and for improving reflexivity (respectively M=2.17, SD=.71; M=2.11, SD=.83; and M= 2.28, SD=.75 on a Likert scale ranging from -3 to +3).

In terms of the final measure related to the observational, noticing and reflective skills, statistically significant differences were found between the two groups. In particular, teachers working in the video-annotation condition were able to identify more descriptive indices in the teaching activities (descriptive components identified $M_{con}=8.36$, $SD_{con}=3.17$; $M_{video}=15.38$, $SD_{video}=6.53$; t(28)=3.65, p=0.047) and more interpretative elements ($M_{con}=7.07$, $SD_{con}=3.29$; $M_{video}=12.13$, $SD_{video}=7.08$; t(28)=2.44, p=0.036) than their colleagues who did not use video technologies. Moreover, within the video-annotation condition the increment in terms of numbers of alternatives of action calculated through a repeated-measure ANOVA, proved to be significant (F(2, 32)=3.92, p=0.03).

Results suggest that this study can contribute to the innovation of teachers training programs through the integration of video annotation tools and a progressively increasing collaborative pedagogy, while helping instructors in the creation of curricula where professional competence development is fostered through feedback, self-reflection and collaborative analysis of authentic practices.

* The results of this experiment are detailed in a 2019 paper published by Boldrini, Cattaneo, and Evi-Colombo)



EAPRIL 2019 CONFERENCE PROCEEDINGS

Experimenting the suitability of video diaries in school practicum

The goal of the experiment was to find out what, in the opinion of teacher-students, are the advantages and disadvantages of using video for learning purposes compared to written diary, and whether written or video-diaries are preferred when learning from the experience of fellow students as well as what are the justifications for their choices.

The following research questions were formed: 1) What are the advantages of the video diary format, compared to written reflection, based on the opinion of teacher students? 2) What are the disadvantages of the video diary format, compared to written reflection, based on the opinion of teacher students? 3) Which diaries (written or video) the fellow students comment on the most during the practice and what are the justifications for their choices?

The experiment was conducted with 24 bachelor level 2nd year teacher-students on the "Observation and Pedagogical Practice" course. 20 students were female and four male, the youngest was 21, the oldest over 50, the majority between ages 21-25. These students were studying to become teachers of several subjects in middle schools and this course included their first school practice.

For the study, students were divided into two groups: 13 students reflected their practice experience in a written diary format and 11 students used video for the same purposes. At the end of the practice week, students from both groups made practice summary post in video format.

Students who kept a written diary posted their written reflections about their practice experience onto Moodle Open-Source Learning Platform. Students who used video diary format uploaded their videos to the Flowboard Online Video Platform Flowbox. This is an interactive environment for uploading and sharing video content in password-protected folders.

All students from the course were able to view the reflections from their fellow students. It allowed the students to share with fellow students what they experienced in the school environment.

Students commented on written and video diary posts from their peers. This enabled collaborative learning.

Students answered questionnaires two weeks before and one week after their practicum week. The aim of the preliminary questionnaire was to find out what the students consider as the advantages and disadvantages of the written and video-format diaries; which diaries students plan to read/review and comment on and why. The aim of the follow-up questionnaire was to find out what were the advantages and disadvantages of using the written and video-format practice diaries; which diaries they read/reviewed and commented on and why; what knowledge and skills were developed through the use of different diary formats. During the practice



period, 96 video clips were uploaded onto Flowboard and 84 written reflections were uploaded to Moodle.

Flowbox Online Video Platform provided simple uploading, sharing and commenting. It is a good environment for group reflections and collaborative learning. Most students preferred watching video reflections than reading written diary posts. Students liked the novelty of the video format, they said that watching videos was a pleasant change to reading. Also, more comments were written for video diary posts than for written diaries.

The results of this study showed that assigning video tasks, e.g. adding video diary option to written reflections, are good opportunities to motivate teacher students and to improve their public speaking competence. In the opinion of the students, the video diary reflection format has several advantages over written reflection, although there are also drawbacks. The possibility for students to create videos for professional activities can give them the confidence to create and use video based learning material in their future practice.

Video observations in music education to enhance collaborative learning

The purpose of the experiment, set in School of Professional Teacher Education, JAMK University of Applied Science in Finland, was to explore innovative approaches for enhancing video-based collaborative learning in music education. The aim of this study was to explore how video-observations support collaborative learning in music teacher education from a music teacher's perspective.

In music education and music teacher education, especially in terms of traditional instruments like a 'kantele', the Finnish national instrument, challenges arise as only few students study the instrument throughout the country. Thus, teaching and learning to teach the instrument, is normally based on one-to-one tuition one and the power of peers and collaborative learning are not typically used.

In order to enhance collaborative learning in music teacher education, video-based technology platform allowing recording, sharing, on-demand access and analysing was tested in this experiment.

One music teacher and two music teacher students from two different universities, participated in the pilot study. IRIS Connect video platform was deployed, using two cameras and an online platform to record, share and analyse the kantele-instrument teaching sessions. Recordings were made by the music teacher students. Recorded sessions were analysed by the student (self-analysis), a peer-student (peer-analysis) and the music teacher, after which a collaborative discussion was held.

In a first phase, the music teacher familiarised herself with the IRIS Connect platform's video technology and its pedagogical possibilities with mentors with teacher education background. At the second phase, the music teacher students were introduced to the pedagogical procedures of the pilot. Students recorded three



different kantele-teaching sessions and shared the videos with the teacher and the peer student. The peer and the teacher analysed the recordings and gave feedback and comments after each session on the IRIS Connect platform. The students and the music teacher held an online collaborative discussion session related to the feedback personal and discuss the student's received to learning aims. The interim data was collected from the music teacher after the first experiment cycle by using semi-structured interview and analysed by applying inductive content analysis.

Preliminary results from the interim data showed that video-observations in music teacher education is a powerful tool to offer, to the music teacher and the music teacher students alike, possibilities time and place for collaboration. This was especially relevant in the case of music education, where only a few students study a certain instrument and where the distances are so long that face-to-face learning situations are difficult to organize.

According to the interviewed music teacher, the pedagogical activity piloted, made the music teacher students' and the music teacher's collaboration possible. The music teacher students, who video recorded their teaching sessions, received feedback and ideas on how to improve their teaching practices. Acting as a peer, was also seen as beneficial, as it offered a wider perspective for reflection. The videobased collaborative pedagogical solution used in this pilot, made it possible to all partners to analyse the videos at the best time suited to them and to arrange time for collaborative discussions.

The music teacher felt that the pedagogical solution applied in the pilot challenged her to rethink and redesign the pedagogical process she will use. She also felt that this redesign process enhanced music teacher students' learning "better" than before. In addition, the music teacher's own professional competences were improved, particularly in creating and implementing reflective instructions.

Some challenges were faced during the experiment. Firstly, the video technology platform used in this experiment did not transform the sound as accurately as it was hoped for. In music education the quality of sound is a crucial element. This issue was discussed with the company and improvements were made accordingly. The approach by the software provider company was experienced as an important step to enhance cooperation between the organisations.

Secondly, in terms of pedagogical perspectives, the music teacher thought that she would need more experiences in conducting collaborative discussions, either face-to-face or online, to further improve the collaborative learning. However, the dialogue between the music teacher and the music teacher students offered a possibility to share fresh ideas and to work collaboratively.



Students' lesson video recording to enhance reflection and collaborative learning

This experimentation was conducted in The Aeres University in The Neederlands. The experiments aims was to create more understanding on how the role of the teacher trainer enables more Video Supported Collaborative learning during lessons about pedagogy in relation with the theory of collaborative learning.

Participants are teacher-students in the domain of Consumption techniques in the bachelor teacher education in the Netherlands. The environment for recording their lessons in practice is provided by Iris Connect. The collaborative conversations took place face-to-face and in the virtual Knowledge Forum.

During this experiment the students film their lessons (with the software/ application of IRIS Connect) while teaching in vocational secondary education and reflect on these lessons at the university in the different stages described by the literature about collaborative learning. The reflections of the students, new ideas and theory found are developed and discussed in the Knowledge Forum and face to face in the classroom.

Data gathering took place through storyboards, questionnaires (for both students and teachers), ethnographic video-blogs of key situations, and appreciative interviews.

Preliminary findings show that there are some technical concerns with the environments like uploading video recordings by students; students report that they have to get to using the Knowledge Forum. Researcher gather that collaborative learning in the sense of having conversations together about the content of the video recordings is very appreciated by students and helps them in their reflections. The aimed learning outcomes are the following: integration of cooperative learning, collaborative learning, concepts of feedback, shared control, distance learning, and increasing knowledge of concepts usable during teaching. Students are inspired by peer to peer feedback, literature found by the students themselves, as well as literature provided by the teacher trainer as: Bijkerk, L. van der, Heide, W. van der (2006). Het gaat steeds beter. Springer Media B.V; Ebbens, S. , Ettekoven, S. (2016). Samenwerkend leren. Noordhoff Uitgevers.; Geerts, W. , Kralingen, R. van (2016). Handboek voor leraren. Coutinho. ; Slooter, M. (2010). De vijf rollen van de leraar. CPS Uitgeverij.

Teacher-Students' reflection supported by narrative video and collaborative learning

This experiment conducted in the domain of consumption techniques in the bachelor Teacher Education in the Netherlands aims to improve the reflection skills of teacher-students in secondary vocational education through peer feedback in genuine, authentic situations.



The environment for constructing narrative videos of their practical experience is EdVisto, a digital storytelling environment, provided by company partner Diesel 21. The collaborative conversations among students took place face-to-face and in the virtual Knowledge Forum.

Students film moments and reflections and share this in EdVisto. The assumption is that knowledge building will improve their reflections. Based on the reflection experience with the movies in EdVisto. Data was gathered through appreciative interviews, storyboards, questionnaires (students and teachers), and ethnographic video-blogs of crucial collaborative situations.

Analysis focused on Video-supported collaborative learning to enhance a deeper understanding of the reason why the chosen film could engender competence development (pedagogical, didactical and subject matter competence) and is guided by the following research questions:

RQ1: Has the students' concept/theory about reflection in general become different (perhaps wider?);

RQ2: Can they discuss about how to improve reflection in general, and consequently can they identify what works for themselves?

RQ3: What is (are) than the right way(s) to reflect? Can students develop a method on how to do this properly and can they tell what works and what does not work?

RQ4: How does reflection contributes to the professional development of the teacher?

CONCLUSIONS

Preliminary results of all the conducted experimentations reveals the emerging of innovative pedagogical models for video-supported collaborative learning.

- *Collaborative video-problem solving pedagogical model* reveals increased student's engagement, collaborative learning skills, motivation, responsibility and autonomy.
- *Video-based-annotation-tools feedback pedagogical model reveals* positive perceived usefulness and effectiveness of video annotation tools used by inservice teacher to improve reflection and, consequently, better their teaching practice.
- *Video-recording based diary pedagogical model* proves to be a valuable alternative to written summaries, and can support reflection skills of future teachers.



- *Video-observation-based pedagogical model* in music shows the potential of using video in music education as a powerful pedagogical tool to offer the students innovative solutions.
- *Video recording-based peer-feedback pedagogical model* reveals potentialities of video to understand and promote the role of teacher trainer in the promotion of collaborative learning.
- *Video-recording-based-reflections pedagogical model* reveals potentialities for personal and professional development of student-teachers.

Most of these models were implemented using video live capture and recordings of teaching practices and were combined with company's internet-based video technologies in order to support social learning and interactions, in the field of teacher education, including initial teacher education and vocational teacher education.

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THE DEVELOPMENT OF A PEDAGOGICAL PATH BASED ON THE STEPS OF HISTORICAL-CRITICAL PEDAGOGY

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ABSTRACT

This paper aims to establish a dialogue between Active Methodologies and Historical-Critical Pedagogy in order to support new practices in different learning contexts. In addition, it is analyzed the pedagogical path of RE-MAES course developed based on active learning paradigm. On the one hand, there is the MAES Network formed by teachers from different Brazilian Federal Institutes who offers continuing education courses to teachers based on Finnish principles of education. On the other hand, there is the Historical-Critical Pedagogy as a milestone in Brazilian education still little used at different levels of education. The questions that guided the research were: how did trainers of the RE-MAES course organize pedagogical work from the perspective of active learning? Is it possible to establish a dialogue with Historical-Critical Pedagogy? It deals with a qualitative research of a descriptive-explanatory nature. The instruments for data collection were: the RE-MAES course project, lesson plans and the literature review. The investigation used as a basis studies on Methodologies and Pedagogical Methods for Professional Education. Result indicates the predominance of student-centered methodology and problem-based (ABProb) and project-based (ABProj) learning methods that bring a possible methodological approach along with the steps of Historical-Critical Pedagogy, thus consolidating itself as possibilities for didactic action based on problematizing reality.



INTRODUCTION

Faced with the new configurations of society, the world of work and the way of being of human being, school institutions are, often, challenged that, above all, emerge in the need to redefine their practices. In Brazil, most of the time school and society go at different rates. While global society requires more autonomous, creative and flexible subjects, a large number of Brazilian school institutions remain offering traditional teaching, based on reproductive practices.

The contradiction between social requirements and school reality leads us to believe that formal education has the impasse to evolve to get everyone to learn in a competent way to know, build their life projects and live with others. Therefore, it is essential to review the processes of organizing curricula, methodologies, school times and spaces (Moran, 2015).

Institutional review programs and projects for initial and continuing teacher training are included as a focus of review. According to our perspective, teacher training is an important investment to reframe practices, capable to break the empty of meaning, in addition to provide opportunities for the recognition of instruments to effect an integral formation of the people in their different realities. The teacher training must therefore go through the recognition of his mediating role and promoter of autonomy, as well as it needs to offer practical alternatives that contribute to pedagogical practice, consolidating in a constant reflection-action project.

The challenge of education, therefore, is to insert students in the socio-capitalist machine (since they are part of it), providing a critical formation that leads to overcoming their own condition, making students agents of transformation. Therefore, this article reflects, above all, about the need for more directive and intentional actions managed by teaching activity.

Focusing at methodological aspect, that is, in an attempt to find ways to approach the different themes to be taught, in a way that allows protagonist and reflective learning, it emerges from the internationalization of professional education, the MAES Network, within the scope of extension activities of the Federal Institute of Mato Grosso do Sul - IFMS, *campus* Nova Andradina. Among the activities of the MAES Network, there is the teacher training program RE-MAES Network of Trainers in Active Learning Methodologies for the 21st Century Student, developed in 2018. For development of RE-MAES program, RE-MAES coordinators concentrate efforts for the understanding and proposition of active learning alternatives to outline pedagogical paths that enable the realization of disruptive models of teaching and learning in line with the demands of contemporary society.

This article, therefore, intends to bring the practical path of RE-MAES program in order to discuss whether the methodological steps and the didactic proposals of this



course, based on the learned principles of Finnish training, can also be understood in the light of the principles of Historical Pedagogy-critical.

RESEARCH METHODOLOGY

The research has a qualitative approach as it aims to identify didactic processes not perceived by the trainers. Bortoni-Ricardo (2008) explains that it is up to qualitative research to make visible social structures masked by daily routines in school environments (p. 49). It is interesting to study the teaching and learning method and "check how it manifests itself in the activities, procedures and daily interactions" of the trainers (Ludke & Menga, 2013, p. 13) at school.

The teaching and learning methods used in the process of continuing teacher education are the object of this research. In addition, from the context in which RE-MAES course was developed, we present how the trainers of Re-MAES course organized the pedagogical work and analyze the possibility to establish a dialogue between the methods used with Historical-Critical Pedagogy.

According to the research objectives, this is an exploratory research, which involves bibliographic survey and analysis of material produced by the trainers. We collected data from RE-MAES project and lesson plans, carefully prepared by the trainers during the course, from February to November 2018. After selection and organization of the data that allowed the design of the methods used by the trainers, the description and analysis of the content was carried out in the light of Franco's theoretical and methodological assumptions (2003).

ACTIVE OR EMERGING METHODOLOGIES

To deal with teaching methodologies is to be concerned with the integral education of the student, and not only with the contents, considering that the methodological choices of each teacher, in some way, reveal their training objectives and their professional values. These choices can contribute to reinforce responsible or irresponsible, protagonist or submissive, creative or reproductive, cooperative or competitive education. The choice of methodologies that observe the subjects in a more individualized way and allow them space for reconstruction and reflection is supported by the dialogical perspective about teaching and learning processes, where the educator teach each other, becoming both, subjects of the educational process.

Teaching requires rigor, respect for the student's knowledge, acceptance of diversity and reflection on practice. Aspects that are against the mere transmission of knowledge. It also requires awareness of the unfinished (Freire, 2005) and requires direct action by all involved on the objects of knowledge.



The achievement of this ideal reveals the need for problematizing education, which emerges in formative paths that allow the development of an understanding of the world, recognizing it as equally unfinished, and reflecting on possibilities for intervention and overcoming reality itself. It also implies the reformulation of the process of knowing itself, which in this context suggests problematization as a path to the development of emancipatory learning.

Thus, through active or emerging methodologies, several contemporary attempts to rethink ways of approaching teaching are considered, in order to undertake efforts to achieve problematizing education whose objective is the development of coresponsibility, protagonism and student autonomy. It is based on the studentcentered learning principle, which proposes to transfer to the student the central focus on teaching relationship, breaking with traditional paradigms in which the teacher establishes himself as a central figure, in a relationship of subordination and reproduction.

Student-centered learning or active learning is a term that points to a set of practices that the teacher uses in his praxis, in order to achieve the learning objectives. Such actions intend to establish themselves against the traditional understanding of classes that follow a positivist script of a character that is often "plastered". Actions like these sometimes emerge in a watertight and decontextualized work. In this sense, student should not be merely a "receiver" of information, but must be engaged in a protagonist manner, proposing, analyzing, rethinking and reforming knowledge in his daily life.

In short, the use of active methodologies and methods to promote active learning is established as an alternative for overcoming challenges, solving problems, building new knowledge and developing a more reflective posture of reality, since it requires of the student: analysis, research and decision making to solve different situations. It is closely related to the emerging understandings of training, in a scenario in which the teacher must be clear of his mediating role, whose intentionality in learning situations will emerge in the construction of new knowledge, in a collaborative relationship with the student and the knowledge that he/she has already.

The possibilities of methods and techniques based on active or emerging methodologies are diverse and are based on principles of centrality in the student, application and practice, mediation and personification of teaching. As for the methods, one can list the problematization from the Arco de Maguerez, the Problem-Based Learning, Project and Research-based learning, the steps of Historical-Critical Pedagogy, design thinking among others. Innumerable practices can also be constituted as active learning techniques, observing their conduction and intentionality, such as round tables, debates, seminars, workshops, dramatizations, construction of artifacts, concept maps, generation of ideas (brainstorming), elaboration of questions of research among others (Barbosa & Moura, 2013). It is

important to note that many of these practices share similar steps and activities, with different nomenclatures, when inserted in different learning contexts. It is interesting to analyze the methodologies, methods and active techniques used for RE-MAES program development and the similarities of the methodological approaches with Historical-Critical Pedagogy, despite the different nomenclatures.

METHODOLOGIES, METHODS AND TECHNIQUES IN RE-MAES

In this study, the conceptual reference is the fact that the methodology refers to the science that studies the method in its philosophical and epistemological bases, thus representing a posture, a pedagogical conception. Added to the use of the term "emerging methodologies", which refers to the fundamentals and principles that support active practices.

Otherwise, method refers to a path, a way of organizing steps to achieve some purpose. In educational context, it comprises the rational organization of a pedagogical path, used to reach a teaching objective. The techniques, in turn, are conceived as steps or procedures performed in the context of the method and based (consciously or not) on a given methodological principle.

Among the practices consolidated in RE-MAES course, the use of problem-based (ABProb) and project (ABProj) methods stands out with dialogic techniques capable to promote active learning by participants (both trainers and course participants).

Problem-based teaching and learning method emerged in the 1960s in the context of behavioral psychology and it was widely used in the health field today. It emerged to stimulate the capacity for self-training, from the search for knowledge in an active and autonomous way. It refers to a teaching plan that starts with the identification of a problem and the search for information to support the student to solve it. It is thus a learning opportunity that starts with the objective of solving a given problem situation, and implies collaborative work and the ability to self-organization. According to Souza and Dourado (2015), AbProb has the potential to involve group discussion, promote cooperative research and contribute significantly to confer applicability to the concepts learned.

With principles similar to the Problem learning method, there is the Project-based learning method (AbProj), also used in the formative course of RE-MAES. Barbosa and Moura (2013) argue that both "can generate innovative teaching practices in the context of professional training" (p. 49), not least because they have as main characteristics the student as a center of learning, group work and the teacher as a manager of educational situations (teaching-learning). However, as pointed out by Barbosa and Moura (2013), there are significant differences between the two methods important to remember in order to understand the alternatives for teaching practice brought by RE-MAES course.



Both methods have problems as the guiding principle of pedagogical practice, however, in ABProj, educational action is not always guided by a problem, which may be due to different types of student motivation. Having the problem as a central point in the ABProb method, practical situations are always generators of learning. On the other hand, in ABProj, learning can be encouraged by practical situations, purely theoretical or theoretical-practical studies. At ABProb the teacher guarantees, in a certain way, the centrality of the process, once he defines the problem, at ABProj students are encouraged to make choices, plan, develop and evaluate the process, guaranteeing greater autonomy and their involvement in the educational process.

Having a path defined by the Professor, with a focus on presenting analysis and solving a problem, without the obligation to generate a product, the ABProb method has a duration period just like ABProj. This, in turn, aims at innovation, through the presentation by students of a final product, the result of the study of practical situations anchored in theoretical principles.

RE-MAES STRUCTURE

According to Vieira and Chediak (2018), RE-MAES course took place in two phases: 1) February to June 2018 and 2) August to November 2018. Phase 1 was developed in twenty (20) weeks and phase 2 in eighteen (18) weeks. In total, in phase 1, twenty (20) activities were guided and developed during face-to-face meeting, once a week, on Wednesdays (from 7 pm to 10 pm) and fifteen (15) activities were oriented and developed by the participants in different online environment. In phase 2, there were eighteen (18) face-to-face meetings, two (2) online activities and ten (10) activities developed in the context of the teacher-students.

The activities oriented in phase 1 of the course had the purpose of building projects for continuing education activities for teachers, being the main instrument for assessing learning in this phase of RE-MAES. On the other hand, the implementation of the activities planned by the teacher-students in their contexts of work. The presentation of results were the requirements for completing the second phase of RE-MAES.

The course has the didactic intent of relying on structural curriculum standards for competence and project-based learning. It begins with a diagnostic assessment to understand the reality of teacher-students, forming a learning community in order to make teaching less directive and more dialogical.

The analysis of RE-MAES project and the lesson plans built in the virtual environment *google drive* by the trainers allowed the conclusion of two (02) systematized actions followed during the course, the first one starts from the



principles of Problem-based learning method (ABProb) and it evolves to the Projectbased learning method (ABProj).

It means that from the first (1st) to the eleventh (11th) face-to-face meeting of RE-MAES phase 1 (February to May 2018), the participants were instigated, through face-to-face and interactions *online*, to take theoretical readings, to reflect based on theoretical principles about the context of each person's performance, to identify and solve problems in the their school routine. During this period, in the light of the literature consulted, there was a predominance of problem learning method (ABProb). The description of activities one (01) and two (02) brings the systematization of the actions organized by the trainers, as in the course's weekly activity plan:

Activity 1

- Reading, discussion and analysis of the textual description of a problem situation commonly perceived in school;
- Registration of at least three (3) and at most five (5) causes and possibilities of solutions to the problem;
- Argumentative presentation of the causes and suggestions for solutions;
- Debate and contributions from other participants.

Example of a situation commonly faced by teachers at Brazilian schools

A Portuguese teacher decided to guide an activity in pairs. To do so, in agreement with the students, he established a deadline for the activity to be done. A pair of students chose to divide the tasks because it was difficult point a meeting and this would speed up the activity. A week before the deadline, in class, the pair met and one student was responsible for the initial part and the other for the final part of the work. On the deadline, one of the students did not do his part and he was not worried with this because he believed he was not harming anyone. The teacher in face of this situation established another date for the students. The student who had done his part argued to the teacher that decided to assess individually each student.

Points to discuss: what is the purpose of group work? When we propose an activity, do we truly believe in its role for student learning? How to evaluate the student who does cooperate with the team?



Activity 2

Hello, dear ones, we propose a challenge for the next week. Our Wednesday meeting will be in Maria José's kitchen. Each group work will prepare the following dishes: rice with lentils and chicken wrapped in bacon; Roll steak and banana flour; chocolate cake and pastel de Belém. In Maria José's kitchen, groups should prepare these recipes, at 7pm on Wednesday. Remember that we do not have the ingredients.

According to the problem-based learning method, it noticed that activity 1 and 2 present problems that guide studies and reflections based on real contexts of teacherstudents with a tendency to be more contextual than theoretical. In addition, the two situations bring the content to be studied according to the course objectives. The pedagogical proposal for discussion and analysis of the situation is perceived, and there is no plan to be developed in social reality.

On the other hand, after eleven (11) face-to-face meetings and ten (10) online activities that took place in the period from February to May 2018, a different methodological path guide the process of learning, specific characteristics of the project-based learning method (ABProj) emerge. The teacher-students were challenged to present interests, needs or problems from their education real contexts. Besides, the trainers assumed the role of advisor and guide in the decision-making of each teacher-student. This process began in May and ended in November 2018, which results were a teacher training program, its implementation in teacher-student context of work and an event for sharing the experience with the local community.

The process guided by project-based learning (ABProj) method took place in twentyseven (27) face-to-face meetings and ten (10) face-to-face workshops. It is important to clarify that the RE-MAES course promoted team works of at least three (3) and a maximum five (05) teacher-students, identified as Development Groups. Activities 3, 4 and 5 brings examples of ABProj characteristics developed by the trainers:

Activity 3

Now, you will create a concrete representation of everything that is still a little abstract for us all about our teacher training program. Then, decide what your team group will create and bring, next Wednesday, materials for working together.

Activity 4

Hello Teacher, we sent nine (9) scientific texts in your email, please choose one (1) or more for reading and analysis. The paper chosen must be according to the thematic you are interested to study deeper.



Put your name in front of the name of the paper you chose, this way everyone will know the text you are reading and analyzing. It is okay to read a text that another colleague will already be reading. If this happens, we suggest that you interact with your colleague and exchange some ideas. We hope that this exercise help you to find the paths that guide your research. Good reading!

Activity 5

Hello RE-MAES community, we are going well in the process of construction the interventionist action plan and the research plan. Next step, we ask you to check the action and research plan for making sure that they are ready to guide the course with your colleagues at the school you work.

Activity three (3) indicates the demonstration of a project based learning in a situation of interest to the teacher-students, which reveals a less centralized approach of teaching, characteristics of ABProj as it begins with the student interest, need or problem and the teacher acts as a mentor.

Activity four (4) provides a teaching orientation, which students find theoretical support for the situation that generates the intervention project they will build. Activity five (5) indicates the intervention projects for pedagogical practice and research projects as proposals to develop something new and reflect on the action developed.

HISTORICAL-CRITICAL PEDAGOGY: SOME CONSIDERATION

In addition to describing the course experienced, the objective of this paper is to establish a parallel between the principles of ABProb / ABProj and the steps of historical-critical pedagogy in order to reflect on the possible proximity of these methodologies, since both are possibilities for teacher training especially in the context of Professional Teacher Education. These methodologies emerge in different moment of Brazilian history and they bring different concepts, but we believe they have similarities that are important to be highlighted.

Among the various aspects, already registered in this paper, that characterize AbProb and ApProb as emerging methodologies of an active nature, we return to some principles that support the intended analysis, such as: the consideration of the student as a transforming agent, application in the practice of the learned, teaching and consideration of problematized reality. Therefore, it deals with teaching practices that are committed to the development of subjects based on the investigation and articulation of knowledge (Bender, 2014). For Gasparin (2005) the philosophy that supports the principles of this pedagogy finds support in the Historical-Dialectical Materialism proposed by Marx, which is based on the worldview, praxis, concreteness and dialectical logic. He understands that in order to overcome common sense, theoretical reflection is necessary, aiming at reaching philosophical consciousness. Therefore, it must start from the knowledge of the empirical reality, study of the theory, abstractions and reach of the concrete reality until reaching the full comprehension of the posed reality.

Saviani (1984) suggests, initially, five steps articulated with each other for the realization of a sequence of teaching work. These steps are further deepened based on the studies by Gasparin (2005) and are named for: 1) Initial Social Practice 2) Questioning 3) Instrumentalization 4) Catharsis and 5) Final Social Practice. Such methodological characteristic that points to structured stages for teaching, in turn, brings to reflection the possibilities of dialogue between historical-critical pedagogy (HCP) with other methods.

In HCP, the main characterist of Initial Social Practice (1) is the contradictory daily relationships, as well as individual and collective relationships. It is consolidated in the prior knowledge of the student and the teacher and encompasses the enunciation of the contents to be studied and their respective objectives in the search to know their knowledge, establishing relationships even before something is taught to them, in an investigative and challenging proposition.

The second step is problematization (2), which occurs in an association of content with the main problems identified in social practice. It starts with a discussion about the problems and their relationship with the contents to be learned. From this discussion, problematizing questions are raised that encompass the scientific, historical, cultural and social spheres, considering from multiple perspectives.

In the next step, Instrumentalization (3), the different dimensions of the content are worked on, based on Instrumentalization. This stage can be defined as the work done by student and teacher, from the presentation of scientific, formal knowledge and other spheres raised in the previous stage, establishing a parallel between knowledge and daily life, causing the appropriation of new content. Therefore, it deals with the appropriation of knowledge constructed socially for the construction of new knowledge.

According to Saviani (1984), this construction will only occur if there is an internalization, that is, the incorporation of knowledge to thought into action, which he named Catharsis (4). Catharsis constitutes the fourth step of Historical-Critical Pedagogy and is characterized by the more elaborate expression of what it was intended to explore, in a relationship between theory and social practice. At this moment, a mental synthesis is carried out that manifests itself from a new posture. The learner is able to explain what has been learned in its different dimensions.



The fifth and final step is the Final Social Practice (5) and consists of assuming a new attitude towards what has been learned (GASPARIN, 2005). Through this attitude, the student will be able to manifest new attitudes, in a commitment to social exercise and acquired scientific knowledge.

In observance of the steps and references that encompass Historical-Critical Pedagogy, some positions that determine it stand out. The primacy of school knowledge and the need for its appropriation by the learning subjects, learning difficulties as a result of conditions previously established and subject to change and the possibility of developing self-training when practices become the object of reflection and criticism. This method, in short, aims to stimulate the activity, increase the dialogue between the subjects involved and with the culture accumulated historically, with a view to the appropriation and articulation with the students' knowledge, without omitting the logical relation of the constructed knowledge.

The understanding of such positions, which characterize the HCP, and the exploration of the steps proposed as a teaching methodology raise reflections that, safeguarding their epistemological character, instigates the methodological proximity to the problematization. Thus, in order to establish a parallel between the principles of the questioning methods used in RE-MAES (AbProb and AbProj) and the steps of PHC, a comparative reflection is proposed, based on the concepts published by Bender (2014), Barbosa and Moura (2013), Souza and Dourado (2015) and Gasparin (2005):

Despite the different contexts in which the proposals arise, the pedagogical action in both propositions is approached, initially by proposing everyday situations as a starting and ending point, in a bias commitment to reality, and later reflectivetheoretical phases for the appropriation and reframing of socially constructed knowledge.

In the first step of the HCP, called Initial Social Practice, it is possible to establish a relationship with the principle of problematization work proposed in ABProb / ABProj, which implies in the analysis of daily life and delimitation of the problem to be studied.

In the second proposed step, the questioning, proposes the association of the problem with the learning objectives, a situation that converges with the questioning principle (ABProb / ABProj) of linking the learning situations to the knowledge, according to the teaching objectives.

Instrumentalization, in turn, is associated with the investigative principle on which ABProb / ABProj is based, aiming at the theoretical-scientific basis that will bring



the initial understanding of the problem and possible reflections for overcoming it, based on socially constructed knowledge.

In Catharsis, knowledge is incorporated into action, bringing the problematization ideal of associating theory and practice, with a view to concrete action. The Final Social Practice dialogues with the fact that learning necessarily generates a new posture, concept and/or product. Situation similar to the final step (expected result) of ABProb / ABProj.

When registering these assumptions in parallel, it is also noticed that the different registered methods, equally, point to a methodological alternative based on the problematization of reality (either under the theoretical guidelines of HCP or ABProb / ABProj) as an alternative of teaching. They therefore suggest, in the same way, a practice that promotes a critical look at everyday issues, the appropriation and reflection of the knowledge produced by humanity and the identification of possibilities of overcoming associated with a new attitude towards the issues addressed.

In view of the approaches recorded above, based on the theoretical survey carried out, the possibility of rethinking the steps suggested in the HCP is therefore considered as a problematic teaching method that methodologically approaches the principles proposed by ABProb and ABProj and, furthermore, consolidate as important practices for Professional Teacher Education, in a possible dialogue.

CONCLUSIONS

It is noticed that, in recent years, a lot has been produced about active methodologies for teaching practice, at the most different levels of teaching. Learning methods and techniques are developed and adapted to the most diverse contexts, based on studentcentered teaching. However, activities based on active methodologies are personified in different ways, starting from different understandings for planning, application and evaluation in the teaching processes.

Aiming effectiveness of active methodologies in the direction of the intentionality by which they are defined or elected, it will be necessary for participants in the process to assimilate them in order to understand them (Berbel, 2011). Therefore, it is relevant that, in the case of teacher training, the teacher not only replicates, but experiences active learning actions in order to reformulate them according to his pedagogical intention, perceiving them as learning resources that can bring his practice of integral training, contributing to the critical training of the student. The use of Active Learning methods does not refer to the field of experimentation, but to collective constructions that are guided by clear training objectives; but that, they are subject to the student movement, since its development in all the human spheres is the final objective. In this understanding, RE-MAES course explores, as a didactic basis, teaching actions of an active nature, suggesting alternatives that commit to praxis based on the observation of reality, identification of problems and the search for solving them, exploring them, theorizing it, elaborating hypotheses and applying them; in order to intervene in the contexts in which they present themselves. From this perspective, it is understood that these teaching methods can collaborate for a more structured and intentional teaching performance.

In short, it is concluded that the pedagogical practices proposed by RE-MAES trainers are committed to the exercise of teaching, promoting replicable approaches between initial training, often restricted to theoretical understandings, and professional practice; consolidating itself as an innovative didactic-pedagogical proposition. His proposal is consolidated in a response to the propaedeutic formations that, as a rule, do not consider the school reality, in a proposal to break with traditional teaching practices.

It is important to emphasize that the perspective of active learning, in this proposal, does not cancel the role of the teacher and the excellence of his specialties; but it instrumentalizes it for the work, allowing the observation, problematization, theorization and intervention in the reality itself, towards an integral formation.

Therefore, it deals with methodological proposals that allow reflection, action and emancipation, when permeated by such objectives. It is understood that teaching strategies, when imbued with this intentionality, can favor the break with mechanized teaching practices, which are often limited to theoretical, decontextualized explanations of action and applicability.

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SELF-DIRECTED LEARNING COMPETENCIES IN ADULTS' EDUCATORS' QUALIFICATION DEVELOPMENT: OPEN LEARNING RESOURCE CASE

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ABSTRACT

Development of E-Learning and various of E-learning platforms as well as the development of information and communication technologies in general, is so fast that there is almost no doubt that sooner or later they will become the routine for each of us. Information and communication technologies in the educational process today is not only relevant to the aspects of visualization or activation. They become one of the essential tools of teaching and learning activities in the 21st century, but by expanding our learning opportunities they have also highlighted the need for new learning competences.

The traditional roles of teacher and learner are replaced by new ones because in E-Teaching / learning environment, the learner must not only work independently, but also more and more often have to manage his / her learning. This requires the new competences - self-directed learning competences. The extent to which learners will have mastered this competence greatly depends on how much they will be able to and how qualitatively they will be able to benefit from the E-learning education.

Obviously, one of the essential duties of today's teacher is to create a learning environment that is educationally friendly, enabling, stimulating, motivating, and constructive. However, the extent to which each learner will take from that environment will depend only on his / her own, namely engagement, motivation, relevant skills and competences, especially self-directed learning.

Keywords: Self-directed learning competencies; Knowledge management; E-learning platforms

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INTRUDUCTION

Development of E-Learning and various of E-learning platforms as well as the development of information and communication technologies in general, is so fast that there is almost no doubt that sooner or later they will become the routine for each of us. Information and communication technologies have not only expanded our ability to access, manage, disseminate information, but also to do this very quickly, over long distances and in even huge quantities. Today, their application in the educational process is not only relevant to the aspects of visualization or activation. They become one of the essential tools of teaching and learning activities in the 21st century. One of such tools, especially in adult education, is different E-learning platforms which could be treated as open learning resources.

Such knowledge systems, such platforms create a lot of opportunities for users but at the same time raise some challenges and problems also (for example, lack or limits of knowledge managing, information seeking and especially self-directed learning skills and competences. Purpose of the article is theoretically and empirically to prove self-directed learning competencies as a prerequisite for knowledge management in open learning source. And the improvement will be based on the analysis of one of such platforms - the Electronic Platform for Adult Learning in Europe (EPALE) (Electronic Platform for Adult Learning in Europe, 2019).

The main goal of EPALE is to bring together the community of adult education professionals in a multilingual, dynamic, interactive and innovative space. The platform is intended for adult educators, andragogues, lecturers, volunteers, as well as policy makers, researchers and lecturers working in the field of adult education, in other words, for all, who in one or another way is interested in adult education and quality improvement. It enables adult educators, experts to get acquainted with the latest trends in adult education in Europe, exchange experiences in cyberspace, comment on the information provided in the platform, participate in practical communities of EPALE, discuss relevant adult education issues, search partners for project activities, etc. (Electronic Platform for Adult Learning in Europe, 2019).

Aim of the platform, as all the academic platforms or social networks (Jeng, DesAutels, He & Li, 2017) is to become the main reference point for adult learning professionals in Europe. It offers a place to meet and discuss important adult learning topics, as well as to exchange ideas and materials to support professional practice. This type of community platform is the first of its kind for the sector of adult learning, especially non-formal. It means that EPALE was established to create better possibilities for adult educators to develop their qualification, but to use it qualitatively adult educators need some skills

and attitudes. At first, it is skills of self-directed learning and management of such learning. And these skills are very important for active participation on the platform.

Members of the community can engage with adult learning colleagues across Europe through the site's features, including the forums and by commenting under blogs; can also interact with your peers across Europe through the thematic areas which provide structured content according to topic or find projects and make professional connections using the partner search repository. EPALE has a strong editorial policy that also centres on the adult learning community. All users should feel welcome on the site, and to trust the information that is presented on this platform. (Electronic Platform for Adult Learning in Europe, 2019).

This platform was establish 3 years ago, but already now has more than 52 600 registered members, more than 20 000 different kind of resources (scientific articles, methodic, news, practical cases etc.), more than 50 different Communities of practice. Communities of practice are online groups where people with similar interests from the adult learning sector can get together. (Electronic Platform for Adult Learning in Europe, 2019).

The platform is very important also because the general agreement that adult learning by 2030 will be able to take advantage of an abundance of learning materials including open educational resources (OER), produced in multiple and collaborative ways, offered by many different providers and players, and used/reused by learners, enabling strong personalization of the learning processes. Fluidity will be the key to allowing learners to move easily from one educational setting to another without impediments, according to their own interests and needs of the moment. This vision is not necessarily new but is becoming more likely as we move towards a digital networked society. (Castaño Muñoz, Redecker, Vuorikari & Punie, 2013).

The exceptional feature of this platform is that active users can not only use the information, but also create or reconstruct, in other words, manage, the content of the platform also. This offers opportunities for creative thinking and the application of technological tools to support pedagogy, which, in turn, will empower us to participate in our societies knowledgeably and with respect for all. (Grassian, 2017, p.232-239)

In this case the knowledge systems especially specialized are very important and useful, but by expanding our learning opportunities they have also highlighted the need for new learning competences. Of course, such knowledge systems create a lot of opportunities for users but at the same time raise some challenges and problems also (for example, lack or limits of knowledge managing, information seeking, self-directed learning and other skills).

Meaningful and successful personal and professional life of today and the future requires the person's ability to adjust to the constantly changing environment, the ability and inclination to constructively react to changes, act in accordance with constantly renewing and increasing information. In this context learning to learn is understood as the person's wish and readiness to take up new tasks, the ability to control cognitive and emotional processes during learning and apply acquired abilities in various contexts. (Knowles, 1983, Sahlberg, 2005 et al.).

In order to succeed in learning, the learner has to understand the worth of learning, treat it as the lifelong learning process, feel the need to learn and improve, seek to know himself/herself as a learning person, have disposition and be able to independently, purposefully and persistently seek the set aim, be self-confident, believe in success of learning, feel responsibility for his/her learning activities, process and outcomes, be able to share knowledge and acquired experience with others, etc.

Anyway, developed approaches do not ensure success of learning to learn. It is necessary to know and understand how the learning process takes place, what ways and strategies are suitable for solving one or another learning problem, one must know that there are various learning styles, what concrete learning style, learning powers and possibilities of the concrete person are what sources are available for learning, etc.

Therefore, the competency of learning to learn can be defined as readiness and the ability to independently raise learning aims and according to the need and/or situation correct them, plan and organize the learning process, solve arising various type problems, reflect on one's learning experience and evaluate obtained results considering them, manage the process of one's further learning, etc. It is important to perceive that learning to learn is not only acquisition of subject knowledge or abilities, this is thinking about one's learning process and its management. This first of all requires knowledge of the process of learning and its management peculiarities, cognition of oneself as a person and as a learner, the ability to apply various learning strategies and technologies, etc.

The importance of independent, responsible, creative, active person who is able to learn and act in a self-directed way is still more actualized when the (self-)educational process steps beyond the traditional environments and forms and takes place in new real (teaching and learning in the library, in the nature, enterprise, etc.) and virtual (elearning, distance learning) environments, using the reality that is being created here and now, one's and others' experience as sources of teaching and learning and, based on them, creating one's individual knowing and acting here and now. Emphasizing the learner's active and conscious participation, also taking part of responsibility for both learning outcomes and the process of the very learning and teaching, the learning paradigm also presupposes the need to (self-)develop the corresponding abilities and competencies.

Considering quantity and quality of information existing today, the speed with which it is created and updated, presented to the consumer, etc., it is evident that today it is impossible and there is no need to cover all flow of information. On the contrary, it is particularly important to be able to find, select, analyze, evaluate information and perform other information management operations. In addition to general literacy, ICT management, critical thinking, creativity, etc., today it is particularly relevant for the person to be able to act and manage that information responsibly. The general culture of information literacy also becomes important.

One of the possible variants of (self-) development of this ability could be work with literature (usage of various printed sources), seeking not only to acquire subject knowledge but also emphasizing (self-) development of thinking. This, in turn, would encourage communication and cooperation of the (self-) educational process participants not only performing the activity but also planning it, develop the student's responsibility for this activity and its results, enable to differentiate and individualize the (self-) educational process, etc.

Identification of the person's learning needs and resources on one's own initiative, formulation of learning aims, choice of the most suitable learning strategy, self-assessment of learning outcomes according to chosen criteria, etc. are essential characteristics of self-directed learning, emphasized in this model. It is important that already at school the child should learn to manage his/her learning process; i.e., be able to set a learning aim, foresee necessary activities and most suitable ways to reach it, monitor the learning process and outcome, be able to organize and if necessary change the learning process, based on assessments and reflections.

The goal of self-directed learning organization system is to educate self-directly learning personalities making innovative decisions, which have acquired bullying prevention and non-discrimination competencies. This is emphasized in many European documents on education and national documents regulating education (in the conclusions of the European Council "On Preparing Young People for the 21 Century" (2008/C 319/08), Communication from The Commission to The European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions



"Rethinking Education: Investing in Skills for Better Socio-economic Outcomes"(COM (2012) 669, Strasbourg, 20.11.2012) etc.).

The system of self-directed learning orientated to innovative solutions and its suitability responding to requirements and challenges arising for today's comprehensive school and the educational process in general. The idea of self-directed learning as meaningful learning, which increases learner' independence, responsibility, expands their social participation, is grounded. Otherness, which is often the basis and the pretext of bullying, is acknowledged as an advantage rather than a disadvantage. Learning cooperatively, sharing experiences, searching for innovative solutions and implementing them, otherness is perceived as one of the favourable and even necessary conditions enabling to reach more efficient, better quality holistic result of any teaching and learning activity. From the perspective of learning to learn (self-) education orientated to innovative solutions is significant because it is sought to activate learners to solve problems, individually but responsibly make adequate, innovative decisions in order to solve a corresponding problem.

Implementation of the self-directed learning system at school changes both the learner's and educator's activities and their roles. The traditional roles of teacher and learner are replaced by new ones because in E-Teaching / learning environment, the learner must not only work independently, but also more and more often have to define learning goals, methods and activities, organize his / her learning, and so on. This requires that he has the competence of self-directed learning, which can be defined as readiness and ability to formulate individual learning goals independently; adjust them according to need and / or situation; plan and organize your learning process; to solve the various problems that arise during it; reflect on your own experience and evaluate the results and the process itself and, on the basis of those reflections, manage your further learning. The extent to which learners will have mastered this competence greatly depends on how much they will be able to and how qualitatively they will be able to benefit from the E-learning education.

The educator turns into an assistant, advisor for the learner and not a direct renderer of knowledge who takes responsibility for the person's learning and mastering. This means that limits of responsibilities are redistributed, formal and non-formal environments merge, the learner's freedom and responsibility show up, autonomy dominates. In this respect the educator's ability to cognize the learner, notice his/her individual traits, needs, etc. becomes important. Teaching and learning in the individualization aspect is grounded on the essential condition: not teaching, rendering of knowledge, skills and faculties is important but the learning process in which the educator helps the learner to find the individual way of learning that is suitable only for him/her, grounded on his/her

individual inclinations, interests, abilities. This way the educator helps the learner to form as a personality, realize him/her, be proactive, participating. Proactiveness here means the learner's freedom of action and personal responsibility for decisions and actions which he/she takes and performs in the teaching and learning process.

This platform is very useful virtual learning environment for all adults. The exceptional feature of this platform is that active users can not only use the information, but also create or reconstruct, in other words, manage, the content of the platform also. It offers a place to meet and discuss important adult learning topics, as well as to exchange ideas and materials to support professional practice. This type of community platform is the first of its kind for the sector of adult learning, especially non-formal., but to use all the possibilities of this platform it is necessary to be active and able to manage your own learning process, in other words, the learner needs skills to manage self-directed learning.

The respondents' survey showed that they prefer to be more passive user of the platform and majority of them lack self-directed learning skills and abilities to manage their own learning not to mention their ability to develop these skills of their students.

Obviously, one of the essential duties of today's teacher is to create, as far as possible, a learning environment that is educationally friendly, enabling, stimulating, motivating, and constructive. However, the extent to which each learner will take from that environment will depend only on his / her own, namely engagement, motivation, relevant skills and competences, especially self-directed learning. Mastering this competence would not only lead to success in teaching / learning, but would also largely save time and effort on learning. This competence is relevant for all ages, and the demand for adult learners is even greater

Methodology.

The research deal with the main aspects of the development of knowledge and e-learning management system in an institution or organization based on content analysis of scientific sources, documents and analysis of empirical data.

Research Ethics. The research is based on the principles of benevolence, respect for personal dignity and justice. Respondents are guaranteed confidentiality.

Research instruments. An anonymous electronic questionnaire survey using closed and open-ended questions was used to collect data. This choice was determined by the benefits of the group questionnaire survey, for example the survey can be carried out remotely, the survey ensures a sufficient sampling rate, 100% or close to questionnaire

reciprocity, the questionnaire takes less time than the interview (Luobikienė, 2003, p. 84).

The survey sample. In total, the study involved 126 respondents. As demographic characteristics did not have a significant impact on the results of the study, they will be summarized as a general characteristic, enabling better reflection of the respondents and understanding of the results of the study.

The survey respondents were mostly middle-aged (57.1% - 41-50 years old and 33.3% - 31-40 years old), women (95.4%), working in cities (52.4%) and small towns (23, 8%). It is broadly in line with the main characteristics of the community of adult educators. 76.2 percent are registered on EPALE platform users, i.e. they can not only read the material provided on the platform but also place it, comment on it, participate in practical communities and groups, search for partners, etc.

Results

When analyzing how EPALE responds to the needs of respondents' education and upgrading their qualification, they were asked what competencies (educational, managemental, research or general) would be most relevant to them. Educational competencies were named as the most important ones; other competencies were mentioned only by individual users. Although the need of the respondents in the development of other competences is the lowest, in particular general competences, the EPALE platform should not be abandoned to fill the resources of this topic, primarily because the relevance of general competences is increasingly highlighted by employers (for example, the TOP 20 skills identified by the World Economic Forum in 2016, etc.). In addition, the content of already recognized competences, as well as their educational capabilities and methodologies, vary greatly. Therefore, enough attention should be paid to the development of general and other competences on the EPALE platform. Similarly, some themes may appear on the platform to be new or separate, more relevant or more specific to the various educational themes.

The 5 main topics are presented on EPALE: "Life skills", "Quality', "Learning environment", "Support for students" and "Politics". Which topics are more prioritized by respondents is shown in Table 1.

Table 1Distribution of respondents according to which topics they prioritize

Topics	Percentage (%)
Life skills	81
Languages	47,6
Cultural education	85,7
Entrepreneurship and employment	28,6
Quality	42,9
Professional development of personnel	81
Learning environment	81
E-learning	76,2
Learning at work	71,4
Support for students	61,9
Social inclusion	45
Elderly people	60
Politics	15
European policy, projects and funding	45

Of the five themes outlined in the platform, 3 - "Life skills" and "Learning environment" (81%) and "Support for students" (61.9%) - are most important for our respondents.

It is obvious that in the themes of "Life skills" group of subjects, according to respondents, the most relevant theme is cultural education; the second issue would be language education. The problems of entrepreneurship and employability are relevant for about one quarter of respondents. The most relevant themes are the Basic skills and financial literacy.

In "Quality" topic the most relevant for respondents is the professional development of personnel, the second place is for quality assurance and approval of service providers.

The respondents' opinion on the relevance of the topic "Learning Environment" is that regarding educational environments, respondents considered the most relevant is E-learning and learning at work. Such a choice of respondents is understandable, because both themes have been highlighted in both theory and practice in recent times. In addition, in the context of the rapid development of information and communication technologies and in the context of the IV Industrial Revolution, their relevance will only increase. Due to the increasing need for assessment and recognition of competences acquired in non-formal and informal learning, which is becoming increasingly common

in the past, different types of resources for non-formal and informal learning will be even more relevant.

As far as support for students is concerned, it is obvious that the theme of elderly education is most relevant here, since adult educators, especially in the field of nonformal education, mainly work with elderly people. On the other hand, acknowledgment of previous learning, social inclusion and the analysis of learning disruptions and their overcoming is becoming more and more relevant - almost one third of respondents approve it.

Summing up the respondents' views on the topics presented in the EPALE platform and their relevance for adult educators, we can say that all topics are focused and needed. Some of them might even be even fragmented. This would help them find out more quickly and use the knowledge gained during their studies to improve the quality of adult learning.

Although registered visitors, the vast majority of respondents are passive users, although 50%. They are not on the platform of a tangible article, blog, event information, or resource, most likely because they do not have the relevant information they can put on the platform. However, knowing how many different events take place in adult education, this is unbelievable.

Obviously, more than half of the respondents tend to be active in commenting on or evaluating other articles and other resources embedded in the EPALE platform. On the other hand, even here they like to be at least active. The activity of respondents in commenting and evaluating resources only reaffirms that on this platform their informational behaviour is similar to behaviour on other web sites, i.e. they tend to perform their usual activities: marking "likes" or "dislikes", commenting, evaluating the information provided by others, but not putting them on their own.

Most of them do not have experience in practical EPALE platform communities or groups. This may be explained by the fact that they do not like to comment or evaluate, or because this activity on the platform is new enough. Non-participation is also explained by the ignorance of such a possibility (it should be remembered that this activity is sufficiently new on the platform) or lackluster. All cases indicate that there is a need for another person, i.e. in most cases, most likely, expert assistance, as well as the need of self-directed learning management skills.

Although 50% of respondents are passive users of the platform, they are very pleased with the platform's usefulness to its professional activities. By specifying in which areas,

according to respondents, the platform is most useful to them, the opinions were distributed accordingly (see table 2).

Table 2

Distribution of respondents according to EPALE utility for their professional activities (in
marks)

Statements	Percentage
	(%)
I can find information for improving my andragogy activity	23,8
I can discuss various relevant adult education topics	38,1
I can find out about events taking place in Lithuania and in the field of	57,1
adult education and get acquainted with their content	
I can share my experiences and learn about other adult education	52,4
experiences	
I can find colleagues who like to initiate and run new projects	47,6
I can read scientific articles about adult education trends in Lithuania,	42,9
Europe and the world	
I can find out about people who are active in adult education and their	19
merits	
I can publish information on adult education	38,1
I can communicate with other by blogs (blogs), discussions, comments	23,8
I can find legal information for me in adult education	23,8
I can participate in the EPALE community	4,8

According to respondents, the most useful professional activity is the possibility to find out about events taking place in Lithuania and in the field of adult education (57.1%), as well as the opportunity to share their experiences and learn about others' experiences in adult education 52.4, to find I am able to read scientific articles about the tendencies of adult education in Lithuania, Europe and the world for 42, 9, as well as colleagues who are thinking of new projects. The general assessment reaffirmed the opinion of the respondents about the possibility of communicating with other, discussions, comments, which are not very relevant to the respondents and which they find useful for their profession (23.8%), but the least useful is participation in practical EPALE communities (4.8 percent).

The fact that the EPALE Platform is a useful, up-to-date and positively evaluated platform is due to the fact that almost 76.2% respondents would recommend their colleagues, friends and peers become registered visitors to the EPALE platform, which means they will be able to not only read the information provided there, but also actively participate in information placement, possess the platform's methodological and other

resources, comment on the participation in practical EPALE, communities and groups by finding or becoming participants, partners, etc. of projects, conferences or other activities. But to use it qualitatively adult educators need some skills and attitudes. At first, it is skills of self-directed learning and management of such learning.

Conclusions.

- 1. Respondents believe that the platform is most conducive to educational (their educational need remains the highest) and general competences. Although the opinion of the respondents is that the competence of the latter is the smallest one, the EPALE platform should not be abandoned by the resources of this topic, primarily because the relevance of the general competences is increasingly emphasized by employers, and the content of the already known competences is very variable as well and the possibilities and methods of their education.
- 2. All EPALE platform ("Life skills", "Quality", "Learning environment", "Help for students" and "Politics") and their relevance are appreciated by adult educators, although they are "Life skills" most relevant to them. "Learning environment" and "Support for students". On the other hand, some of them might even be even fragmented. This would help them find out more quickly and use the knowledge gained during their studies to improve the quality of adult learning.
- 3. Although registered visitors, the vast majority of respondents are passive users. They are not on the platform of a tangible article, blog, event information, or resource, most likely because they do not have the relevant information they can put on the platform. However, knowing how many different events take place in adult education, this is unbelievable. On the other hand, it in a sense indicates that adult educators underestimate their experience, the significance and uniqueness of their activities, and therefore most actual and unique events, methodologies, and experiences are not shared. At the same time, this once again substantiates the need for EPALE experts as well as the need of some new skills and competencies. At first, skills of self-directed learning and management of such learning.
- 4. Obviously, more than half of the respondents tend to be active in commenting or evaluating articles and other resources embedded in the EPALE platform. On the other hand, even here they like to be at least active. And on this platform their informational behaviour is similar to behaviour on other websites, i.e. they tend to perform their usual activities: marking "likes" or "dislikes", commenting,

evaluating the information provided by others, but not putting them on their own.

- 5. Most of them do not have experience in the practical EPALE platform communities or groups. This may be explained by the fact that they do not like to comment or evaluate, or because this activity on the platform is new enough. Non-participation is also explained by the ignorance of such a possibility (it should be remembered that this activity is sufficiently new on the platform) or lackluster. All cases indicate that there is a need for another person, i.e. in most cases, most likely, expert assistance.
- 6. According to the respondents, the most useful professional activities are the possibility to learn about events taking place in Lithuania and in the field of adult education, to get acquainted with their content, to share their experiences and learn about other experiences in adult education 52.4, to find colleagues who are interested in initiating and implementing new projects. 47,6, I can read scientific articles about adult education trends in Lithuania, Europe and the world 42,9.
- 7. The fact that the information provided on the EPALE platform is relevant and useful is also well illustrated by the opinion of the respondents on recommending that other colleagues, associates become registered visitors to the platform. Three quarters of respondents tend to do this.

Recomendations

- 1. To encourage adult educators to be not only passive, i.e. only use the information on the platform but become active users of EPALE platform, i.e. to put on its own a variety of mutually beneficial information on this platform, to share news, submit their comments, and so on. This is likely to further enhance the perceived need and utility of each adult learner.
- 2. To make EPALE platform a virtual community of adult educators in Lithuania providing opportunities to communicate, share experiences, search for partners, express opinions, etc., as well as to the international level.
- 3. Develop their self-directed learning abilities.



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MASTERS & APPRENTICES: BREATHING TOGETHER A RICH LEARNING EXPERIENCE FOR ORGANIZATIONS?

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ABSTRACT

Masters & Apprentices is a unique and successful concert series where young musicians work together with very experienced singers. During a relatively short but intensive rehearsal period they work towards a concert series with a worldrenowned conductor. Deep and collaborative learning while maintaining a very high professional standard yields top performance. We assume that profit and not-forprofit organizations, can learn from this special program focusing on conveying deep smarts and implicit experiences. The preliminary findings offer a number of possible lessons for the wider domain of human resource development.

INTRODUCTION TO THE MASTERS & APPRENTICES PROJECT

The Masters & Apprentices project is an intensive training program for professional singers who, under the guidance of a renowned conductor and accompanied by a coach, rehearse a demanding program and perform it during a series of high-level concerts. The project is an initiative of vocal coach Geert Berghs. Young singers - the apprentices - stand next to an experienced master and thus naturally acquire the skills that the master has already developed. By working together, the apprentices take over their experienced colleague's expertise, which is difficult to convey in words. After all, ensemble singing involves much more than following the instructions of the conductor and technically singing the correct notes. It is also about the ability to adapt to each other, to form a homogeneous sound and to communicate a jointly felt interpretation.

The Masters & Apprentices project aims to offer young musicians the opportunity to develop their talents in the field of ensemble work at a high level, in addition to their training as soloists and conductors. A second goal is to let young singers experience how beneficial it is for a future soloist career to work in an ensemble, because even for a soloist it is of great importance to keep their eyes and ears open for their fellow musicians. In addition to the musical and artistic aspects, such a project also offers the opportunity to expand one's professional network and thereby improve one's economic perspective.

In the Netherlands, Masters & Apprentices has been a successful annual concert series by and for young, professional singers since 2011. During an intensive rehearsal period, twenty young singers (apprentices) work with four experienced singers (masters). The learning process is supervised by a singing coach (Geert Berghs, Amsterdam Conservatory), and the rehearsals and the concerts are led by a renowned conductor. In 2018 the conductor was Daniel Reuss (chief conductor of Cappella Amsterdam). In 2019 the program was led by the Finnish conductor Nils Schweckendiek, chief conductor of the Helsingin kamarikuoro.

In the world of classical music, preparing a concert program is often a tightly organized process, which is led by the conductor. The conductor is familiar with the repertoire and with the concert program and has a clear understanding of how a composition should sound. He uses the rehearsal process to clarify his opinion about the desired end result and works with the singers until he has achieved the desired ideal sound. Young singers, however, also have to cope with practical aspects to which a conductor usually pays little attention, such as developing the discipline to be present on time, following the conductor's instructions without discussion, how to stand and how to manage their energy in such a way that they can physically endure a long, intensive rehearsal period.

Preparation and technique

Ensemble singing also requires a professional attitude, which includes knowing the notes and the text before the rehearsals begin. A choir singer is supposed to do homework and be well prepared when starting rehearsals. In terms of the vocal technique, the singer should virtually already have mastered the concert's program. This requires careful and disciplined preparation. The project participants generally have little experience in this area and they also do not always know how to approach such individual preparation, especially if they are not yet familiar with the repertoire.

Learning to adapt to a choir

An important role of learning to sing together is to learn to adapt one's own voice, keeping however its individual character, to the surrounding voices. It is important to learn how one's voice is at the service of creating a new and special harmony. In



a musician's training, all the attention is usually focused on discovering and developing his or her personal sound, searching for the most unique expression and strengthening one's own identity. In choral singing, the capacity to conform to the whole comes first.

Compliance and obedience

Ensemble singing also requires learning to accept what the leader wants to hear. The singer's opinion doesn't matter. It is pointless to enter into a discussion with the conductor or with the master to try and influence the desired end result. It is the choir singer's profession to transform the conductor's wishes into sound. This also applies to the master.

Being obedient as an individual singer appears to be an important condition for apprentices. It is an attitude that is at odds with views about shared leadership, cocreation and democratic decision-making about artistic quality. In fact, the choir singer completely surrenders to a form of classical and autocratic leadership. However, as soon as the individual singers have been grown into a real ensemble, this ensemble will have a character, a sound, a musicality of its own and even a musical initiative. That is the moment where, as a second step, a dialogue can emerge between the conductor and the ensemble: for both a most rewarding event.

POTENTIAL CONTRIBUTION TO PRACTICE-BASED RESEARCH IN HUMAN RESOURCE DEVELOPMENT

We suspect that industry, organizations, schools and government institutions can learn from this special program. After all, many organizations use 'internships', 'traineeships' and 'in company' trajectories to prepare new, young employees for a position, but often with varying effects.

The project shows that it is possible to organize learning by combining experienced professional singers and novices. When studying the constituent characteristics, theoretical viewpoints on informal learning (Marsick & Watkins, 2001), social learning (Bandura, 1986), team learning (Edmonson, Dillon & Roloff, 2008) and workplace learning (Billet, 2010; Dochy, Gijbels, Segers & van den Bossche, 2011) seem to be attractive, as well as the notion of tacit knowledge acquisition (Polanyi, 1966/2009; Leonard & Swap, 2005).

Participating in the choir assumes a form of implicit competence development during workplace learning that uses the deep smarts of the experienced master, without the need for targeted instruction. Deep smarts are powerful forms of experiential knowledge and often unconsciously present among experts (Leonard & Swap, 2005). The transfer of such deep smarts is only possible through jointly undergoing the rehearsing and performing process. Talking about deep smarts makes little sense, at most as a reflection afterwards.



Research design and methodology

The main question guiding our research is: Which characteristics of this Music & Arts learning environment are conducive to experimentation, learning and professional growth in a corporate setting?

After building a conceptual framework, interview guidelines have been developed for conducting 36 interviews with conductors, masters and companions. The analyzed data have been validated in a feedback meeting.

This paper for the EAPRIL 2019 Roundtable Meeting discusses an approach that enables a meaningful translation of the findings from a Music & Arts setting to learning and development in the corporate world.

Research questions

The following research questions are central:

1. What do young musicians learn during the collaboration in the Masters & Apprentices program?

2. What makes the approach successful? What is the role of the conductor, the coach, the master(s) and the apprentices in this?

3. Which characteristics of the learning environment are conducive to experimentation, learning and professional growth? Which characteristics are obstructive?

4. What can managers, HR staff and training professionals in other contexts learn from the Masters & Apprentices program when it comes to organizing, designing and developing learning programs?

To provide an answer to the above research questions, a concise conceptual framework has been designed as described briefly in the introduction. A strong emphasis is on making explicit informal interaction between masters and apprentices. A detailed interview guide has been compiled based on this framework. Subsequently, 36 interviews were conducted with participants in the Masters & Apprentices program of the past five years: 3 conductors, 7 masters, 25 apprentices and 1 coach. The first analysis was shared in a round table meeting with 4 master, 5 companions and the coach. The researchers have asked additional questions for clarification. The next step is to translate the findings from this music practice into the world of human resource development in companies, schools, hospitals and government organizations.

Preliminary findings

The talented musicians all commit to a higher goal. It makes feedback and critical awareness of quality self-evident. The participants submit to the authority of the conductor of free will. The aspects of a common higher goal and the role of the chosen hierarchy are worth exploring further in labor organizations. The motives of the singers to make something beautiful and unique is probably the core of pride in craftsmanship. It is remarkable how the high artistic goal exerts a great attraction on the participants. Leadership seems to be about expressing a jointly supported ambition and working towards this without compromise. The apprentices experience the essential feeling of being desired and needed. It is probably an important ingredient in preventing meaningless work and getting caught up in the drama of the bullshit jobs (Graeber, 2019). Many internships and knowledge exchange programs for new professionals can use this principle of meaningful participation.

Upward pressure towards a concert series

The learning path is not without obligations, as the entire choir works towards a series of concerts. That goal is all-determining and tangible. The participants describe this "deadline" as a noticeable upward pressure towards a finale. The program, the dates and the venues are fixed. They cannot be changed or postponed. Canceling is not an option.

Making abstract goals of the conductor explicit

The master helps the young singers to translate the abstract goals of the conductor into a vocal-technical approach. For example, a conductor may have wishes and articulate these in a way that is difficult to apply for an inexperienced singer. A master will then give tips and suggestions based on his experience and expertise. In this way vague goals are translated concretely and explicitly into an audible timbre and expression of the choir.

Proximity of the master

An important role of the master appears to be that he or she is present close to the young singer. The master stands next to and between the apprentices. The master converts the conductor's comments and instructions into sounds in a natural and immediately audible way. Apprentices feel how the masters breathe, how they prepare a tone and with which energy and intensity they use it, in order to subsequently generate volume, form a timbre and move with it. This close-up feeling and experiencing appears to be invaluable to apprentices. There is a form of transfer of expertise that takes place without using words. This process would be disrupted if a master were to give excessive instructions and behave more or less like a second conductor.

Consciously opting for instructional learning

In the rehearsals of the four vocal groups, the four masters work separately with the sopranos, altos, tenors or bass singers on the technical details of the score. During



these rehearsals, there is room for explanation and specific instructions. It proved to be particularly valuable for the singers to be able to practice and experiment together. The apprentices expect a direct, personal approach and feedback from the master of their vocal group, which the conductor usually cannot provide. The master contributes a wealth of experience and makes ensemble singing an expertise in its own right, while it usually receives little attention at the conservatory.

The role of the conductor

A good conductor makes it possible for the choir to do something that the individual members have never done before or may not even have considered possible. If they succeed, it is an indescribably important artistic experience. It makes little sense to go against the wishes of a conductor, who is the absolute leader in terms of goal and result. The goal is therefore set very high and is actually beyond each individual professional. The singers themselves do not have an explicit "yardstick in mind", but they must be able to cope with the singing, they must understand the intention, and they must find the intended result interesting and desirable.

The role of the vocal coach

Participants of the Masters & Apprentices program spend a certain amount of time together practicing, singing and performing a lot. This creates a great sense of togetherness and trust and even a family feeling. The coach, Geert Berghs, plays an important role in this process. He ensures that all participants feel at ease and does not make the work unnecessarily unattractive by burdening the participants with forms that need to be completed, overly long training sessions or unnecessary team outings. The coach has a strong connecting role in the group, performs daily breathing and consonance exercises to shape the group, conducts coaching conversations and organizes joint meals and activities. The coach is responsible for reinforcing the pedagogical objectives of the project. He almost turns the Masters & Apprentices project into a family affair, in a way that is rarely found in a professional choir. The coach also helps to resolve ambiguities and potential conflicts. He is a stable factor in a demanding professional environment.

Beneficial and impeding factors for learning experiments and professional development

Further analysis of the interview findings also sheds light on a number of characteristics of the specific learning environment offered by the Masters & Apprentices program that seem to promote or even impede learning experiments and professional development. Here we present a brief overview of critical factors.



Beneficial characteristics of the Masters & Apprentices program

A number of elements were repeatedly mentioned as characteristics that make the concert project such a special experience:

• All participants are strongly driven by the desire to make music together at a high level. This presupposes the presence of a conductor with an international reputation and very high ambitions.

• The coach and the conductor compose an attractive program that participants can perform during a series of six to nine concerts on different stages around the country.

• For the young singers it is a privilege to be able to sing not only under the guidance of a top conductor, but also in the presence of experienced experts in the singer's profession.

• The Masters & Apprentices program offers a lot of time for rehearsals, not only with the entire ensemble, but also in separate voice groups, under the guidance of the master, and also with a specialized voice coach.

• A lot of attention is paid to learning to sing together. It is not just a matter of learning to sing the notes and the lyrics together, but above all of working on a common chorus sound, merging with each other's voices, in order to achieve a homogeneous expression.

• It is even a matter of learning how to breathe together. The awareness of joint breathing, noticing this among each other and joining in and becoming part of it is an important feature of high-level ensemble singing.

• Giving up individuality and ego to create something "impossible" as a group appears to be a key characteristic of high-level choral singing. This aspect seems to be at odds with the characteristics of modern professional music practice, in which individual talent often takes center stage.

Impeding characteristics of the Masters & Apprentices program.

From the analyses of the conversations with the masters, the apprentices, the conductors and the coach, we can also distil a number of elements that stand in the way of the project's high ambitions.

• It sometimes happens that a master starts behaving like a second conductor. A master who is giving instructions disrupts the learning process that is geared towards developing harmony. This creates a tension that undermines the accepted hierarchy in music practice.

• It sometimes happens that a conductor indicates that he is not satisfied and that a certain passage must sound differently, without showing or indicating how it should be done. This can lead to frustration, because the conductor does not provide a clear solution for achieving the desired result. Attempts at guessing usually aggravate the



problem. The master can play an important role here by making a feasible translation of the conductor's wishes based on experience and presenting this translation as an audible solution.

• One of the more or less hidden reasons for apprentices to audition for the project is the hope that the conductor or the master might help them to gain access to one of the few available positions in professional music practice. Apprentices who are too busy with individual profiling and try to stand out for the conductor or the master disrupt the delicate process of ensemble singing, forming a balanced choral sound and merging into joint breathing. In such situations the coach plays an important regulatory role.

• The aim of the rehearsal period is to achieve the desired interpretation and fulfil the conductor's high expectations regarding the ideal sound. It is a continuous process of communicating wishes that are difficult to express, which the singers responding searchingly with sounds. The conductor continues this process – as do the masters during the group sessions - until a satisfactory result is achieved. Due to impatience, time pressure, tension and fatigue, feedback can be expressed in hard and direct comments. This is a difficult practice for young singers, because getting feedback on one's voice feels like receiving criticism of one's soul. It is an important task of the coach and the masters to teach the apprentices how to deal with feedback on their voices.

What can managers, HR and Learning & Developing professionals learn from the Masters & Apprentices project?

Based on the preliminary research results of the Music & Arts project it is worth looking for a possible application of this approach in the field of training, learning and development in professional work organizations, industry, hospitals, service agencies and the like. One may conclude that organizing, designing and developing learning environments can be very successful if the content really matters, is meaningful, and fits in with the ambitions, motivations and dreams of young professionals. If everyone is able to play an active role from the outset in a project where the participants are really needed, feel recognized and appreciated in a pleasant, safe and caring environment, then the bar can also be very high, the road uncompromising and the feedback on the intermediate results, direct and straightforward. The characteristics and the success of the Masters & Apprentices program offer a number of possible lessons.

Search for a higher goal

The Masters & Apprentices program unites talented musicians who all have committed themselves to a higher goal: performing a concert series at a very high level, which the singers and the audience experience as a special event. It is not only the conductor's ambition. Consequently, feedback, practicing and being critical of quality are not up for discussion within the group. That is a logical consequence of wanting to perform at one's best to achieve this higher goal together. The participants voluntarily submit to the authority of the conductor and the masters. At the same time, this acceptance of authority only applies to this concert series, and hence it is limited in duration and scope. The aspects of a common higher goal and the limited nature of the chosen hierarchy are worth exploring further in work organizations.

Make use of professional autonomy

Each singer has a great deal of professional autonomy and expertise, which is necessary for performing together. This expertise is fueled by a strong passion for the profession and by pride in a magical result. Linking this professional autonomy to a common higher goal generates acceptance of authority, without enforcement via control, hierarchical structures or even punishment. The Masters & Apprentices project can be successful because all the participants consider it a meaningful program, to which they are happy to commit themselves for the time being. The goal is not imposed by someone who does not actively participate in its implementation.

Search for beauty in everyday work.

There is a great deal of beauty in a joint experience of learning, rehearsing and performing. Audiences will also feel it during a concert. They will experience something beautiful and unique. Participants experience it to a much greater extent. The experience resembles a kind of overwhelming "whirl", a kick. The trick for work organizations is to also search for what motivates people to make something beautiful and unique, and to manage that motivation. It probably is the core of pride in craftsmanship.

For talented musicians, the bar can be set high.

The conductor has a goal in mind and for that he sets a very high standard. To achieve this, the conductor works extremely hard. It is perhaps even more remarkable to notice how this high goal exerts a great attraction on the participants. Leadership is therefore not only about being able to inspire enthusiasm, but perhaps mainly about using one's expertise to express a jointly supported ambition and working towards this goal without compromise.

Create a pleasant working environment.

It is remarkable how much the participants benefit from a "hands-on" coach who is present during rehearsals, who supports the participants, helps where necessary and guides them through voice exercises. This coaching entails much more than offering reflection, asking questions and providing technical support. The coach creates a pleasant working environment, paying personal attention to the participants and teaching them to deal with feedback on their voice, which may sometimes be harsh. The coach also takes care to provide the right conditions for a family atmosphere, such as planning lunches, conducting individual conversations, assisting with administrative tasks and organizing dinner before each concert.

A pleasant working environment with personal attention, recognition and appreciation makes it easier to work unconditionally towards a top performance.

Everyone participates 100%.

The principle of active and full participation can be used in many internships and knowledge exchange programs for young professionals. Going to work immediately, using everyone's talents and focusing on the central substantive issue generates the essential feeling of being wanted and needed. This implies saying no to "sneak previews" and to getting to know the work while remaining on the sidelines. Even people with little experience should be invited to get to work immediately on a substantive, meaningful "higher" goal.

CONCLUSION

The lessons of the Masters & Apprentices program seem to suggest that organizing, designing and developing learning pathways can be very successful if the substantive theme really matters, if it is meaningful and fits in with the ambitions, motivations and dreams of young professionals.

If, right from the outset, everyone can be made to play an active role in a project in which the participants are really needed, where they feel acknowledged and appreciated and where they can cooperate in a pleasant, safe and caring environment, then the bar can also be set very high, the process of pursuing the goal can be uncompromising, and the feedback on the intermediate results can be direct and straightforward.

Submitting and conforming to the ambitions of a powerful leader - the conductor - is completely acceptable if one has consciously and freely chosen to participate in a project with a desirable higher goal that is entirely in keeping with one's own professional identity. It would seem only natural to use the experience and expertise of masters and coaches who enable young professionals to achieve that attractive goal; not by speaking to them in a patronizing way about what they are doing wrong, but by demonstrating and making them hear and see how it can be done differently, better, more effectively and more beautifully. Without losing themselves, they can deliver performances at a level they didn't think was possible. It is probably the art of learning to breathe together.



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CHALLENGES OF SIMULTANEOUSLY IMPLEMENTING A FACE-TO-FACE AND DISTANCE BACHELOR PROGRAMME

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ABSTRACT

Offering a Bachelor programme in a competence-oriented format both face-to-face and at a distance poses a great challenge when it comes to designing the two versions. At the implementation level, it means handling the course design orientations of teachers at the same time, based on common learning outcomes and in accordance with the institutional requirements for a traditional face-to-face university setting. From a theoretical point of view, adapting course organisation relies first and foremost on the theory of transactional distance and digital skills. This research project takes a qualitative approach and uses data that consists of reports written by the distance learning coordinator based on interviews and the work undertaken with 10 teachers and other stakeholders over two years, in addition to documents produced over the full period. After carrying out a pragmatic analysis, the findings reveal issues related to i) teachers' professional development; ii) content adaptation and pedagogical strategy refinement to meet students' needs both faceto-face and at a distance; and iii) quality improvement of the face-to-face programme, particularly in terms of active teaching methods and alignment between learning outcomes and evaluation.

INTRODUCTION

The current digital era is changing personal and professional interactions and technology is extending human capacities (Biau Gil & Pym, 2006). Its impact is evident on practices, settings and interactions (Bates, 2000; Frank, Roehrig, & Pring, 2017; Prensky, 2016). In academic organisations, new and emerging technologies require from educators a paradigm shift in current learning environments, introducing transformations in the patterns of pedagogy and the possibility of new kinds of learning with technology (Cope & Kalantzis, 2017). The use of technology for teaching and learning also demands major changes in teaching and organizational



culture (Bates, 2000). The translation profession is no exception; technology has modified translation workflows and practices (Buysschaert, Fernandez-Parra, Kerremans, & van Egdom, 2018; Drugan, 2013; Orlando, 2016) and evolving labour markets call for a change in traditional standards (Pym, Fallada, Biau, & Orenstein, 2003). There has been a growth in language services over the last few decades (Kelly & Stewart, 2010; Marczak, 2018; Pym, Orrego-Carmona, & Torres-Simon, 2016) due, in part, to globalisation and the voluntary or non-voluntary circulation of people (Orlando, 2016). The increase in language service provision is also due to high access to the internet and personal computers, which renders today's translation 'a form of human-computer interaction ... that is dependent on computer resources, sometimes to a great extent' (O'Brien, 2012). One of the outcomes of this is a growing volume of texts for translation (Drugan, 2013; TAUS, 2013) and the resulting utilization of CAT tools, machine translation tools and, recently, file sharing services and cloud-based disks as server spaces (Marczak, 2018). The translator's habits are also changing in order to adapt to new forms of work, such as telecollaboration, an anytime/anywhere-basis and various online solutions (O'Brien, 2012).

The development of machine translation (MT) and Computer-assisted tools affects not only the work settings and practices of professional translators but also the areas, tools and modes of teaching and learning (Ivanova, 2016; TAUS, 2013). Thus, technology-enhanced or technology-based courses challenge us to rethink the pedagogy of translation.

Translation training material and plans are evidently adapting to include a wide array of technology-based activities and computerized resources such as Machine translation in teaching and learning approaches (Marczak, 2018; Orlando, 2016; TAUS, 2017; Thelen, 2016). The use of computing devices has altered the transmission of didactic knowledge in space and time (Cope & Kalantzis, 2017) and facilitated online or distance training in the field of translation, whether in the form of continuing education or as a degree programme for translator training (Schmit, 2006). The purpose of this paper is to describe the implementation of a Bachelor degree in two forms - face-to-face and at a distance - in a traditional researchintensive university. While it was important to develop the distance version of the programme to reach new audiences, it was also important to continue offering the face-to-face version. The onsite BA is a modular programme that includes descriptions of each course along with clear objectives, skills and evaluation forms. It promotes a dynamic and active approach that stimulates independent learning and the development of teamwork techniques. These properties allow both programmes to run in parallel. Furthermore, students must still apply for the face-to-face programme.



UNIVERSITY OF GENEVA CONTEXT

The University of Geneva identifies digital technology as a cross-cutting theme that affects all its activities. It is therefore working on developing an open and betterconnected science and transmitting knowledge '*based on open, participative and inclusive methods*' (UNIGE). Distance learning is one of the technological trends that is changing the institution's educational paradigms. Concretely, in addition to the distance-learning Bachelor (BA) and Master (MA) programmes offered by the Faculty of Theology, the Arabic Unit at the Faculty of Translation and Interpreting has launched the first Distance Bachelor in Multilingual Communication for Arabic speakers (*e*-BA Arabic), thereby fitting into the university's <u>digital policy¹</u>.

The programme has been running since fall 2019, providing training in translation for students with the language combination Arabic-French-English. It is offered in parallel with the face-to-face BA programme. The ultimate objective of the project is to offer face-to-face and distance learning versions of the programme that are fully equivalent - pedagogically speaking and also from the certification point of view.

CONTEXT OF THE E-BA IN MULTILINGUAL COMMUNICATION AT THE FTI

Motivations

By launching the Arabic *e*-BA, the Arabic unit is aiming to reach a target audience for which the BA in multilingual communication would otherwise be inaccessible. The *e*-BA is offered to Arabic-speaking candidates who are established in Arab countries and worldwide, and who are admitted through the Faculty's annual entrance exam, but encounter a number of administrative and financial obstacles that make it impossible for them to come study at the Faculty. It is also intended for applicants aiming at a professional reconversion and who are looking to begin new studies. It is particularly of interest for people with a degree in specific fields (law, education, art, etc.), who have the necessary skills in Arabic, French and English and would like to get a degree to work as translators. For this specific degree, the focus is on training graduates with skills and competences in cross-cultural communication, which include but are not limited to the field of translation. Distance courses are undertaken fully remotely from the student's PC, with exchanges and discussion threads with teachers and peers.

From a scientific point of view, the move towards a distance programme is motivated by changes in the profession, as mentioned in the introduction.

¹ https://www.unige.ch/numerique/en/digital-strategy/digital-strategy/#theme2

As demonstrated in the theoretical framework, the process of adopting technologies is progressive and varies from one course to another. At this stage of the *e*-BA, the rationale behind introducing technologies is following: the use of technologies in knowledge acquisition helps create the proper environment for constructive learning, as put forward by (Herrington & Oliver, 1995) and promotes student-centered learning (Oliver, 2002). They argue that 'the computer can provide an alternative to real life setting [...] without sacrificing the authentic context' (p.3). Distance learning also enhances the development of skills that are called for by the labour market by designing authentic learning (Herrington, Reeves, & Oliver, 2014) and project-oriented training. Kiraly and Hoffman (2016) advocate competence development in translation learning and promote 'the self-organisation of skills and knowledge from the simple to the complex and from the teacher-centred instruction to the autonomous learning' (p. 140). With this in mind, the development of autonomy, networking and collaborative work has been mobilised. Distance learning also allows for flexibility in terms of the place and manner of learning (Bichsel, 2013; Khan, 2009) and responds to new generations of students who are becoming increasingly sophisticated in their use of technology (Bichsel, 2013; Tapscott, 2009). Lastly, the e-BA seeks to train "research practitioners" (Orlando, 2016, p. 34) through regular assignments in the form of written submissions (eg. written and oral presentations). This enables students to develop both the skills of a translator and the attitude of a researcher to engage the student in his/her learning process for lifelong learning.

More generally, the literature on distance learning provides an extraordinary basis for examining the pedagogical issues at hand (Dillenbourg, 2017), which try to simultaneously enhance the quality of distance learning and face-to-face training. Teachers are constantly called upon to rethink their courses with a view to distance learning and introduce many innovations in their face-to-face courses, which are therefore also transformed (Cope & Kalantzis, 2017). In that sense, digital education is serving as a vector of change to rethink teaching and learning by transforming the behaviour of students and teachers, and integrating it into a broader sociopedagogical strategy (Bates, 2000). From a constructivist perspective, which considers students to be actively engaged in learning, these educational experiences integrate learning through authentic translation practice and real-life professional activities, and involves students in every aspect of the teaching/learning process (Kiraly, 2000).

The *e*-BA Arabic reflects these changes by featuring technology-based learning environments and teaching methods.



Pedagogical support

The *e*-BA and face-to-face courses of the BA are given in parallel, based on the same study plan and regulations. The e-BA has the same academic value as the on-site programme, and is regulated by the same curriculum and examination process. The programme takes three years (6 semesters) and equals 180 ECTs. It offers the same mandatory and optional courses, including transversal courses (e.g. linguistics, language for specialized purposes), second-language courses (French and English), translation courses (e.g. methodology of translation), and information and communication technology courses. The lecturers of the programme have a wide range of profiles, ranging from translation practitioners to subject-field specialists (law, economy, etc.).

Since each course varies in content and language, a common vision has been developed with all the lecturers. Through regular meetings, teaching workshops and feedback sessions, all course content had to be redesigned and adapted to integrate students at a distance. Each lecturer was provided with support to identify an effective way to present the content and activities of his or her class online. Pedagogical situations were identified, ranging from instructor material-dependent teaching, where lecturers reinforced didactical material, text resources and annotated bibliographies, to authentic-oriented approaches, where students had a greater involvement through multiple sources of knowledge. Specifically, in order to simultaneously appeal to present and distant students, multimedia tools were incorporated into the course (mediaserver, webinars, smart notebook, e-Portfolios, wikis) to record lectures, create and share interactive content, record short videos and move towards autonomous, collaborative and reflexive learning.

As a result, lecturers turned to various tools and platforms to ensure that both distance and face-to-face students were provided with a dynamic and engaging learning environment.

Technical Support

The e-BA has benefited from the services and infrastructure of several institutional support services. Four institutional support centres have been involved in seting up the distant learning environment: the Centre for Teaching and Learning in Higher Education (teaching and learning pedagogy and tools), the Centre for e-learning (Moodle and e-Assessment solutions), the Media Centre (lecture recording and video capsules) and the Office of Legal Affairs (regulatory questions).

The Centre for Teaching and Learning (Pôle de soutien à l'enseignement et l'apprentissage) organised pedagogical workshops to assist lecturers in the



adaptation of didactic material; provided guidance with regard to the context, organisation, resources, processes, results, and effects of the training programme in conformity with the guidelines of the European Association for Quality Assurance in Higher Education (BureauQualité, 2015); and validated the final format of the programme.

The *e*-BA courses run on the learning management system (LMS) Moodle, which is the LMS used by the university. Some e-BA lecturers were already used to teaching with the LMS and were able to easily adapt their courses, while others needed more streamlined support. The centre's support was crucial for solving technical problems and providing e-assessment solutions.

The Media Centre provided assistance with occasional enquiries and the Office of Legal Affairs responded to specific questions and issues of a legal nature.

Techno-pedagogical Support

Internally, two actors worked closely together in the Faculty: the director of the programme and the distance learning coordinator. Apart from making decisions and being in charge of all institutional documentation, they also worked with the abovementioned support centres to cater to customised, in-house needs. Before and after institutional workshops, they also offered individual support to each lecturer according to his or her capacity, in order to help foster professional development.

THEORETICAL FRAMEWORK

In terms of designing courses, the theoretical background relies principally on the theory of transactional distance (Moore, 2013). The course structure allows for face-to-face and distance teaching and learning; interactions are scaffolded with compulsory, pro-active and on-demand activities; and the autonomy of students is nurtured in a variety of ways by institutional and homemade tools. The professional development of teachers (Boud & Hager, 2012) leverages their competence in the domain of teaching and learning in higher education, and further trains them in on-line course design with the help of the TPACK model (Koehler & Mishra, 2009). Digital skills (Redecker & Punie, 2017) are required for e-learning and can be found in the technological knowledge of the TPACK model. Domain-specific pedagogy in multilingual communication and translation (Kiraly, 2013; Marczak, 2018; Orlando, 2016; Pym, 2011) is an invariant included in the pedagogical knowledge of the TPACK model (Figure 1).



What is the theoretical basis for running simultaneously the BA in multlingual communication for Arabic language in face-to-face and at a distance? Theory of transactional distance (Moore) provides based on * Structure Dialogue Frame to empower fòr Learning Autonomy of learners is supported by facilitate Professional development of teachers (Boud & Hager) represents Common pillar for the face-to-face Content Knowledge in this and the distant programmes context backed on represents helps to Multiple-fold pillars Pedagogical Knowledge in this distinguish context distinguishing TPACK model (Kohler & Mishra) Technological Knowledge Face-to-face only General vs domain specific vs distance only vs face-to-face + distance

Figure 1: Visual representation of the theoretical framework

RESEARCH QUESTION

The purpose of this study is to document the facilitating elements and constraints of simultaneously offering the same programme face-to-face and at a distance in a traditional face-to-face university that is in the midst of developing its digital strategy. In reference to (Tait, 2008), and at this early stage of the research, this phenomenon can be understood as a blurring of frontiers between the roles of open and face-to-face universities. The guiding research question is therefore the following: what are the inherent facilitators and constraints at the University of Geneva's Faculty of Translation and Interpreting when it comes to simultaneously implementing a Bachelor programme in multilingual communication at a distance and face-to-face? Subsidiary questions are: how do the pedagogical choices for the different courses vary to reflect transactional distance elements? How do teachers accommodate the distance element in their course?

METHODOLOGY

To set up the learning environment, we relied on design-based research (DBR) (McKenney & Reeves, 2014), particularly since the Faculty has a track record in blended learning supported by DBR (Class, 2009). Upfront, the DBR had two theoretical inputs:



- The Edukata project (https://edukata.fi/) and, more specifically, the Innovation maturity model (<u>http://files.eun.org/fcl/eduvista/eduvista-tool-2p1.pdf</u>). While most lecturers are at stage 2 or 3, their aim is to progressively reach stage 5;
- Competence-based education (Bachmann, 2018) provides a learner-centred perspective, driven by the intention to reach identified outcomes at the end of a course. Students engage in different kind of activities and projects to demonstrate their skills, while teachers play the role of facilitators and guide them in their individual progress.

The research reported here focuses on a qualitative approach and draws on the structure variable from the transactional distance model. It is based on the analysis of reports written by the distance learning coordinator, which result from interviews and work undertaken with 10 teachers and other stakeholders from Spring 2017 to Spring 2019. It also relies on course descriptions, documents presented during the workshops offered by the centre for teaching and learning in higher education to develop digital skills, and documents produced to comply with the administrative and institutional requirements (e.g. explanatory statement). More specifically, the preliminary data analysis is pragmatic and seeks to describe and understand how a programme can be set up in two formats.

PRELIMINARY FINDINGS

Preliminary findings show that:

- i) In terms of a teacher's professional development, introducing a distance-learning component offers teachers the opportunity to ground their skills and knowledge in higher education teaching and learning. For instance, a lot of work has been accomplished in terms of identifying key learning outcomes, naming them, and then aligning outcomes, activities and evaluation. Training on designing courses for distance learners builds upon all that and depends on each lecturer's desire to either do the minimum (e.g. record face-to-face courses) or embark on an enriching adventure (organising webinars that include face-to-face and distant students). In the end, the entire process of reflecting on and designing a course for an e-learning context has proved to have a positive impact on the quality of the face-to-face course as well.
- ii) In terms of institutional functioning, the process takes a long time because the same administrative steps are required to launch an e-BA programme as to set up an entirely new programme. This entails several steps within the faculty before final approval is granted from the institution, taking approximately one year in total.
- iii) With regard to exams, creative solutions have to be found to comply with institutional e-assessment requirements. In particular, we are



referring to institutionally-recognised centres that offer identical infrastructure and can oversee the exams simultaneously.

iv) In terms of institutional support, both the e-Learning Centre and the Centre for Teaching and Learning offer great customised support.

CONCLUSION

The first conclusion is that offering a regular Bachelor programme at a distance has proved to be a transformative experience for the Faculty, with an impact on several levels. For example, the very nature of exams will have to be examined in the near future to align it with the professional experience of translators in the marketplace. The second conclusion underlines the need to support teachers in the development of their professional identity, while cultivating distance learning and teaching. This conclusion is closely related to the teachers' willingness to evolve professionally, especially since no special funding exists for this type of initiative; professional development is therefore the reward.

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PLAYFUL MAKING IN AN EARLY EDUCATION CONTEXT: INDOORS, OUTDOORS, AND FABLAB

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ABSTRACT

New national core curricula call for the use of diverse indoor and outdoor environments. Learning must be based on problem-solving, playful activities, and the use of all senses and the entire body. We designed a playful making process using three environment types: indoor in the kindergarten, outdoor in the forest, and indoor in the FabLab maker space. The aim was to explore children's learning in these three different environments. The following research question was formulated: How does children's understanding of healthy food develop during the playful making process? Sixteen children, aged 4-5 years, participated in the playful making process, which followed a narrative, instructed by the Owl (a hand puppet), who needed the children's help. The data were collected through video-recording, photographs, and photo-elicitation interviews. The results reveal that children's understanding of healthy food increased clearly during the process. By the end of the process they could, without hesitation, categorize foods as healthy or unhealthy. Children learn a given topic easily, even at the conceptual level, when the activities are repeated in different playful making activities and environments. Gradually increasing children's autonomy in collaboration, activities, and creativity is useful. The results are applicable for researchers and practitioners in the field of early childhood and elementary level education.

INTRODUCTION

Children's right to a high-quality childhood—including early education and care and their right to play are stressed by national and international reports, studies, curricula, philosophical statements (e.g. Karila, Kosonen, & Järvenkallas, 2017), and the Finnish National Board of Education (FNBE, 2016, 2018). The importance of



play is underscored in the new curriculum for pre-school education (2016) and in the core curriculum for the early education of young children (2018).

When designing playful learning processes it is important to note that adults and children perceive play differently (Ernst, 2018). Children see opportunities for play in almost any environment (Glenn, Night, Holt, & Spence, 2012) and they consider as play almost any activity that they find triggering, engaging, and meaningful. It seems that decision makers, caregivers, parents, and teachers do not always adequately understand play (Little, 2010; Singh & Gupta, 2011; Nicholson, Bauer, & Wolley, 2016; Stolp, 2011), disregarding the very play environments that children prefer—that is, those environments which provide physical, emotional, and social activities, and elements of nature (Hyvönen & Kangas, 2007).

Although play activities in indoor facilities and in outdoor nature-based environments have been studied from the perspective of teachers and children (e.g. McClint & Petty, 2015; Waller, Sandseter, Wyver, Ärlemalm-Hagsér, & Maynard, 2010), less is known of using making activities and maker spaces in the early education context. Further, misconceptions about making are still prevalent among early childhood educators, and these can prevent learning through making. One misconception asserts that making is essentially dependent on the use of manufacturing tools, such as 3D printers (Cohen, Jones, & Smith, 2018).

Maker space and *maker education* refer to environments and activities where children make and learn. Making involves playful experimentation with tools and materials (Regalla, 2016): children make ideas and artefacts, and they create, revise, and test their own theories of the world as they play with other children (Resnick, 2018). Maker spaces also constitute what is referred to as an *open-door approach* (Kjällander, Åkerdeldt, Mannila, & Parnes, 2018), which describes the nature of integrating formal and informal environments. The maker movement is uniting educators across disciplines in an exceptional way (Regalla, 2017); therefore, we need research as to how maker education can be designed in early education, particularly by connecting with nature elements.

Maker space denotes to a wide variety of spaces and environments where creative processes can take place (Regalla, 2017). *Outdoor* can signify any environment that is exterior from indoor early education facilities. Although natural outdoor settings have been recognized as important environments in early education, there are still barriers to using them as a learning environment, including limited access to such environments, lack of time, winter weather, and safety concerns (Ernst, 2014). Regardless of the chosen environment, it is important to understand which elements and events have the greatest potential to trigger and maintain children's interest, and how nature settings can present playful making activities and learning. This is particularly crucial because, as often happens when integrating play and learning



(playful learning), either the play turns out to be uninspiring and dull or the learning does not happen as expected (Hyvönen, 2011).

The aim of this research is to study children 4-5 years old in the *playful making process* in a setting where the three environments have been integrated. The making activities are woven together with the narrative of the Owl, who needs the children's help in providing knowledge about healthy food and in providing food for forest animals. The main focus was to examine the entire process and analyse children's learning during collaborative playful making activities.

THEORETICAL FRAMEWORK

The theoretical framework is knitted together by integrating *playful learning* and *maker education*, which we conceptualize as *playful making* in the early childhood context. Playful learning denotes a pedagogical context in which play and playfulness are integrated with learning goals (Hyvönen, 2008; Resnick, 2018). It is characterized by collaboration, activity, narration, creativity, emotionality, and concretization (Hyvönen, 2008; Hyvönen, Helenius, Hujala, 2016). Play pedagogy involves teachers who know that playfulness and the co-construction of meaning with children go hand in hand (Singer, 2013). The following features are emphasized in this study:

Collaboration in early childhood is child-centred and based on earlier understanding and experiences. Developing this capacity involves social interaction and exploratory talk, in which children are encouraged to question and co-reason (Mercer, 2000) to understand the collaborative task and its purpose (Dawes & Sams, 2004). Interaction helps children to understand other's perspectives and to participate in a more advanced skills (Tudge & Rogoff, 1989). Interaction is not only verbal, but includes non-verbal, kinaesthetic, and emotional aspects (Dukuzumuremyi & Siklander, 2018). In this study, collaboration among children is considered at three interconnected levels:

- 1) Social cohesion and a feeling of togetherness, particularly in indoor activities at the beginning of the process. To be able to share their thoughts and ideas, group members must trust each other and feel that they fit in.
- 2) Co-operation when making things together, particularly in the forest activities. Children have a common goal and they divide tasks to accomplish that goal.
- 3) Collaborative learning with joint knowledge construction, especially in the FabLab making activities. Collaborative learning requires learners to participate in shared activities, negotiating and sharing knowledge to reach a common goal (Dillenbourg, 1999). Sharing can help children to develop their thinking on any subject matter, and could include observing one another, questioning, asking help, inviting feedback, creating jointly, and pooling information (Dawes & Sams, 2004).



Activity shows denotes hands-on, body-on, and mind-on activities. However, children cannot take part in playful making activities if they are not sufficiently competent in these areas. Therefore, activity in this study is based on the childcentred approach, which allows room for children's actions, proactivity, and agency in the playful learning process (Hyvönen, Kronqvist, Järvelä, Määttä, Mykkänen, & Kurki, 2014). The decision to allow children to play and make with tools, materials, or technologies is often based on the decisions of adult teachers. When the teacher is a *leader*, then the children's duty is mainly to follow instructions, which was the purpose at the beginning of our process. Allowers see and value playfulness as a means to construct and maintain social relations and friendships, thus they encourage children's free and spontaneous play. Negotiations, agreements, and disagreements may occur, which is also important for learning collaboration. (Hyvönen, 2011) This was the purpose of the forest activities. Afforders are teachers who integrate play and curricular goals in such a way that learning takes place in play, without diminishing the essence of play. Our final environment, FabLab, focused on the ideas of the afforder.

Narration was chosen as a key element of playful making. For children, narrativity makes activities logical and procedural, which approximates the process of computational thinking (Kjällander et al., 2018). Narrativity also supports a project-based approach to learning (Resnick, 2018). The entire playful learning process was designed around the story of the Owl, who asked the children to help. The Owl, in the form of hand puppet, spent all its time with the children until one morning when s/he 'disappeared'. The children found an envelope from the Owl in a tree, and in this way understood her/his presence.

Creativity is defined as a mental process with emotional, social, and physical features, which can lead to outcomes that are original, ethical, desired, and novel (cf. Kampylis, Berki, & Saariluoma, 2009). Creativity includes thinking differently, using one's hands and materials, and messing around (Resnick, 2018). Throughout this study the narrative posed problems for children to solve. For instance, once they found Owl's envelope, enclosed with a map and recipe, their problem was to find their way to the forest and cook food for the forest animals. The degree of required creativity increased from one environment to the next. Children in this study took the story and their role without hesitation. Collaboration in creativity is also important; while some children can be creative in their thinking, they cannot always realize that creativity into outcomes. Creativity requires one to find one's own ways, styles, and expressions, all of which children can achieve together (Tanggaard, 2014).



The *emotions* and *emotional tone* of the play making mileu are important considerations when designing playful making processes. For instance, the playful making process encourages children to recognize, label, and regulate their emotions (Kurki, 2017). In addition, children feel positive emotions when they find tasks and activities meaningful and doable, and when they succeed (Määttä, Järvelä, & Perry, 2016). Emotions play a significant role in the maker mindset; for instance, humour and sense curiosity are two important elements (Hyvönen & Kangas, 2007; Regalla, 2017), 2018; Resnick, 2018).

By *authenticity*, Kjällander at al. (2018) we signify to participants, whose interest is central in making and engaging in process-oriented authentic tasks. Authenticity is also linked to solving authentic problems. In our study, the playful making process took place in authentic settings as regular early education activity, where thinking was made *concrete* by the children. Through playing and making, abstract issues such as healthy food become concrete and understandable (Hyvönen, 2008).

AIM AND RESEARCH QUESTIONS

The aim was to investigate children during the *playful making process*, in which three environments were integrated: indoor facilities, outdoor forest, and indoor maker space (FabLab Oulu). The following research question was stated: *How do children come to understand the concept of healthy food during the playful making process*?

METHODOLOGIES

Research Design and Participants

The playful making process is collaborative, and includes orientation, play, and elaboration phases (Hyvönen, 2008) (Figure 1). The model design incorporates learning and making as an integrated process, and authentic early education activities are built to trigger children's interest and engagement (Halverson & Sheridan, 2014).



EAPRIL 2019 CONFERENCE PROCEEDINGS

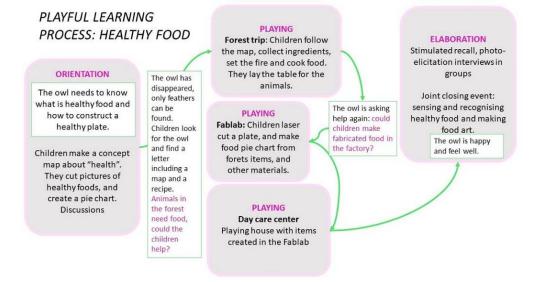


Figure 1. Pedagogical design of the study.

Activities for the study were conducted in three phases:

1) Orientation comprised different indoor making activities. The purpose of these orientation activities was to activate children's prior knowledge, trigger their interest, and to start collaborative knowledge construction. The children created a shared understanding of the topic and the tasks and engaged in the Owl narrative The Owl asked the children to help him/her understand what kind of food is healthy, particularly which food items contain proteins and carbohydrates, and which include vegetables and fruits. Children made plates and food for the owl.

2) The main activities took place in accordance with the narrative as it unfolded in the forest and FabLab.

3) Elaboration, with post-test and photo-elicitation.

Sixteen children aged 4–5 years participated in the activities for two weeks. Two early childhood teachers, two early childhood students, two master's degree students, and three researchers participated in the process. The children were divided into mixed-gender groups of three or four, and they undertook collaborative activities related to healthy food.

Indoor activities took place in the early education facilities, outdoors in the forest, and in FabLab, where the groups fabricated a joint plate model for healthy eating. Activities were video recorded with iPads (15:40 of video data) and photographed. Children's prior knowledge and learning were evaluated with observational process analysis and photo-elicitation (Dockett, Einarsdottir, & Perry, 2017; Richard & Lahnman, 2015). The data for this study comprises:



- 1) Concept maps, which were created at the beginning of the process; one map for each group, resulting in three maps.
- 2) Photographs, taken from the entire process, totalling 205.
- 3) Video data.

Photo-elicitation was conducted during the final day of the process, and the children participated in groups. A table was covered with 43 photographs showing the entire process in the three environments. Children were directed, 'Choose a picture or pictures in which you felt inspired and interested'. After making their selections, the researcher asked prompting questions: Why did you choose it? Who is in the photo? What are they doing? What did you learn about healthy food? We then showed the children another set of photos representing healthy and unhealthy food items. The children were asked to pick up those photos that represent healthy food. The final task was to select the food items they would like to eat now.

Analysis

Video data were analysed using the qualitative data analysis software, nVivo. By observing videos, concept maps, and photographs, we scrutinised collaborative situations, looking for those behaviours, expressions, and outcomes which that the children understood the idea of healthy food.

RESULTS

How do children come to understand the concept of healthy food during the playful making process?

Making activities indoors

In the orientation phase, the children discussed and concluded that *healthy* means many different things, such as play, friends, sleep, physical activity, doctor checkups, and healthy food. *Healthy food* denoted single food items and a few meals, such as salad, peas, potatoes, mandarins, apples, sausages, mämmi (traditional Finnish Easter dessert), noodles, spaghetti, meat soup, and liver casserole. In addition to these eleven elements, children mentioned vitamins, and discussed the idea that 'We need to eat food in order to prevent our bones from breaking. Otherwise we would turn to skeletons,' and 'Healthy food keeps us well and healthy.' They also said that 'We learn to stay healthy.' Concept maps were made for the Owl on the basis of this discussion.

The next playful making activity was to cut out pictures of healthy food and place them on the plate chart (Figure 2). Although the task was to cut out only healthy food

items, some children wanted to include doughnuts and other treats, which were placed outside the plate. This activity contributed several more items, including fish, eggs, and a greater variety of fruits and vegetables. Although the children easily found many food items for vegetables, fruits, and items containing proteins, they had difficulty identifying foods with carbohydrates. The teachers and researchers encouraged the children with prompting questions.



Figure 2. One result of the children's making.

Making activities outdoors in the forest

One morning, after the Owl disappeared, the children went outdoors and started looking for her/him. They found an envelope underneath a tree, inside of which were a letter, a map, and a recipe. In the letter the Owl asked the children to follow the map and recipe to cook food for the forest animals. They followed the instructions and walked to the forest, where they started to look for the required ingredients.

The children, focused on their task (Figures 3 and 4), collected mainly healthy items, demonstrating that their understanding of the topic had deepened. After collecting the items, they built a 'campfire' and cooked the food in pots and pans using a stump as a stove. They then laid a table cloth on the ground and set the table for the forest animals. Although the weather was cold and windy, and there were not many items to be found because of the snow, the children were inspired to engage in these forest activities, and their creativity was challenged.



Figures 3 and 4. Outdoor making activities.



Making activities in the FabLab

The Owl asked the children to make more food in the factory. The children brought forest items with them to the university's FabLab, where a plate was laser cut from plywood. The children were allowed to steer the machine with the help of an adult. The children, now divided into groups, then used the forest materials to make larger plates of healthy food (Figures 5 and 6). The FabLab provided the children with greater freedom than they had in the previous environments. The adults' were to allow children's collaboration and making. The children collaborated on three levels: as a group, co-operation, and knowledge construction. For instance, once they had discussed amongst themselves about red berries, together they could name several different red berries. At the same time they added red berries to the plate. Humour was displayed as the children played with various ideas.



Figures 5 and 6. Making activities in the FabLab.

Photo elicitation

The purpose of the photo-elicitation was to reflect and elaborate upon the entire process using photos taken of the children's activities and pictures of the food items. When the children were asked to select photos of the most inspiring moments, they selected images showing the playful making activities in the FabLab, followed by the forest activities (including photos of the Owl).

The children were then asked to select the healthy food items, which they did without hesitation. They could also identify those items that can be both healthy and unhealthy; for instance, while the lettuce and tomato in a hamburger meal are healthy, the hamburger itself can be unhealthy. They understood causal relations such as the consequences of unhealthy eating, and could categorize main concepts and sub-concepts. For instance, bread is the main concept, followed by healthy bread (rye) and unhealthy bread (croissant). They could identify some nutritional concepts (e.g. vitamin D), and could select those food items that included proteins and



carbohydrates. Finally, the children were asked to select photos of the food they would like to eat now. While they preferred salmon, carrots, salad, milk, and rye bread, they also agreed that weekends afforded them more freedom to choose, including sweets.

CONCLUSIONS

Learning took place and, because it was evaluated as a collaborative activity, individual differences were not examined. The results indicate that children's understanding of healthy food increased during the process. In the orientation phase they could identify concepts considered 'healthy', with food as one concept. They could also identify some healthy and unhealthy items. In the end they could unhesitatingly categorize foods as healthy or unhealthy. The results confirm earlier studies of children's learning in playful learning processes and the meaningfulness of collaboration for children (Hyvönen & Kangas, 2007; Hyvönen, 2008; Kronqvist, 2010).

We can close with the following four conclusions:

1) Children learn a given topic easily, even at the conceptual level, when the activities are play-based and the topics are repeated in different playful making activities and environments. In addition, humour in collaborative making situations seemed to trigger creative thinking and having fun with food-related ideas, which confirms our earlier results (Hyvönen & Kangas, 2007).

2) Different environments are conducive to different playful making actions; therefore, it is essential to use different environments, in which the familiarity of the environment decreases and the collaboration of the children increases. FabLab maker space was new for the children, and they found it fascinating. The level of collaboration was highest there (Vuopala, Siklander, Holappa, & Martikainen, 2020). The forest was familiar, and provided some routine activities; however, mapping and orienteering, and searching, finding, and counting were triggering for children. The indoor activities in the kindergarten provided familiar routine tasks. Children were skilled in cutting, being fast and exact. Although the children worked as a group around the table, they worked mostly individually.

3) The narrative and the role of the Owl were important in triggering the children's interest and willingness to help and engage in the activities. Each child had an opportunity to hold the Owl and to show her/him the making process. The narrative also made it possible to bring the nature element into the FabLab.

4) The adults showed pedagogical and playful engagement (Kangas et al., 2017) and varied their roles from leader to allower and afforder (Hyvönen, 2011). However, an even more open approach could be practiced. As Pitri (2013) highlights, teachers could enhance their playfulness and cultivate themselves as creative problem-solvers. Instead of offering direct instructions, teachers should allow the children to use open-ended materials, encourage them to test ideas, and trigger their thinking by, for instance, posing specific questions.



IMPLICATIONS, ETHICAL CONSIDERATIONS, LIMITATIONS, AND FUTURE RESEARCH

This is the first study to examine children while implementing the playful making process with three environments: indoor, outdoor, and Fab Lab. The results are applicable to researchers and practitioners in the field of early childhood and elementary school education. Our study provide tools—particularly a pedagogical design for teachers—for implementing playful making processes.

Ethically, a child-centred approach was followed; the children were not objects of the study but active agents in it. Their voices were heard and their activities valued. Children's safety and well-being is a priority in our research (Estola, Kontio, Kyrönniemi-Kylmänen, & Viljamaa, 2010). We followed strictly confidential principles and ethical rules at every stage of the research and proceeded with the study only after it had been outlined by the *Finnish National Board on Research Integrity*. Consent was obtained from parents and caregivers, as well as the municipalities. Participants were anonymous, so neither early childhood facility can be identified.

The study has some limitations. The small number of participants provides insight from only one early childhood unit, which does not represent wider cultural or regional participants and settings. In the next phases, we will replicate the process with other daycare centres and with school-aged children. We will gradually increase the children's active role (Hyvönen et al., 2014) and collaborative activities (Vuopala et al., 2020).

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HOW YOUNG CHILDREN COLLABORATE IN MAKER ACTIVITIES?

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ABSTRACT

Collaboration and collaborative learning are essential activities when preparing children for school, and the associated skills should be enhanced at early ages. Although several studies have found that young children collaborate productively, more research is needed from various learning contexts that foster joint endeavours to fully understand the quality of children's collaboration. This study illustrates how young children collaborate during maker activities. It is particularly interested in understanding the forms of interaction children experience during collaboration. The participants were 16 children aged 4–5 years who took part in maker activities for two hours in FabLab Oulu in Finland. In small groups, children worked on collaborative tasks related to healthy food with the goal of fabricating a joint plate model for healthy eating. The activities and interactions were captured on video. A qualitative content analysis was used to capture collaborative events and forms of interaction. Results indicate that, in general, there was a high degree of collaboration, as over half of the duration of FabLab sessions included collaboration. In their collaborations, children engaged in both content- and coordination-related interactions. The former included mostly short statements in which new information was presented. The latter included activities such as taking turns for using tools and materials. The results of this study provide early childhood education teachers and teacher educators with knowledge of collaborative learning and maker culture among young children. This knowledge is useful when designing maker activities and evaluating maker environments in early childhood education contexts.



INTRODUCTION AND AIM OF THE STUDY

Collaboration is a strategy that supports learning in various subjects and is a necessary component when preparing young children for school (Lara-Cinisomo Pebley, & Maggio, 2004). Beginning in pre-primary education, collaborative learning is emphasized in modern schooling, and studies suggest collaboration and knowledge co-construction can have positive effects on individual learning outcomes (Light, Littleton, Messer & Joiner, 1994; Roschelle & Teasley, 1995). The mastering of basic skills for collaborative learning establishes the foundation for solving more complex tasks at higher levels of education (Dickinson & Neuman, 2006).

Although there are numerous studies that prove the effectiveness of collaborative learning among different age groups, from those in primary school (e.g., Lipponen et al., 2018) to those in higher education (e.g., Howe & Zachariou, 2017; Roschelle & Teasley, 1995), there are less studies concerning collaborative learning conducted in early childhood education context where the focus has been in group work instead of peer collaboration (Lipponen et al., 2018). This could be due to the common belief that young children do not have the capacity to work together towards a given aim (Gomez et al., 2013). Since collaboration is a crucial 21st-Century skill (Binkeley et al., 2012), its development should be developed early in children's lives.

Indeed, children in early childhood are capable of working collaboratively, but their teachers must design the appropriate conditions (Stevahn et al., 2000). When children have an opportunity to work together, they can develop a common understanding of the phenomena or problems at hand and, at the same time, acquire social, cognitive and verbal skills that affect their learning (Gillies, 2006). In addition, participation in collaborative activities requires children to interact with each other which might promote empathetic behaviours (Vasileiadou, 2009).

In our communication-driven society, collaboration skills must be imparted during early childhood. Consequently, multimodal learning environments should be provided so children can practice these skills (Gómez et al., 2013). One context in which collaborative learning can be studied is maker education, which refers to learning that leads individuals or groups to produce digital and/or tangible objects and collaborate when planning, testing, implementing and assessing different solutions to the problems at hand (Papavlasopoulou, Giannakos & Jaccheri, 2017). Maker education might offer an ideal collaboration and learning environment, especially to young children, to whom playing and creating is natural and spontaneous. In this study, we examined how small groups of young children collaborated and co-constructed knowledge while working on an open task in the context of maker education. The aim of this research is to understand how young



children collaborate and interact during maker activities. The specific research questions are:

- 1. How frequent are the sequences of collaboration during maker activities?
- 2. What kinds of interaction forms occur in children's collaboration?

THEORETICAL FRAMEWORK

Collaborative learning in the context of early childhood education

This study is grounded in theories of collaborative learning, knowledge coconstruction and collaborative interaction. Collaborative learning is a process in which learners participate in joint activities and efforts to reach a common goal by negotiating and sharing knowledge (Dillenbourg, 1999). Collaborative learning can be seen as knowledge co-construction in which individuals interact to build new knowledge or extend their existing knowledge (Janssen, Erkens, Kirschner & Kanselaar, 2009). These interactions include sharing ideas, asking questions, negotiating and positing arguments (Dillenbourg, 1999; Roschelle & Teasley, 1995). According to Murphy (2004), producing shared artefacts results from the highest level of collaboration, while lower levels include articulating one's own perspectives, commenting on others' ideas, co-constructing shared meanings and building shared goals. Lower levels must be achieved in order to experience higher levels.

There is a strong evidence that collaboration can deepen individuals' learning through the activation of effective learning mechanisms, such as negotiation, asking questions, adopting other perspectives and following other learners' strategies. In addition, collaboration can increase learners' motivation and engagement, enhance critical thinking and promote shared understanding, co-regulation and knowledge co-construction (Gómez et al., 2013; Järvelä, Volet & Järvenoja, 2010; Vuopala, Näykki, Isohätälä, & Järvelä, 2019). However, collaborative learning is not a spontaneous process, and it may not lead to successful learning (Oksanen, Lainema, & Hämäläinen, 2017).

Evidence suggests that despite the dialogic nature of teaching activities, children find it difficult to engage in collaboration and achieve productive results (Pasternak, Whitebread & Neale, 2018). However, research also shows that even though collaboration is challenging, young children can acquire the skills necessary for collaborative learning if these skills are systematically taught (Stevahn et al., 2000). In other words, children in early childhood can work collaboratively, but teachers must first create the appropriate conditions. For example, when children are provided opportunities to participate in collaborative learning activities, their interaction skills are developed, including those related to the exchange of ideas and empathetic behaviour (Vasileiadou, 2009). Stevahn et al. (2000) compared two



groups of preschool children; one was taught the collaboration skill of conflict resolution and the other was not. They found that those children who received the training solved conflicts between their peers in a positive fashion by applying correctly skills they learnt during the training.

At its' best collaboration enables children's active participation and efforts in achieving joint aims through knowledge co-construction and shared understanding (Jones & Isroff, 2005). For example, Kronqvist (2010) studied early learning and children's collaboration. She analysed peer interactions in the context of a child teaching a new game to other children. They found that all children can assist their peers by using different tutoring strategies, such as facilitation, correcting mistakes, maintaining their peers' attention and encouraging their peers participation.

Young children's collaboration has also been studied in the context of computersupported collaborative learning (e.g., Davidsen & Vanderlinde, 2016; Scott, Mandryk & Inkpen, 2003; Shahrimin & Butterworth, 2001). For example, Shahrimin and Butterworth analysed the interaction patterns of five-year-olds who were undertaking a collaborative learning task with a computer. The researchers found that children engaged in several different types of interaction while collaborating. The most frequent form of interaction was the presenting of new information.

Maker education as a context for collaborative learning

The idea of making in education has its roots in constructivist epistemology and the notion of learning by doing, and the idea now includes digital fabrication in which various information and communications technology tools and software are used in problem-solving (Papavlasopoulou et al., 2017). Modern skills, such as creativity, problem-solving, productive participation in teamwork and the flexible use of information and communications technology are required from students at all levels of education (Häkkinen et al., 2017). One way to enhance and support the development of 21st-Century skills in schools is to engage students in maker education (Blikstein, 2013).

In this study, maker education is a learning experience in which groups of children produce tangible objects while engaging in joint activities and social interactions (Papavlasopoulou, Giannakos & Jaccheri, 2017). International interest in the concept is increasing (Blikstein, 2013, 2018), and recent research has underscored its value (e.g., Heikkilä, Vuopala & Leinonen, 2017). In Finland, the national curriculum emphasizes learning by doing, collaborative learning, phenomena-based learning and project-based learning, all of which can be applied to maker education.

In the context of early childhood education, makerspaces can offer children opportunities to share, including in the context of work and play with communal



objects; these spaces also offer opportunities to engage in collaborative endeavours (e.g., Gauntlett, 2011; Honey & Kanter, 2013; Siklander, Vuopala, & Martikainen, 2020). Therefore, makerspaces offer children opportunities to develop their emotional and social skills. Petrich and Bevan (2013) found that makerspaces foster solidarity between children, while Gauntlett (2011) emphasized that creative acts – including those conducted in makerspaces – usually involve a social dimension and connect children to work as a team.

During joint activities, children engage in interactions with their peers, teachers and the environment. Wohlwend, Keune and Peppler (2016) excluded teachers' impacts on children's interactions and looked only at peer interactions and interactions with the makerspace. They found that children engage in four types of interaction while working in makerspaces. First, children concentrate on playing when they are inventing and making meaning with the materials at hand. Second, children focus on the design of what they are creating. Third, they are motivated to solve problems, clearly proposing and testing hypotheses as they form solutions. Last, children concentrate on collaboration and knowledge co-construction by sharing their knowledge and contributing to each other's ideas.

In this study, maker education provides a context for young children to collaborate and work together on joint tasks. The focus of the study is on collaborative interactions, including content- and coordination-related interactions.

RESEARCH METHODS

Context and participants

The study was implemented in a Finnish kindergarten. Sixteen children aged 4–5 participated in maker activities for two weeks as part of their daily activities. They were divided into mixed-gender groups of three or four, and they worked on collaborative tasks related to healthy food. In FabLab, children were tasked with creating a joint plate model for healthy eating. They used a laser cutter to create the wooden plate on which they placed the imaginary food items they collected from the forest the previous day. They had to place the food items onto the plate according to their nutritional value. Each group spent two hours at FabLab, and they engaged in collaborative activities for 30–43 minutes (mean value 38 minutes). The teachers were instructed to give only minimal guidance, letting the children collaborate spontaneously. However, they observed the children's progression all throughout the activities.



Data collection and analysis

The FabLab activities were video recorded with iPads, producing 15 hours and 40 minutes of data. These data were analysed with NVivo, a qualitative data analysis software. The data were first segmented into 30-second events, and content log descriptions were written for each event to provide a general overview of the content. The segments provided an analytical focus point for the analyses (Miles & Huberman, 1994). Each segment was then observed to see if it included collaboration. Collaborative events were coded if there were two or more children working together around one table. Two interdependent coders coded the segment, and Cohen's kappa was calculated (see Table 1). The segments coded 'collaborative' were analysed in more detail and were coded as 'interaction' or 'joint activity' depending on whether the collaboration focused on joint making without social interaction or on interaction in addition to joint making (see Table 1). In fourth phase of the analysis, 'interaction' segments were further coded as 'content related' or 'coordination related'. Finally, segments coded as 'content related' were further coded according to different types of knowledge co-construction and the forms of interaction they contained. These coding categories were 'sharing information', 'asking questions', 'providing answers' and 'summarising', and they were selected based on the findings of previous research (i.e., Chi, 2000; Chinn, O'Donnell & Jinks, 2000; Roscoe & Chi, 2008; Volet, Summers & Thurman, 2009). As before, two interdependent researchers coded the data, and Cohen's kappa indicated the coding scheme's high validity.

Category	Coding Rule and Data Example	Cohen's Kappa
Collaboration	Segments in which at least two children worked together.	
Interaction	Verbal interactions between children.	0.96
Content- related	Children discussed their task, i.e., how to construct a plate model for healthy eating.	1.00
Presenting information	A child brought new information to the discussion, including the repeating of information, the presentation of specifying information and reactions to a teacher's question.	0.75
Question	A child asked a question to which he/she obviously expected an answer.	0.70
Answer	A child provided an answer to another child's question.	0.75
Summary	A child summarised previous discussions.	1.00



Coordination- related	Children discussed technical issues related to creating a plate model (planning, implementation,	0.78
	material selection, turns with tools, etc.)	
Joint activities	Children concentrated on joint activities without	0.73
	interacting or the interactions were off topic.	

Table 1. Coding Scheme

RESULTS

How frequent are the sequences of collaboration during maker activities?

Results indicate that, in general, collaborative events were frequent, as more than half of the duration of the FabLab sessions were spent collaborating. Indeed, 58%–67% of the FabLab session durations were spent on collaborative work. Group 2 (see Figure 1) collaborated for 43 minutes, which was more than the other small groups, and Group 1 collaborated for only 30 minutes.

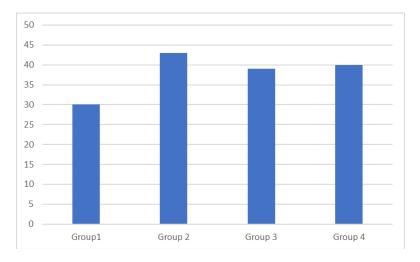


Figure 1. FabLab Group Collaboration Times

Most collaborations (76%–94%) included social interactions. However, the focus of the interactions varied between groups. In Group 4, social interaction was mostly content related (71%), while in Group 2, the corresponding percentage was 32. Respectively, the degree of coordination-related interaction across all four groups varied between 29%–68%. Coordination-related interaction was mostly concentrated in the context of joint activities, such as taking turns for using tools and



materials. Table 2 describes the fluctuation of content- and coordination-related interactions.

Time	Data Example	Interaction Form
9:00– 9:30	Moona: 'Hey, where does a banana belong to? Um, I know. It belongs to vegetables!'	Content related
9:30– 10:00	Leena: 'Is it my turn to use the pink baize? Could you give it to me?' Moona: 'Do you mean this one?' Leena: 'Yes.'	Coordination related
10:00– 10:30	Moona: 'Can I now use the fabric with flowers?' Iisa: 'Fabric with flowers? Do you mean this one? Here you go.' Moona: 'Thank you.'	Coordination related
11:00– 11:30	Leena: 'I could do a chicken pie. I like chicken pies! Do they have carbohydrates or not?'	Content related
11:30– 12:00	Moona: 'Iisa, do you want to test this glue?' Iisa: 'Okay.' Moona: 'Here you go.'	Coordination related

 Table 2. Fluctuation of Content- and Coordination-Related Interactions

What kinds of interaction forms occur in children's collaboration?

During collaboration, children explored content-related interactions, which mostly included the presenting of new information (see Figure 2). Children also asked questions, but only half the questions received an answer. Higher-level knowledge co-construction activities, such as summarising previous discussions, were rare, as only one segment including summarising.

However, small groups differed with each other in terms of how the different interaction forms were divided. Eighty-five percent of Group's 1 segments concerning content-related interaction included the presenting of new information, whereas 50% of Group's 2 did. Further, the number of questions varied significantly. Twenty-nine percent of Group's 2 segments concerning content-related interaction included a question, whereas 10% of Group's 1 did. In addition, 21% of Group's 2 content-related interaction segments included answering, while 4% of Group's 4 did.



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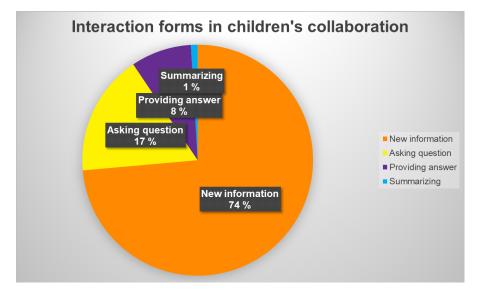


Figure 2. Forms of Interaction Children Used to Collaborate

Table 3 represents a typical form of content-related interaction in which one child presented mostly new information to the others. Clearly, children used one another's contributions to stimulate their own thoughts; this can be seen in the manner in which they extend their discussion of various berries. Furthermore, a question was presented and answered.

Time	Data Example	Interaction Form
0.00– 0.30	Jaakko: 'I just put a strawberry onto the plate.'	New information
	Niilo: 'I'll add one, too.'	New information
0.30– 1.00	Saana: 'Lingonberries are also red berries!'	New information
1.00– 1.30	Jaakko: 'And cherries!'	New information
	Saana: 'Where does the cherries go?'	Asking a question
	Niilo: 'They belong to proteins!'	Answering a question



	Jaakko: 'Redcurrants are also red.'	New information
1.30– 2.00	Niilo: 'And raspberries!'	New information

Table 3. Group's 2 Forms of Interaction

DISCUSSION AND CONCLUSIONS

Collaboration skills are part of the skill set children need in school, and they therefore need to be introduced in early childhood education. In this study, we showed how young children collaborate, co-construct knowledge and interact during maker activities. The results indicate that children can engage in collaborative activities, as they collaborated for more than half the duration of each FabLab session. Most collaborative events included social interactions instead of just joint making. However, the amount of content-related discussions varied significantly between groups. Regarding knowledge co-construction activities, the most common form of interaction was the presenting of new information. Higher-level interactions in terms of knowledge co-construction, such as summarising, were rare. Drawing on Murphy's (2004) levels of collaboration, it can be concluded that children achieved lower levels of collaboration, but not the higher levels like truly co-constructing shared meanings and producing shared artefacts by negotiating and building shared goals. However, although children mostly engaged in lower levels of collaboration, such as introducing their ideas and prior knowledge, these levels are important steps towards higher levels of collaboration.

Furthermore, we have concluded that young children rarely spontaneously engage in productive learning interactions, such as providing explanations, summarising and asking thought-provoking questions (Janssen, Erkens, Kirschner & Kanselaar, 2009; Vuopala, Näykki, Isohätälä & Järvelä, 2019). As has been highlighted in earlier studies (e.g. Stevahn et al., 2000), teachers' role is crucial in supporting and enhancing collaboration between children and creating the conditions that foster it. This requires that early childhood education teachers and teacher educators be competent in supporting the development of these skills.

This study found that there were differences in the quality and forms of the group's interaction. One reason may be that children's social competencies affect collaboration. Research has found that in the context of play, children who are socially competent are better able to help their playmates, resolve possible conflicts and participate in reciprocal turn taking (Howes, 2011; Rubin, Bukowski & Parker, 2006). In addition, children who are friends collaborate and negotiate more than children who are not friends (Rubin et al., 2006).



When it comes to maker education, this study indicates that learning by making is fun, natural and engaging for children. At its best, learning by making can feed children's creativity and develop their thinking skills and capabilities to collaborate and work in groups. This study also found that makerspaces, such as FabLab, can offer children opportunities for sharing and collaborating (e.g., Gauntlett, 2011; Honey & Kanter, 2013).

Our research contributes to the multidimensional understanding of small-group collaboration and collaborative learning as it occurs in makerspaces. The focus on young children was crucial in understanding how pre-schoolers collaborate before enrolling in regular school, at which point they must be able to engage in social interaction and collaboration as part of their formal learning activities. However, this study's limitations, such as its small sample size, must be acknowledged. More participants would have allowed for a better statistical analysis, which in turn would have allowed for findings that could have been generalised. However, this study contributes to the field of process-oriented research by presenting findings from real-life collaborative learning situations (Järvelä, Järvenoja & Näykki, 2013).

This study supports the current field of practice-based educational research by increasing our understanding of the possibilities and challenges of collaborative learning among young children. In addition, this study provides one practical example of conducting a maker project that guides children to develop their collaboration and interaction skills. Since this study indicates that engagement in maker activities can enhance children's learning, maker education can be considered a powerful approach to early childhood education.

The results provide early childhood education teachers and teacher educators with knowledge of collaborative learning and maker culture in young children. This knowledge can be applied when designing and implementing maker activities that support learning. In the future, children could be even more committed to the processes and tools of digital fabrication, as makerspaces can be inspiring to them.

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LESS IS MAES: CONCEPTUAL BASES OF A TEACHER PROFESSIONAL LEARNING COMMUNITY IN A BOARD GAME

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ABSTRACT

The research aims to present an educational resource based on the principles of gamification capable of engaging teachers on training processes. The educational resource presents teaching and learning concepts that support the MAES Network that consist of ongoing teacher training courses planned by teachers who participated the VET Teacher for the Future and FiTT Finnish Training Trainers programs in Finland, and implemented by IFMS, Campus Nova Andradina. Gamification adds a set of practices and skills capable of promoting a new possibility to teaching-learning problems when integrated into the educational process. By using principles of motivation and engagement, gamification in education has become a field of high potential as an educational method. With the potential to contextualize, to exemplify and to disseminate complex concepts anchored in the national guidelines for the Brazilian educational system, based on the gamification conceptions, the game Less is MAES is a research product that can be used as an educational resource adaptable to different educational objectives and environments.

INTRODUCTION

Currently, the adoption of active learning methodologies in education has caused a wave of concerns and awareness that the school needs to change. In order to apply concepts of active learning and competence-based curricula, Federal Institute of Mato Grosso do Sul, IFMS has implemented the following educational programs to improve teacher education: MAES Active Learning Methodologies for 21st Century Student (2017), RE-MAES network of trainers in Active Learning for the 21st Century Student (2018) and ProfCAC-MAES Collaborative Learning Community among Teachers (2019). The courses leaded by IFMS Educators, Nova Andradina campus, are important because they can help teachers to improve their methodologies and reflect about how to align theory and practice which improves the student learning.

In this text, the conception that active methodology is a relevant field of research is highlight to understand the place that education occupies in social and personal development, having in mind that education has a fundamental role in everyone's lives, among other facts, it is responsible to define the kind of subject to act in different social spaces.

By assuming an active methodological stance, based on student-centered learning, possibilities of integrating social technologies (digital and non-digital) into school dynamics are studied in order to highlight the extent to which educational objectives are achieved. Therefore, this research brings a peculiar contribution since it presents an educational resource with principles of education that we want for Brazil materialized in a board game. It aim to contextualize and assist users in understanding student-centered pedagogical practices, and to promote everyday situations in the classroom that lead them to understand the changes in ways of learning caused by technological evolution as they are disseminated in MAES, RE-MAES and ProfCAC-MAES programs.

RESEARCH CONTEXTUALIZATION

Renewing old structures and practices is one obligation to school nowadays and technology has been shown to be a partner for being present in different social spaces and for being a cultural instrument for improving the quality of human life. Based on this point, collaboration and active learning methodologies can help to promote pedagogical practices that are different from those proposed by traditional teaching through the integration of technological tools to mediate the development of knowledge, skills and attitudes.

The constant development of methodological practices and technology in global world leads us to question how to use digital resources for promoting student



learning. It was thinking about this that a technology based on the principles of gamification is presented, with the intention of promoting active learning and connect to the work Following the Finns: a game to learn how a Finnish Vocational Teacher Works (Santos Jr., et. al., 2016).

The Following the Finn game was developed to elevate and offer the opportunity to reflect on teaching practices based on the style of Finnish educational system. The main objective of the game is to present to the Brazilian society the educational principles that guide Education in Finland. On the other hand, the Less is MAES game, our research focus, is the re-signification of the educational principles learned by Brazilian educators participating in educational training programs in Finland.

EARLIER RESEARCH RESULTS

Gamification as a pedagogical resource

Gamification is the term used to represent a set of practices of games dynamics and mechanics to engage people towards a goal, solving problems, improving learning, motivating actions and behaviours in environments outside the context of games. The main objective is to increase engagement and arouse the curiosity of users, in addition to the challenges posed in usual games, gamification rewards are not usually crucial to success.

The concept of gamification is different from that of an educational or serious game. While the latter describes the design of complete games for non-commercial purposes, "gamified" applications only employ game elements. The term "gamification" is quite recent. According to Deterding et. al., (2011), the first use of the documented term is from 2008, but there was no widespread adoption before the second half of 2010.

Scott and Neustaedter (2013) performed an analysis of gamification in education and evidenced four main principles that strengthen the use of gamification in education, namely: 1) Freedom to make mistakes; 2) Fast feedback; 3) Progression; 4) Interaction. The authors state that freedom to make mistakes allows the user to experiment and go deeper and deeper into the game without fear of making mistakes or hindering his progress, with this, the feedback becomes instantaneous and allows the teacher to see the student's performance, many times In real time. The studies by Scott and Neustaedter (2013) evidenced success in the use of such practices, in their case studies they affirm that the practice corroborates with education because of its methodology and objectives, liberating new areas and proposing discussions that promote the student a kind of 'career' where he explores the knowledge motivated by the conquest.



In this sense, Benson (1997) emphasizes that progression is essential to assist the student both in support and in learning, this is due to the advances promoted by the game, it is evident that the progression arouses the interest of the player due to the practices adopted. Both Benson (1997), Scott and Neustaedter (2013) affirm that the interaction between the story and the game has a great impact on learning within the classroom. This happens through the narration of the story and it allows the user to experience, since all games have stories and a good story is able to entertain the student for hours and hours.

For Alves (2015), the look of philosophy invites us to reflect on games based on their nature and cultural significance. The game is something even older than culture, since culture presupposes the existence of human society. Animals also play and if we observe them it is noticed that they reproduce gestures and attitudes that seem to be a certain ritual, they play and bite themselves with controlled force so as not to hurt each other and evidently have fun in this game. Based on this observation, we conclude that the game seems to be more than just biological manifestation, it is a significant function and this is very important when we transport it to gamification.

Alves (2015) believes that the game is connected to something beyond itself, ascribing a biological function in its context. The biological functions evidenced by Alves are: 1) Discharge of vital energy; 2) Satisfaction; 3) Need for relaxation. The author states that nature could have used other mechanisms that would serve the functions of energy discharge, satisfaction of a certain imitation instinct and even the need for relaxation, but no, she gave us the fun of the game.

Gamification has the ability to motivate interest in the study of a theme through applications that involve gaming practices in situations related to the theme, it has the potential to make a game about any subject. Gamification addresses a series of concepts that promote several cognitive and biological factors at the same time. For the development of the Less is MAES game, the product of observing the MAES Network courses, the five-step model by Huang and Soman was adopted.



Figure 1: five-step model (Huang & Soman, 2013)

The model consists of five steps that are summarized in a gamification application in a learning context. The first step is to understand the target audience and the context, a determining factor for the success of an educational game is the understanding of the context and who the students are, both support each other to reach the objective of the program. The analysis of the target audience supports the determination of factors such as skills, age, etc., while analyzing the context can help you determine the details about the group, how the content is organized, etc.

The second step is to define the educational objects, the game must be objective, all instructors must help the student to reach the end of the teaching activity. It is through the fulfillment of the objectives that the exchange of experiences is generated and the knowledge is shared, hence the need guided by the objectives. Unlike ordinary games, an educational game can distance itself from the goal if it is not clear to the participants. The third is the structuring of experiences, phases, objectives and achievements.

The fourth step is to identify the resources, once the goals and objectives are identified, the instructor can easily determine which levels can be gamified and how, questions such as checking the rules, context and feedback in addition to restructuring can be easily redone, once everything so far has been identified.

The last step is to apply elements of gamification in the game process, as mentioned before, Gamification is the addition of game elements in applications that do not necessarily have to be game themes, it is at this stage that the game developer usually identifies the progress of the game , through points, levels, rewards, cards, for example. Thus, the results of the study on gamification and the understanding of the MAES Network courses are presented.

LESS IS MAES GAME

Less is MAES is a game for at least two players. It was planned to offer an opportunity to reflect on the principles of pedagogical practices that underlie the actions of the MAES Network. It aims to promote a dialogical environment for the teacher to understand the profile and skills required of 21st century professionals, the basis of the Finnish educational system.

To start the game, participants receive one (1) board, the game rule, one (1) pawn for each player, one dice for each group of players, thirty-six (36) thematic cards and twenty (20) surprise cards.

The board

The game Less is MAES has as its central structure an infinite that represents the educational principles of the trainers of the MAES Network. To understand the



infinite, used as the basis of the Less is MAES game, it is important to understand its origin.

The board makes reference to the educational path of pedagogical improvement of the MAES Network that involves the three courses MAES, RE-MAES and ProfCAC-MAES, all with the purpose of teaching professional development. The Active Learning Methodologies for 21st Century Student - MAES (Costa & Vieira, 2018) course, developed in 2017, aimed to promote pedagogical competence for the use of active methodologies and teaching by skills for applicability in the classroom. The course Network of Trainers in Active Learning Methodologies for 21st Century Students - RE-MAES (Vieira & Chediak, 2018), developed in 2018, focused on training trainers, offering active learning and curricular development by skills for intervention with their peers. The ProfCAC-MAES course, in turn, is jointly conceived of the Active Learning Community between Professors ProfCAC-MAES that emerges from the second phase of RE-MAES, consisting of a course planned in 2018 for your experience in 2019. The courses offered have a strong influence on the Finnish educational model, based on the experiences of teachers who train in the MAES Network in the VET III (2016) and FiTT (2017) courses. There is an understanding that not all students enter the same level of knowledge and skills and the same form do not leave each course at the same level. The competences can be developed at different times for each one, so the curriculum of the MAES Network courses does not appear linear, nor does it seek a leveling, but rather a continuous, gradual learning process and retroactive.

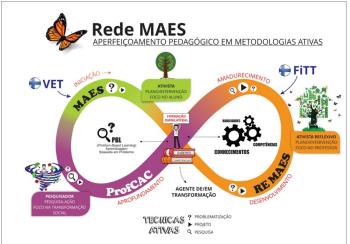


Figure 2: Representation MAES, RE-MAES, ProfCAC-MAES.

Figure 2 is part of the research result linked to the project title "teacher education in the polytechnic perspective: a curricular proposal", in process in ProfEPT Educational Master degree program. It brings the subject to the center of the training



process based on knowledge and skills and identifies the problem based learning method as the central methodology of the MAES Network. The MAES course, with a strong influence of the VET program, corresponds to the initiation of the training process and is identified by the green color that gradually becomes RE-MAES (orange), a period of pedagogical development and maturation where teacher students become trainers, approach to the FiTT program model. RE-MAES becomes ProfCAC-MAES (violet) which corresponds to the level of further training. Each course has an identity image built in reference to the course lived, the theoretical assumptions and the learning objectives. The expected profile of the graduates of each course is also indicated, with MAES being an activist profile, transforming teaching through the use of active methodologies; RE-MAES a reflective activist profile, by rethinking the context and the faculty for a significant change in the educational model. ProfCAC-MAES has a researcher profile, in order to reflect and disseminate knowledge and practices. The active techniques adopted at each moment are identified by symbols that vary in size proportionally to the emphasis given in direct relation to the level of autonomy of the course teachers. Finally, the representation of the MAES Network tied to the butterfly makes reference to the Theory of Chaos in the understanding that small changes can promote great transformations.

Based on the understanding of the training path of the MAES Network and of the necessary adaptations, the representation created for the MAES Network is shown below the game board Less is MAES.





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Figure 3: Less is MAES game board

The board game is an adaptation from the research "teacher education in the polytechnic perspective: a curricular proposal". On the board, it is possible to observe six themed houses of mandatory stop for all players, these houses are in black color and represent the following themes: active learning, collaboration, theorizing, curriculum, training and research. There are also surprised houses, they are in blue and red. Each color in the infinite arc represents one of the MAES Network courses, with the following courses: MAES Active Methodologies for the 21st Century Student (green), RE-MAES Network of Trainers in Active Methodologies (orange), ProfCAC-MAES Active Learning Community among Teachers (purple).

The center of infinity represents the starting point of the game, however, participants can choose the direction to follow. The game is over when players go through all the themes and reach the center of the board. The winner is the player who first reaches the starting point of the play. The flags represent the Brazil-Finland partnership in the development of teacher training programs for the Federal Network for Professional, Scientific and Technological Education VET and FiTT that took place in Finland, MAES, RE-MAES and ProfCAC-MAES that took place in Brazil.

How to play?

Each player must have his own pawn. One of the players rolls the dice and moves his pawn according to the number of numbers drawn by the dice. If the number drawn on the player's dice is greater than the number of squares needed to reach the next thematic square (black circle), it is necessary to disregard the value drawn by the dice and stop at the thematic square for reflection. That is, every player must stop at all thematic boxes on the board.

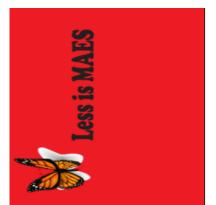
When reaching a thematic house, the player must choose a card referring to the theme on the back, read the letter out loud and discuss with his colleague (s) his understandings on the subject of the card. It is important to know that the Less is MAES game aims to interact and debate what is presented to you about active learning, collaboration, theorizing, curriculum, training and research. It is an educational game based on the theory of dialogicity.

If the number drawn causes the player to stop at a blue or red square he must choose a surprise card of the corresponding color. The blue card offers you a prize, but the red card can delay your game. They represent "bad behavior" houses, when the player stops there, he takes a card from the red pile, reads it out loud and performs the action at the end of the card. The third image presents one of the cards linked to the Collaboration theme, the text of which encourages the participant to reflect on implicit concepts of teaching and learning, as well as leading him to share his ideas with other players.



Figure 4: collaboration theme letter

Now, the fourth image shows a card that represents a "punishment" for playing for maintaining a traditional posture and another that brings advantages for showing attitudes aligned with the principles of education that MAES network advocates for Brazil.



BAD LUCK! GIVE TWO STEPS BACK

Figure 5: surprise cards for traditional conceptions



Figure 6: surprise cards for active learning conceptions

It should be noted that the game Less is MAES has twenty (20) surprise cards, ten (10) blue cards and ten (10) red cards, all with the purpose of promoting greater dynamism to the game, as well as, fostering suspense moments characteristic of the unpredictability that every game brings.

CONCLUSIONS

Certainly, games represent powerful tools for motivating and engaging people of different ages. We have the youngest who easily engage in digital games and older people who do not miss a good game of cards or a football game with friends in the late afternoon. Therefore, studies that bring games as allies to the increase of the engagement and motivation of students, of any age, in school processes are of paramount importance for the development of Brazilian and country education, which, like Brazil, has been challenged to transform the traditional model of teaching.

In order to collaborate with research already carried out on gamification, strengthen the network established between Brazilian and Finnish educators directly involved in the internationalization programs of the Brazilian Federal Network for Professional and Technological Education from the Brazil-Finland partnership and expand the work developed by Santos et . al. (2016) with the game following the Finn whose focus is to demonstrate how Finnish professional education teachers work. Less is MAES game emerges so as not to let the flame of the partnership go out at the end of the programs encouraged by the federal government and show the world how Brazilian teachers have made a social commitment to engage professional colleagues in training processes committed to lifelong education.



Less is MAES is an analogy to the Finnish popular saying, "less is more" understood as a message from Finland to Brazil that it is possible to change the reality of Brazilian education just by trusting the Brazilian and Brazil that we have.

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THE TECHNOLOGICAL ONION OF TEACHER TRAINING COURSES IN ACTIVE LEARNING METHODOLOGIES

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ABSTRACT

This text presents the digital tools integrated to the pedagogical practice by teachertrainers during in-service teacher training courses, offered by Federal Institute of Education, Science and Technology of Mato Grosso do Sul - IFMS, campus Nova Andradina and analyzes which digital technologies present, in the view of the teacher-course students, potential use in basic education. The study is justified by the need to design methodological strategies for integrating technologies as an instrument for mediating human learning. The methodological assumptions adopted follow the paradigm of qualitative, participatory, descriptive and explanatory research, with characteristics anchored in qualitative research. As data collection instrument, we used the logbook, trainers' lesson plans and questionnaire with open and closed questions. The literature review was based on the study of the potential of technological resources in promoting active learning, as an instrument for demonstrating learning evidence in curricula based on project-based learning. The research participants are teacher-trainers from IFMS, campus Nova Andradina and students, mostly professors in practice, linked to the Postgraduate Program in Teaching for Professional, Scientific and Technological Education and the MAES Active Learning Methodologies extension course. for the 21st Century Student. The study enabled the creation of the MAES technological onion, formed by three layers: 1) standard tools used by teacher-trainers; 2) tools used to build learning narratives; 3) suggestions of tools for integration into future teacher training.



INTRODUCTION

Currently the adoption of active learning methodologies in education has caused a wave of concerns and awareness that the school needs to change. Looking for applying concepts of active learning methodologies related to curricula organized by the transdisciplinary approach, focusing on skills and competences, there was the creation of the extension course MAES Active Learning Methodologies for the 21st Century Student. The implementation of MAES was the Federal Institute of Mato Grosso do Sul, IFMS, *campus* Nova Andradina, in 2017.

Research on the IFMS Educators initiative, *campus* Nova Andradina, becomes relevant since methodologies that try to align theory and practice can lead us to reflect on the real purpose of education. Besides, reflecting about the means to achieve certain ends and the conditions and circumstances that enable the creation of evidence of the success of the pedagogical objectives about the object of knowledge in the school context.

This text assumes the conception that active methodology is a relevant research field to understand the place that education occupies in social and personal development. It also lead us to the position that education has a fundamental role in the lives of individuals because, depending on the way the methodology is adopted, the subject that is intended to be formed to act in contemporary society is defined.

By aligning active methodologies with student-centered teaching, we see possibilities for integrating social technologies (digital and non-digital) into school dynamics, in order to highlight whether and to what extent educational objectives are achieved. Therefore, this research brings a peculiar contribution, considering that it presents, from the point of view of teachers involved in an active learning process, the practical potential of different technologies when used to facilitate collaborative learning.

The article aims to present and analyze, from the teacher's point of view, the didacticpedagogical potential of the tools used during the continuing education courses for teachers at IFMS, *campus* Nova Andradina. For this, we will present the technological tools integrated in the practice of teacher-trainers, from the adoption of active learning strategies, and we will highlight the tools that offer the teachertrainee potential for integration in pedagogical arrangements in Basic Education. Finally, we will offer a list of technological tools organized by their characteristics and possibilities of educational use in the form of an onion composed of three layers.

In order to explain in detail the systematization of this text, we divided it into five sections. In the first, the context of the research is presented, in the second, the



teacher training courses offered by IFMS, *campus* Nova Andradina, in the third, the methodological path, in the fourth, data analysis was approached and presented, and finally, the final considerations.

RESEARCH METHODOLOGY

The school requires renewal for maintaining the same structure of past centuries, and technology has shown itself to be a partner for being present in different contexts of / in society, for being a cultural instrument for improving the quality of human life. From this point on, active learning methodologies can help to promote pedagogical practices different from those proposed by traditional teaching, centered on the teacher, through the integration of technological tools to mediate the development of knowledge, skills and attitudes, in short, professional competences of current teaching. In view of this, it is important to understand some guiding aspects for using technologies as a knowledge mediation tool.

According to Cuban (1993), the biggest obstacle to the use of technologies in schools is the organizational culture of the institutions, the way the school is usually organized, the didactic approach or the paradigm of what it is to learn. According to Johannesen & Pedró (2010), the connection between technology and pedagogy is very deficient or, at worst, nonexistent, which seriously inhibits the potential of educational systems to advance in the use of technologies to promote learning. The authors state that the use of technologies within the classroom promotes student development, however it is necessary to reformulate the organizational space, study the tools and well-defined objectives so that there is a real integration of technologies as a promoter of collective intelligence. (Levy, 1999).

The reformulation consists of the construction of a curricular rearrangement different from the disciplinary approach. Johannesen & Pedró (2010) suggest the organization of knowledge in an interdisciplinary or transdisciplinary way, as well as advocating the adoption of active learning methodologies, making the technological tools used to facilitate the achievement of the proposed educational objectives.

According to Sigalés & Mominó (2009), the use of Information and Communication Technologies (ICTs) depends on the teachers' view of teaching and learning processes. Therefore, teachers with a more traditional and transmissive perspective of teaching tend to use ICTs to reinforcing presentation and content transmission strategies, while teachers with a more active and constructivist view tend to use ICTs in exploration, inquiry, self-directed, collaborative work and to facilitate problem solving.



It was from the perspective of integrating technologies into pedagogical practice as a mediating tool of information and with the potential to promote human interaction and, consequently, the collective construction of knowledge that the MAES course and module II of the Graduate Program in Teaching for Professional, Scientific and Technological Education at IFMS, *campus* Nova Andradina, were designed. Following, we provide a basic overview of in-service teacher training courses that served as the context for our investigation.

Teacher Training Courses

Thinking about the promotion of pedagogical skills supported by Bloom's Taxonomy, Costa and Vieira (2018) argue that "the times and areas of Education must be rethought, completed and interpenetrated in such a way that each person, throughout his life, can take the best advantage of an educational environment in constant expansion (p. 101). Based on this principle, two programs for teacher improvement were designed to meet the profile of current Brazilian society. The first one is course MAES Active Learning Methodologies for the 21st Century Student and the second module of the post-graduate program in Teaching for Professional, Scientific and Technological Education, both offered to teachers by the Federal Institute of Mato Grosso do Sul, campus Nova Andradina. The programs were designed by educators participating in the VET III Program (Vocational Education Training), in Finland, aiming to organize teaching-learning strategies based on problem and projects methodology and on the student-centered learning paradigm.

The focus of the teacher's training course was to promote the adoption of active methodologies for didactic-pedagogical activities in the current Brazilian scenario, where heated discussions of reform of high school are set, the final phase of Brazilian Basic Education, and the implementation of the Common National Base Curriculum (BNCC) of elementary school.

The pedagogical approach to Problem-Based Learning and Project (PBL) allowed moments of concern for the teacher-course students, since they were constantly urged to analyze, evaluate and create higher levels of Bloom's Taxonomy (Ferraz & Belhot, 2010). According to Costa and Vieira (2018), working at the top level of Bloom's Taxonomy requires constant analysis and evaluation from the teacher, which can lead the teacher-students to generate teaching strategies focused on student learning. It should be noted that the MAES course is organized in three (3) phases: 1) problem-based learning; 2) intervention project planning; 3) development of interventionist actions at school.

The second postgraduate module followed the same principles as the MAES course, it was implemented concurrently with the development of the first phase of the



MAES extension course. Soares-Vieira (2018) clarifies that the experience in the postgraduate course allowed the construction of didactic-pedagogical strategies that integrate disciplines in a curriculum organized by three (3) modules composed of four (4) disciplines each, which in practice little dialogue. After this overview of teacher training courses, we then detail the methodological path followed to achieve the proposed research objectives.

Methodological Path

Primarily, there was a need to observe the development of classes, their milestones, actors and forms of assessment. Once understood, the instruments and steps for collecting qualitative and quantitative data on the tools used during classes were defined, given in the form of workshops. Thus, data collection took place in four stages: 1) Development of a descriptive list of the tools used; 2) Construction and application of a questionnaire; 3) Data organization; 4) Creation of the technological onion of the courses, focusing on the MAES course.

It is important to clarify that the technological onion from MAES presents in a visual way the tools integrated by the trainers and their use objectives. The onion is composed of three (3) layers, the first of which we call the layer *standard tools*, the second of which brings the *tools with potential* for use by teacher-students in teaching activities in Basic Education and the third, we call *pilot tools and under test*. The first layer concerns the tools defined as a standard to carry out the mediation between the object of study, teacher-course students and teacher-trainers. The second layer refers to the tools that offer potential for use at school, in the view of teacher-students. The third layer concerns tools that have the potential to be integrated, in the future, into new offers of the MAES course or by the teacher-course students.

First, we observed the technological tools were used and their specificities with regard to the use of each one. The next step was to investigate the use of tools by teacher-students. According to Sigalés & Mominó (2009), the use of technologies, in particular, Information and Communication Technologies (ICTs), depends on the view teachers have of education. Therefore, teachers with a more traditional and transmissive perspective of information tend to use ICTs to reinforce strategies of presentation and transmission of content, while teachers with a more active and constructivist view tend to use ICTs in exploration, inquiry, collaborative work and the search for problem solving.

Throughout the collection and categorization of data, we apprehended the object of study in order to answer the following questions: what technological tools were used by teacher-trainers during the course of teacher training courses? Which ones have



the greatest potential for use in pedagogical activities by teacher-students? Next, we present the data analysis.

DESCRIPTION AND ANALYSIS

The collection was carried out through a questionnaire and participatory observation with the groups of participants of the MAES course and of the specialization in Teaching for EPCT, totaling fourteen respondent students. Most of the students were teacher-trainers, teachers working in Basic Education and in Professional Technical and Technological Education.

In order for the categorization to effectively assist the description and analysis of the data, divisions were made in stages with the aim of showing different perspectives on the technological tools used in the courses. At this point, it is important to clarify that one of the authors of the text acted as a teacher-trainer both in the MAES course and in the graduate program in Teaching for Professional, Scientific and Technological Education (EPCT).

With regard to the technological tools used, the tools used during the first stage of the MAES extension course, which took place in the first semester of 2017, were first analyzed, which resulted in the construction of a descriptive list of technological tools. Table 1 shows the list of tools used and their descriptions.

Tool	Description
Blog	Content sharing and creation tool.
Gmail	sharing and communication
Debut	Tool used to record videos from the computer screen and voice capture.
Facebook	Social network used for communication and data sharing
Padlet	Collaboration platform, data sharing and content development.
WhatsApp	Communication tool, content sharing and video calls.
Google Docs	Online tool for editing or creating texts.
Google Drive	Virtual environment that allows collaboration, sharing and

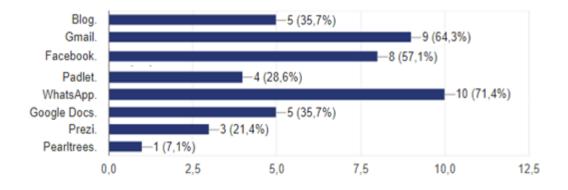
Table 1. Tool and description of technologies used in the MAES course



	development of texts, spreadsheets, presentations, drawings and forms in addition to other types of documents.
Prezi	Tool aimed at developing, collaborating and sharing presentations.
Pearltrees	Platform capable of collecting, organizing and receiving files and documents.

Based on the list of tools used in the teacher training and their respective descriptions, a questionnaire was prepared with questions about the tools described above, with the purpose of obtaining qualitative and quantitative data on the study object. The questionnaire included checkboxes and texts, the checkboxes provided us with statistical data about usage while the text gave us an insight into the difficulties of using resources. The questionnaire was created using the google drive application form.

Table 1 shows the tools used by teacher-trainers, who, in the view of teacher-course students, have the potential to integrate into classes with Basic Education students.



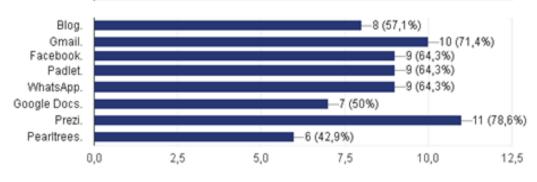
Graph 1: List of tools with the potential to be used in Basic Education

As stated, responses from fourteen (14) participants were analyzed, teachers in exercise in continuing education activities, at IFMS, *campus* Nova Andradina. The responses were categorized in order to allow us to observe the potential of the tools for the participants. Thus, the tools that showed the greatest potential were whatsApp, facebook and GMail for presenting an easy-to-use and learning interface, while others such as: debut, hangout, wix and wikidot presented opposite value due



to their usability interface being somewhat complex. , becoming difficult to apply due to the need for a mediator to assist in the use. Therefore, it is possible to conclude that the tools that represent the greatest potential tend to be the best learning and easy to use.

It is worth mentioning that, during the courses, the teacher-cursors, supported by the four pillars of Education presented by Delors (2003), were instructed to produce evidence of learning through portfolios, narratives and collaborative texts. Tools like *blog, padlet, google docs, Prezi* and *Pearltrees,* appropriate proved since for them it was possible to share and publicize the activities carried out in groups. Image 3 gives an overview of the frequency of use of these tools by teacher-course participants throughout the courses, in their pedagogical activities.



Graph 2: Frequency of using digital technological tools

From the responses of the fourteen (14) participants in the research, it is possible to observe that the tools that showed the greatest potential due to the ease of handling, shown in Graph 1 was used frequently by teacher-students in teaching pedagogical practice. It is also interesting to note that the majority of teacher-course students used almost all of the tools integrated in their teaching practice by teacher-trainers in their classes, leading us to consider that the principles of active *learning by doing* - promotes greater potential for learning and development of Brazilian teachers.

The analysis of the digital tools the teacher-trainers used and the teacher-students considered to have the greatest potential for use in their teaching activities allowed us to list the tools that showed the greatest pedagogical potential. Besides, it was possible to identify the tools teacher-students most use for their personal development. We conclude that the teacher-students in fact recognized the tools listed as potential previously as a positive factor in the development of their activities as a teacher.



In the next section, we present the MAES technological onion. We expect that the onion layers will help teacher-trainers to reflect on the aspects that justify the integration of digital technologies in pedagogical arrangements, expanding the range of digital tools with the potential to promote active teacher learning.

THE TECHNOLOGICAL ONION MAES

In order to contribute to applied research in education on educational technology, we built a representation of the usability of the tools used by the trainers of IFMS courses, *campus* Nova Andradina, called *MAES technological onion*. The representation in the form of "onion" consists of three layers, each layer formed by digital technological tools. Those used by teacher-trainers form the first layer, close to the center, the tools that showed the greatest potential for use by teachers- course participants constitute the second layer and the third layer brings digital technological tools not used during the course, but with great potential for future offers of pedagogical improvement courses. Table 2, below, shows the distinction between two types of tools, the *standard tools*, which are those used to mediate teaching and highlight the learning of students who present a highly usable and easy to use interface. On the other hand, *tools with potential*, which refer to tools that are easy to handle, in the view of the teacher-course students, therefore integrated into the pedagogical practice of the teacher-course student.

Standard tools and secondary tools	
Facebook	Standard Tool
Google Docs	Standard Tool
Padlet	Standard Tool
Prezi	Standard Tool
WhatsApp	Standard Tool
Gmail	Standard Tool
Blog	Tool with Potential
Google	Tool with Potential
Pearltrees	Tool with Potential

Table 2.Standard tools and secondary tools

From the analysis, we built the layers of the *MAES technological onion in* order to clearly show which tools were covered during the course and how the teacherstudents perceived their potential to facilitate the teaching-learning process in basic education. The onion layer is organized into: 1) standard tool; 2) tools with potential for use; 3) pilot and test tool. Following, we detail what each layer represents:



- 1) Technological tools integrated by teacher-trainers with the purpose of creating collaborative portfolios of the material produced, for interaction, facilitating communication and storing support material.
- 2) Technological tools used to build learning narratives, easy to handle and with potential for use in Basic Education.
- 3) Test tools that were used superficially during the courses.

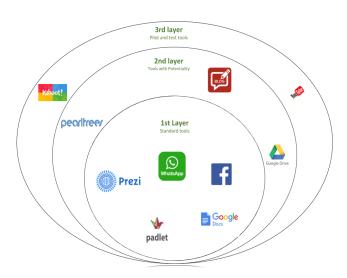


Figure 1: MAES Technological Onion

The MAES Technological Onion visually represents what tools were used throughout the course and what they represented, that is, which are the pedagogical objectives of their educational integration. The "1st layer" represents the tools that were used as a standard, they were selected by analyzing graphs 1 and 2, which brings the potential for use to the research participants.

The "2nd layer" represents the tools that were used to build reports on activities, organize texts and ideas and evaluate data. The tools found in this layer have the characteristic of generating portfolios, reports, documents and videos. The "3rd layer" offers suggestions for tools that can be integrated into educational activities with future classes of courses to improve the teaching practice of IFMS, *campus* Nova Andradina.



CONCLUSIONS

The article aimed to present which digital tools were integrated into pedagogical practice by teacher-trainers during continuing education courses for teachers at the Federal Institute of Mato Grosso do Sul - IFMS, *campus* Nova Andradina and to analyze the potential of the technological resources used for teacher-trainees. The methodological assumptions adopted were guided by the paradigm of qualitative, participatory, descriptive and explanatory research, with characteristics anchored in applied research of an interventionist nature. As instruments of data collection, the logbook, lesson plans of the teacher-trainers and questionnaire were used. The literature review enabled the understanding of the purpose of using technologies in school activities, with the main focus on active learning, centered on the student.

The study made it possible to apprehend the positive impact that collaboration tools offer to teaching through the use of active methodologies, provided that the object of knowledge, learning objective, methodology, evaluation and learning environments are well defined. Tools that are part of the culture of the teacher-student, whether for communication or entertainment, such as Facebook and WhatsApp, showed greater potential for use in Basic Education.

In the past, a platform like *pearltrees*, for example, did not reveal as much potential for use, because, in the view of the teacher-course students, it has a difficult-to-learn interface, requiring the intervention of a professional in the field. On the other hand, tools such as prezi, google drive and padlet were evaluated positively, being used in the pedagogical arrangements of some teacher-course students. Such tools enable collaborative creation and content sharing.

We are aware of the limitations of this study, thus, we see as a possibility of continuing the research the realization of a systematic review on technological tools integrated in transdisciplinary pedagogical projects, guided by project-based, project and student-centered learning. The systematic review would serve as a basis for the construction of didactic manuals of easy interpretation for the most layman in the management of web environments, for implementation as standard tools by teacher-trainers in different curricular arrangements based on active learning.

From the formal curricula of teacher training courses, with integrated digital technologies to facilitate the learning and development of the pedagogical practice of the basic education teacher, a new applied research would begin with the objective of grasping the vision of the teacher-student, evaluating the new added features and expand the technological onion MAES. The construction of a didactic manual is visualized, composed of a set of technological tools with multiple purposes. The pedagogical manual will be guided by collaboration and active learning perspective.



Also, it will be tested in formal school curricula and evaluated by school protagonists according to the usability and potential.

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TEACHER-CHANGE DIMENSIONS TO IMPROVE TEACHING AND LEARNING

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ABSTRACT

The goal of this paper is to collate reflections on strategies to improve teaching and learning environments for the future of education. Last year, some members of one of EAPRIL's cloud thematic networks (https://eapril.org/node/16) contributed to the symposium 'Strategies to improve teaching and learning environments' within the frame of the EAPRIL 2019 Conference in Tartu. The Cloud 3 symposium was organised by Rebecca Eliahoo and Marcelo Giglio and after this symposium, the authors of each contribution re-examined their research project under five teacherchange dimensions: Curricular and technological innovations; Teachers' reaction to change; Teachers' own creative actions; Teachers' social interactions with partnerships (such as researchers, teachers, students); and Forms of teacher contribution to the future. The conclusion considers the meta dimension of international collaboration to share experiences and reflections; the meso dimension of real world scenarios to sustain effective professional learning in multidisciplinary contexts; and finally, the necessity for teaching professionals to partner with universities, policymakers and other stakeholders in order to sustain teachers' roles as developers of pedagogy through practitioner research.

INTRODUCTION: DIMENSIONS OF TEACHER CHANGE

This contribution proposes some teacher-change dimensions to improve teacher strategies and learning. Last year, some members of one of EAPRIL's cloud thematic networks (<u>https://eapril.org/node/16</u>) contributed to the symposium 'Strategies to improve teaching and learning environments' within the frame of the EAPRIL 2019 Conference in Tartu. This paper proposes the three Cloud 3 contributions.

During recent decades, specific attention has been paid to the evolution of educational systems and learning environments in order to identify possible strategies to improve teaching and learning. Teachers need to develop their



professional practice progressively as creative professionals within a digital, societal transformation. New teacher strategies and competencies can mobilise innovative learning environments for students facing the digital challenges of tomorrow's society. According to Giglio, Kantola, Friman, Berghmans and Peixoto, (2018) :

'Knowledge, working, research, teaching, and learning are never exhaustive and always evolutionary. Consequently, a future vision on education and learning cannot be but a part of the current and professional thinking and acting of educational practitioners and researchers.'

How do educational professionals connect digital and material approaches (handbooks, objects, tools, technological tools) in teaching and the real-virtual learning environment? Which conditions might provide a beneficial learning environment for different educational needs? Which teacher strategies are effective for ensuring the development of innovative and transformative teaching/learning processes in teaching, in teacher education and training?

In a systematic teacher exchange process, the teacher can feel individual changes and if teachers improve their practice as practitioner researchers in a social or organisational movement, whilst respecting the perceptions, the practices, the professionalization, the training and more, this can have a wider impact on teachers (Richardson & Placier, 2001). Many changes in the teacher practice advise modifications with adult creativity in educational and institutional organisations with general and social factors (Amabile, 1996). With different difficulties, and different institutional constraints, it might appear likely that the challenge of teacher change will generate more creativity in their professional work. But sometimes these troubles and constraints can lead to professional stress and burnout.

Teacher change can be described in terms of 'learning, development, socialisation, growth, improvement, implementation of something new or different, cognitive and affective change, and self-study' (Richardson & Placier, 2001, p. 905). Based on several international studies on teacher-change, Giglio (2012, 2014) identified five teacher-change dimensions relate to these processes:

- 1. the purpose of curricula and technological innovations as a challenge to the future;
- 2. teachers' reaction to change;
- 3. teachers' creative actions to improve the roles and skills of actors/participants;
- 4. their social interaction with partnerships (researchers, teachers, students, etc.), and
- 5. the forms of teachers' contribution to the future by adapting and adjusting practices and new technological resources.

EAPRIL 2019 CONFERENCE PROCEEDINGS

These types of teacher-change dimensions can emerge connecting individual and collective teacher agency. Because, as reflective adults or practitioner researchers, every teacher has a role in the (inter)individual change due to its empowerment in enhancing their agency (Mäkitalo, 2016; Rajala & Kumpulainen, 2017). All transformative activity requires teachers' creativity as well as specific environments for students' productions, co-creations and learning and both can be connected to social and cultural practices.

THE EVOLUTION OF EDUCATION 1.0 TO EDUCATION 4.0 : AN EVOLUTION OR A REVOLUTION?

Gregoris A. Makrides proposed this contribution to the symposium. The education systems implemented in most countries today are characterised by the elements of Education 2.0, while very few countries are pushing for reforms defined by Education 3.0. The features of the development stages of Education from Education 1.0 to Education 4.0 are more or less clear. But talking about Education 4.0 with today's technologies may not be so accurate. We do not know what will be the technologies in 15-20 years and how these will affect the learning processes. However, we do know that today's technologies are not fully utilized in the current learning processes in school education systems. The objective of this contribution is to try to answer the question: is this an evolution or a revolution? Some related EU funded projects in progress, like L-Cloud: Development of tomorrow's Cloud Education Leaders and new digital-based student competitions will be discussed.

In table 1.1 we present a comparison of some of the characteristics that highlight the evolution from Education 1.0 to Education 3.0.

Education	1.0	2.0	3.0
STAGE	Authority & Input- Centric	Output & Testing Centric	Learner & Student Centric
STUDENT	Passive recipient	Memorising input	Exploring new questions
TEACHER	Authoritarian	Expert	Facilitator
RELATION	Informative (Teacher Centric)	Knowledge through Testing (input-output)	Knowledge and Experience through

Table 1. From Education 1.0 to Education 3.0



			Dialog and cooperation
PERSONAL TECHNOLOGY	Confiscated at classroom entrance	Acceptance and use with caution and no coordination	Everywhere , low cost but not free
TECHNOLOGY IN SCHOOL	Purchased with high cost and neglected	Open source and available on average cost	Low cost and are used with a plan
SCHOOLS ARE LOCATED IN	In buildings	In buildings and on web	Everywhere/any place
THEPARENTSSEETHESCHOOL AS	Day care	Day care	A place where they can also learn

In some countries, one can see the Education 3.0 characteristics developing but still this usually depends on local authorities or private schools, which are usually more flexible in bringing change.

In Table 2 we present a comparison of some of the characteristics that highlight the evolution from Education 3.0 to Education 4.0.

Table 2. From Education 3.0 to Education 4.0

Education	3.0	4.0
STAGE	Learner & Student Centric	Co-Creation & Innovation Centric
STUDENT	Exploring new questions	Co-sensing & Shaping the Future
TEACHER	Facilitator	Coach
RELATION	Knowledge and Experience through Dialog and cooperation	Co-Creative, co-player
PERSONAL TECHNOLOGY	Everywhere, low cost but not free	Easily accessible, free and expected



TECHNOLOGY IN SCHOOL	Low cost and are used with a plan	Free and accessible by all and everywhere
SCHOOLS ARE LOCATED IN	Everywhere Coffee shops, restaurant, work areas	On the Cloud or some technology, we still do not know.
THE PARENTS SEE THE SCHOOL AS	A place where they can also learn	A place where you can develop skills and creativity for innovation.

The next question is how we prepare our school leaders for this evolution so future school students and teachers can have the tools, competences and skills to adapt to the changes.

The Cloud Computing industry is experiencing exponential growth and is the foundation for ubiquitous digital administrative and operational systems, including education. Supporting products, such as mobile device applications are multiplying, including email, information storage, file sharing, collaborative tools, digital communication and other services.

School learner expectations are changing. They require ready access to collaboration tools and content. As a result, educational institutions must show significant leadership to embrace such challenges and provide greater inter-operability between the organisation and student platforms, as well as 24/7 access to secure, reliable networks and the ability to create, deliver, and share content across the institution on any number of devices.

The European Commission acknowledges that Europe must become much more 'Cloud active' to stay competitive in the global economy. It has tackled major barriers surrounding legal issues, data security and copyright. Computer systems provide a quick, reliable, 24/7 service, which requires a different service model.

Cloud Computing adoption in education remains fragmented because, while Cloud Technologies offer many advantages, decision makers are largely unaware of the potential benefits for learning, teaching, administration and management. Therefore, training and support systems are needed to help them keep up to date with the rapidly changing Cloud Computing environment.

As a result of an EU funded Network project during 2013-2016 named 'School in the Cloud', it was demonstrated that leadership for change is needed. The main issue today is no longer access to technology, but the capability to establish meaningful leadership for Cloud-based learning, teaching and administration.



Having all of the above in mind a set of stakeholders from many countries in Europe have managed to develop proposals and get EU-funded projects running that will contribute to the necessary tools and resources. 2019 - 2021 projects:

> 1. STEAME: Guidelines for Developing and Implementing STEAME Schools

> 2. INNOMATH: Innovative enriching education processes for Mathematically Gifted Students in Europe

3. E-I-STEAM: Educational Info-graphics for STEAM

4. LEARN+: Building Communities of teachers producers to implement personalised learning of mathematics supported by machine learning and block chain to assess competences

5. C-DAOEF: Development of Computerised adaptive applications for the dynamic assessment and enhancement of executive functions in students with neurodevelopmental and learning disorders

More details for the five projects above can be read through www.cms.org.cy

The above will be difficult to apply without having a path for developing future Adaptive Cloud Education leaders, as the speed of technological change will be so fast in the future that teachers and citizens in general will not be able to be trained all the time as, by the time of training completion and application the tools may easily become obsolete.

Therefore since 2018 the EU-funded project L-Cloud: Developing Tomorrow's Cloud Education Leaders (October 2018 - 30 September 2020), is developing and testing for finalisation the following three outputs, some already published on www.L-Cloud.eu:

1. Guidelines for Skills and Competences for Adaptive Education Cloud Leaders

2. Qualification Framework for Education Cloud Leaders based on Skills and Competence with an International Professional Certification Programme

3. A MOOC and Webinar for developing adaptive education cloud leaders

Considering all of the above and through the experiences and reflections between more than 50 partner organisations from almost all European Countries, the answer to the questions 'is it an evolution or a revolution' is currently the following. The conclusion is that it is a revolution for teacher's competences and may be for school infrastructure and an evolution for student learning as a necessary subsequence of technology development and because they like it.



EDUCATION FOR THE FUTURE: HEI'S 5.0?

Susana Bastos proposed this contribution. This research arises from the proposal of a new approach regarding the inclusion of soft-digital skills training in higher education. The first study carried out, involved several curricular units in different higher education courses in Portugal, and led us to reflect on a different educational model, which combines the development of soft skills in digital environments. The second study examined state of the art educational realities in distinct countries in the European Union.

The creation of an innovative model to teach and learn designated as a Managerial Simulator Model (MSM) allowed teachers and students to perform, in the learning environment, activities and tasks as if they were working in the real market, such as a company or an organisation in general. This MSM developed a multidisciplinary learning approach where teachers of different subjects are called to 'teach' by doing real activities with students. This Model of being in the classroom and out of it evolved over a number of years and has now reached an end point: or stops; or develops to deal with the soft skills. The digital and technological frame is in the core of the MSM and the skills developed by students raise questions: how and what can we assess when we refer to soft/core skills?

The main question is how pedagogies and the use of technologies can find a meeting point where it is possible to continue humanisation in education through the utilisation of virtual environments to support the teaching/learning processes. The methodology used in the first study has its support from questionnaires made to students of higher education in different areas of knowledge, such as medicine, nursing, engineering, management, arts and literature. The Coski project¹ leaned towards soft skills in business, so the focus groups of the surveys were not only managers, recruiters, teachers and graduates, but also business professionals and entrepreneurs.

The main conclusions of the first study are the creation of digital platforms that not only support the study but also contemplate the use of a virtual reality where students can interact with others in the discussion and resolution of real life situations (Bastos, Azevedo, De Oliveira & Poza, 2019).

¹ Acknowledgements - Part of this work was supported by the Erasmus+ program of the European Commission under Grant 2017-1- ES01-KA203- 038589 in the frame of the project CoSki21-Core Skills for 21th-century professionals. The authors would like to thank the people who have collaborated with the research answering the questionnaires.



The second study has identified a set of activities to perform in and out of the classroom in order to potentiate some specific soft skills, considered the most important for the student career development and to manage the working life.

Technology provides higher education with the tools that can or should engage learning soft skills for students as individuals, in order to support them in their process of developing the core skills needed to embrace the labour market. Higher Education Institutions must create technological learning environments including sets where students find information, tools and teachers duly prepared, to cope with the real situations proposed. The use of digital environments, combined with the traditional set of the process of teaching and learning, improves student performance and helps to be more effective.

The role of each participant in the process of teaching and learning must change to assure high quality education in the future. Higher Education Institutions (HEIs) must reinvent themselves in order to maintain their major role in society: to graduate students prepared for a profession (Bastos, Silva, Azevedo & De Oliveira, 2019).

'This is one shift in the changing roles. I often think of the change to the facilitator, coach, mentor, assessment creator, and even curator!' (Brian McCarty, 2019, p. 19 in Bastos *et al*, 2019). The teacher is now a 'coach', who leads, orients and guides the students in his own learning process. The coach's main function is to facilitate 'a positive team spirit and constructive relationships between team members and encouraging personalised learning and formation of individual soft skills' (Bastos, Schleutker & Azevedo, 2018).

The theoretical frame is developed in themes such as competences, behaviour, attitudes, education and training process and emotional literacy towards a different understanding implicit in the use of the virtual spaces of learning.

In a previous HEI study on two approaches from different countries, Finland and Portugal, regarding the introduction of soft skills in educational contents, the learning environments were shown to be essential to the development of the whole process (Bastos *et al*, 2018).

In Finland in Bisness Akatemia, for instance, lectures are given only exceptionally in cases where a lecture is considered the best way of learning. Otherwise, and for two years, the students work in team with the orientation of a coach whose main function is to facilitate the team's work, positive spirit and constructive relationships, encouraging the personalised learning and formation of individual soft skills.

In both studies there was a large amount of work between researchers, teachers and students. This is especially so in MSM, in which several working weeks were



organised in the countries involved - Spain, the Netherlands, Finland, Austria, Italy and Portugal.

The choice or the settlement of the 'best method to learn a profession' elicits different opinions in the literature and in the real world school situations 'because they are resources that can help in the future. It is easy to access to all. I think that some of the means available are more effective than others, for example, scheduling training turns out to be a more effective means of long-term learning, since it allows consolidating step by step, not only the practice and its details, but also the story that this involves. On the other hand, the simulator seems to be more effective in the short term, but not so in the long term, because all the steps are described in the menu, and therefore, despite providing an interesting experience and good feedback, requires less reasoning and knowledge that support decision-making and does not allow so much attention to detail (Bastos *et al*, 2019)'.

So, the main challenges are related to some aspects, such as: Are the students willing or prepared to take the active role which is needed in an environment where personalised learning and development of personal skills are promoted? Are the teachers prepared to work with these new environments where their role is a coach that is willing to support the path of the students in their academic life? Are the HEI's prepared to deal with the new era for education? And, are industry and government prepared to support the evolutionary interaction between these three main innovators: universities, industry and government?

TEACHER RETENTION AND STRESS: COLLABORATIVE PRACTICES TO PROMOTE TEACHER SELF-EFFICACY

As part of an EAPRIL Cloud 3 symposium held in Tartu during this symposium, Rebecca Eliahoo and Marcelo Giglio organised a workshop exploring some of the causes of teacher stress and burnout.

Teachers and practitioner researchers from a variety of countries were asked to discuss levels of teacher stress and burnout in their own countries and to suggest ways of combating these as well as aiding teacher retention. Research shows that understanding how teacher stress, burnout, coping, and self-efficacy are interrelated can inform preventive and intervention efforts to support teachers (Herman, Hickmon-Rosa, & Reinke, 2017).

Teacher stress and burnout are not restricted to school education, as evidenced by a joint Russian and Portuguese project (Mesquita & Sinagatullin, 2019) examining the professional lives of Higher Education lecturers.

Russian and Portuguese practitioner researchers collaborated with their colleagues to ask teachers in both countries similar research questions, with a view to finding



out whether the causes of teacher burnout were the same across both of their very different countries.

Russian and Portuguese teacher respondents were asked to identify causal factors in teacher burnout, as well as which small changes they thought might have a positive impact on their professional lives.

In Portugal, teachers complained principally about excessive bureaucracy, big classes, inappropriate behaviour by students; and too many curricular units to teach.

In Russia, teachers said that their huge academic workload, poor working conditions and low salaries had led to a lack of motivation. Like the Portuguese respondents, they also suffered from unnecessary paperwork, as well as rigid and systematic control. They also highlighted what they described as 'test nightmares' leading to the burden of over-assessment.

The teaching profession in Europe is not immune to occupational illnesses, as a training seminar on health and health education in 1999 pointed out (EI/ETUCE, 2001). This seminar organised by the European Trade Union Committee on Education (ETUCE) and Education International (EI), in collaboration with the World Health Organisation (WHO), noted that increasing teacher workload was a tendency in several European countries and was leading to a rise in illness, particularly stress-related illnesses.

Some of the factors affecting teachers' ill health included nervous overload; disappointment and frustration; lack of job stability and security; school environment; lack of social recognition; and the burden of administration.

Following the 1999 seminar, a study of elementary, primary and secondary school teachers was launched, seeking the causes of teacher stress, its consequences and the means to combat it. Education International and ETUCE led the study which covered 31 countries using quantitative and qualitative data over the period 2010 to 2012. Their report, Study on Policy Measures to improve the Attractiveness of the Teaching Profession in Europe (Michel Gordon & Sellier, 2013) focussed on responses from teachers working in central and eastern European countries who were members of Education International.

The study showed that there was widespread agreement on the factors causing, or contributing to, teachers' stress across these countries. Although the extent of the influence of each factor on stress levels varied, similar causes was repeatedly cited, regardless of the country.

These causes were categorised as: changes in professional skills; economic pressures; student behaviour and attitudes; difficult relationships with pupil parents;



poor institutional planning and organisation, including constant restructuring and educational reforms; social and personal pressures; and schools as stressful workplaces (Michel *et al*, 2013).

This year, the UK's National Education Union (NEU 2019) surveyed its 8,674 members and found that school and college teachers' work-life balance was worse than a year ago. Workload and accountability were cited as the main reasons why school and college teachers did not see themselves working in the sector in the near future. Two fifths of respondents (40%) predicted that they would no longer be working in education by 2024, and almost one fifth of all respondents to the survey (18%) expected to have left the teaching profession within two years.

Moreover, a study (Lynch, Worth, Bamford & Wespieser, 2016) by the UK's National Foundation for Education Research (NFER) has shown a relationship between low teacher job satisfaction (influenced by factors including workload and feeling valued and supported by managers) and a greater intention to leave the profession.

During this Cloud 3 presentation, the international audience highlighted very similar causes of teacher stress and burnout in their own countries, including a lack of respect for the teaching profession - not only by some policy-makers and institutional leaders - but also from parents and carers. These, they believed, had a detrimental effect on the teacher agency.

The most effective way of increasing teacher agency, as well as respect for the teaching profession, is to develop a collegiate and collaborative culture, according to Ali Leijen, Professor of Teacher Education at the University of Tartu, when she presented her research at the EAPRIL Conference in Tartu in November 2019.

Her research on teacher agency and how to support this effectively (Leijen, Pedaste & Lepp, 2019) showed that this could be achieved through work-based and teambased professional development activities. These help teaching professionals to become more familiar with professional discourse and help them to become more adept and confident at articulating their own, as well as their collective, long-term purpose.

Professor Leijen's presentation came at a time when Estonian school children have reached the top of the 2019 PISA2 league tables in several categories. It was

² The international rankings compare the performance of 15-year-olds in reading, math, and science across 79 countries and economies, including the 36 OECD member states. The rankings take place every three years.



interesting, but disturbing, to hear that despite these excellent results, increasingly Estonian teachers believe that their profession is not valued.

Estonia is not only top of the league tables in reading, maths, and science, compared to other European countries, but it's also the highest placed European country overall, when aggregate scores are compared in Europe by the Organisation for Economic Cooperation and Development's (OECD) Programme for International Student Assessment (PISA) in its 2018 rankings.

But as Professor Leijen explained, according to this year's OECD research, 26% of Estonian teachers overall feel that the teaching profession is not valued (compared to 14% in 2013); and this figures increases to 39% of Estonian teachers with up to five years' experience.

According to Ali Leijen's research (Leijen, Pedaste & Lepp, 2019) there is a need to develop a collaborative culture which helps increase teacher agency. Work-based and team-based professional development activities can also increase teaching professionals' confidence, as well as helping them to focus on their own collective, long-term purpose.

CONCLUSION

As a conclusion of this symposium, we can consider that the three contributions show different dimensions of teacher change.

Firstly, in a meta dimension, international collaboration to share experiences and reflection between different partners is likely to be an important determinant to improve teaching in respect of the teacher's competences, the school infrastructure and the needed technological development.

Secondly, in a meso dimension, real situations (such as a company or an organisation) can sustain effective professional learning step by step and in a multidisciplinary approach.

Finally, teaching professionals need to partner with universities, policymakers and other stakeholders so that they are continuously considered to be an integral and crucial part of developing the field of pedagogy by practitioner research.

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HUMAN IMPACT ASSESSMENT OF VIDEO USE IN EDUCATION

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ABSTRACT

There is a need for the European education system to adapt in order to cope with the changing needs of the labour market. ICT and social media are recognized as tools that are radically transforming the process of learning. Thus, the objective of this study is to define the impacts of using the videos in education. To define the impacts the framework of Human Impact Assessment (HuIA) is used. HuIA is a user-centred approach that clarifies the impacts of different actions and options, providing information for decision-making and helping to deal with conflicts. According to earlier research, the regular human impact assessment of new technologies at individual and community levels may stimulate their adoption by various groups of people. Information technology usage is a rather multi-faceted process, in which both internal and external factors should be recognised. Especially, teachers' perceptions and experiences of the integration of information technology into education have not received extensive research attention, even though those may be crucial, too. According to the results, there are several positive and negative impacts. The collaboration between teachers has increased and the use of videos has raised the understanding about the videos in education. However, the use of videos may also mean increases in teachers' workload and challenges in time management.

INTRODUCTION

The European policies recognize the need for the European education system to adapt in order to cope with the changing needs of the labour market. ICT and social media are distinguished as tools that are radically transforming the process of learning. Earlier studies recognize that ICT integration processes are complex and that internal and external factors play an important role.



Video technologies have been used in very different ways and for different purposes in education field, serving very different pedagogical perspectives and approaches. However, most teachers do not use video tools, like videos, in a way that contributes to developing conceptual thinking and problem solving skills as relevant work-life competence of the knowledge worker (European Commission, 2013). Europe-wide, there is a need for e-competent teachers in utilizing e-learning with leading digital collaboration solutions. The same holds for pedagogical knowledge of designers in educational technology companies. Video-based e-learning and knowledge building are 21st century approaches; the modernization of European Higher Education Institution calls for a workable pedagogy and skilled teachers to take on the up-todate video-supported collaboration solutions for creative teamwork in online environments. The empirical context in this study comes from the ongoing research and development project called ViSuAL. The ViSuAL, Video-Supported Education Alliance, is a co-operation of six Higher Education Institutions and six Educational Technology Designers co-creating an evidence-based pedagogical model for Video-Supported Collaborative Learning.

HuIA offers a tool to assess the impacts of interactive learning tools used in the ViSuAL project. Various groups of people with different roles use the technologies in question in different ways. Impact assessment methods and results generally receive meagre academic attention despite their important societal role. In business life, corporate social responsibility, for instance, has led to this direction, but as a concept/ approach, impact assessment is still often overlooked or misunderstood; evaluation is much better known (Melkas, 2017; Raappana, Rauma, & Melkas, 2007). Confrontations between technologies and practices often exist due, for example, to technical incompatibilities between technologies; professional identities and roles; usability and accessibility problems; the hard pace of work; various fears; lack of orientation, training and systemic thinking; the entry of new actors in the field; the meaning of services vs. technology; the wide variety of technology available; ethical problematics; and obscure responsibilities (Pekkarinen & Melkas, 2019). Such issues, for instance, may be surfaced with the help of HuIA.

An assessment framework has been defined on the basis of HuIA practices, as adapted to the needs of the ViSuAL project. Impact assessment is simple as such – it is also a way of thinking, not mere methods. By focusing on the human perspective in a general sense, the aim of the assessment is to utilize the data comprehensively and outline a framework for the project. Hence, the objective of this particular study is to define the impacts of using the videos in teaching and learning.



HUMAN IMPACT ASSESSMENT

Information technology usage is a multi-faceted process, in which both internal and external factors should be taken into account. Infrastructure and training of the personnel, for example, may be defined as significant external factors in technology integration, whereas internal factors refer to characteristics of the personnel and the educational organization. (Tearle, 2003; Ertmer, 2005; Davis et al., 2009; Sangrá & González-Sanmamed, 2010). Moreover, the teachers' perceptions and experiences of the integration of information technology into education have not received extensive research attention, even though those are crucial internal factors in development processes (Hyypiä, Parjanen & Melkas, 2019).

Human Impact Assessment (HuIA) offers a "tool" to assess technology use from the human perspective. It is not restricted to any particular technological application or field of implementation. Related methods have been applied, for instance, to assess employees' competence and orientation need for technology use in care work (Melkas, 2011). HuIA has common roots with environmental impact assessment (EIA) and belongs to the same "assessment family" that has in recent years been advocated by the European Commission, as well as national authorities in some countries, e.g. Finland. HuIA is often seen to describe an integrated process including both Health Impact Assessment (HIA) and Social Impact Assessment (SIA). It is a user-centred approach that clarifies the impacts of different actions and options, providing information for decision-making and helping to deal with conflicts (Kauppinen & Nelimarkka, 2004). The regular human impact assessment of new technologies at individual and community levels may stimulate their adoption by various groups of people (Melkas, 2011).

In the technology utilisation, many stakeholders are involved and HuIA has the potential to make various relevant groups' perspectives visible. Identifying and caring about impacts is a key in operating in a socially sustainable way (Melkas, 2017). Next, in Figure 1 below, a typical assessment process is presented. In this study, the focus of the HuAI process has been principally related to the first level and in identifying the different types of impacts.

EAPRIL 2019 CONFERENCE PROCEEDINGS

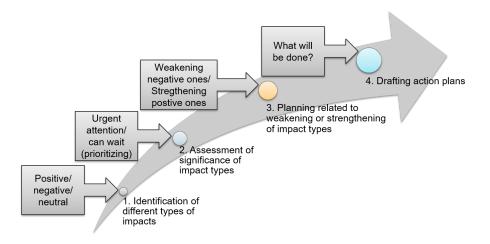


Figure 1: The typical impact assessment process.

Through the present assessment, application of HuIA is demonstrated in a new, topical field. HuIA is utilised in the ViSuAL project to assess the impacts resulting from the implementation of videos in education from the point of view of all the groups concerned. HuIA in the ViSuAL context may include, for example, the linkage of technology (interactive learning tools) to social effects, such as trust and commitment, time usage, information flows and feelings of participation, and to pedagogical effects such as learning and the professional development of educational professionals. Through the identification of early impacts, the information suitable for orientation and future planning may also be produced; thus, the co-evolution of technology and service innovations may be facilitated (Melkas, Hennala, Pekkarinen, & Kyrki, 2020; Hyypiä et al., 2019, Melkas, 2017).

RESEARCH DESING

Video-Supported Education Alliance - ViSuAL

The empirical context in this study comes from the ongoing research and development project Video-Supported Education Alliance (ViSuAL). The aim of the ViSuAL project is to co-create an evidence-based pedagogical model for Video-Supported Collaborative Learning. The developed solution develops students' critical thinking and problem solving skills that are important for navigating the increasingly turbulent, knowledge-intensive and entrepreneurial work-life. In the long run, ViSuAL will contribute to meeting the modernization needs of European Higher Education Institutions in advancing digital skills for learning and teaching. Due to the practical nature and provision of workable practices for transforming



education, the teacher will embrace the experimentations carried out in ViSuAL at local level and spread it through their institutes. The insights gathered during the cocreation process have an impact on the innovation capacity of the companies in partnership with their stakeholders, customers and the Higher Education Institutions as the researchers, facilitators and design partners of the companies. The experiments of video use are related to, for example, a music instrument teacher-student reflecting his/her own work, video annotation in teachers' training or collaborative video-problem solving in primary education (Takkinen, 2019; Boldrini, Cattaneo & Evi-Colombo, 2019; Ramos, Espadeiro, Fialho, I. & Monginho, 2019).

Next, few experimentations of this study are introduced. In the experiments, videos were used in various ways. At the University of Tartu, the speech therapy students review the video recordings of the counselling sessions done by themselves and fellow students, thus increasing their knowledge and experience in speech therapy. During the Operative Management in Catering Services course, the students of Jyväskylä University of Applied Sciences produced three different video tasks to reflect on their own expertise in different topics of day-to-day management. In addition, the teacher produced video material related to the assignment, gave feedback, and offered working life perspectives using video. The experiment of the University of Evora took place in two primary schools. The main purpose of this experiment was to use video technologies to support the collaborative creation of a collection of digital video storytelling created by students within a project-based learning framework (Lepp, 2019; Vaara & Hukkanen, 2019; Ramos et al., 2019).

The data collection and analysis

The research strategy of our study is qualitative case study. The case study is used in many situations to contribute to our knowledge of individual, group, organizational, social and related phenomena (Stake, 2005; Yin, 2009; Erikson & Koistinen, 2005). The data collection in case-study research is typically extensive and draws on multiple sources of information. The empirical data for this study include the memos of meetings, notes on experiments, appreciative interviews and observation. In general, all the data collected and to be collected in the ongoing ViSuAL project may be used for HuIA, depending on their availability (timing, language). However, in this particular study a few cases from the ViSuAL project countries are discussed.

Data included to this study:

- 14 lead user and pre-experimenters' interviews (Netherlands, Switzerland, Estonia, Finland, and Portugal)
- 11 teacher interviews after the video experiment (Holland, Finland and Estonia)



- 6 video-ethnographies (Estonia and Finland)
- Observations of the meetings related to experiments (project meetings and meetings in Finnish UAS).
- 6 poster presentations on experiments at EAPRIL2019 conference in Tartu, Estonia

The inquiry of the data was based on the content analysis, evaluating the appearance of mutual themes, adversarial feedback, experiences and suggestions for improvements among others. At the first phase of the analysis, various impacts were revealed. After that, the impacts were grouped into themes like collaboration, teaching, learning outcomes, workload and time management. In the last phase, each group were analysed separately and the positive or negative impacts were defined.

As a research strategy, case study is also known as the triangulated research strategy, which means using different types of material, theories, methods and investigators in the same study. The present study utilises the triangulation of data and investigators in order to understand the phenomenon and to increase the quality of the study. The results are analysed in co-operation with the authors and the other researchers and company partner from the collaboration project reviewed results.

FINDINGS

In the ViSuAL project, video use is merged with the pedagogy of collaborative learning and creative knowledge building of diverse European teams while bridging education with working life and the surrounding society. Collaborative learning is thus an activity that takes place both in education, in working life and in between those. Collaborative learning is about seeing, for instance, how individual work connects with larger work communities. Connections in education or working life can be avenues for information, resources, and new ideas to be exchanged. It is of crucial importance to be able to make visible the human impacts of video use in teaching and learning of all participants.

According to our results, the use of videos has impact on different stakeholder groups like teachers, students and digital learning personnel. Figure 2 presents the various stakeholders groups in video supported teaching and learning.

EAPRIL 2019 CONFERENCE PROCEEDINGS

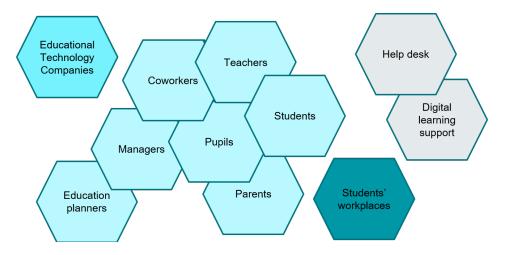


Figure 2: The stakeholder groups in video-supported teaching and learning.

This study is limited to identify the impacts on teachers. Next, the identified positive and negative impacts of this study are introduced.

Positive impacts

The collaboration between the teachers has increased, firstly, because they need help with technical issues, and secondly, because the willingness to discuss pedagogical issues has increased collaboration (or at least willingness to collaborate).

"a former colleague [the name of the colleague] was supposed to use this technology, so I asked him whether he knew more than me about it and if he could teach me."

Teachers' attitudes towards using videos were generally positive, to start with, although many of them may have been somewhat sceptical before the courses.

"It has raised my awareness and understanding that videos are useful for teaching."

As to the impacts on teaching, the respondents emphasized, for instance, the flexibility of teaching. It is not obligatory to be physically present; videos can be used on other courses, too; and videos may especially enhance learning of various skills.

"This was a great way of not having to be in each class physically and for the teachers to feel comfortable uploading a part or the entire class



recording and asking me to observe and use the comment section to give them feedback."

"The video recorded material is very versatile and can be used and reused in a variety of pedagogical scenarios."

Additionally, quite positive responses were given concerning learning outcomes.

"They could see how they interact with the child, how they ask questions, how to better analyze the child's speech, the child's interactions, her own interaction with the child, and language use. I think it's very useful. The videos are important learning opportunity."

"Definitely. I find extremely useful when the students are in charge of the process of creating a video from scratch, collaboratively, in small group settings. In this context, the learning gains are remarkable."

Negative impacts

Various concerns were mentioned. They were related to additional stress caused by different reasons.

"some teachers might still be afraid of using ICT or some even might think that if they video record their lessons they are no longer needed."

An increase in the workload was brought up by the respondents.

"My workload is not normal when using videos. There is more work for me if no limits are set, e.g. for the length of the videos (one student made 25 minutes long videos)."

"The complexity of using a program increases a teacher's workload."

A few negative issues were brought up concerning time management. For example, the planning of the course may require more time and when you are helping others to use videos that takes time and it is not necessarily allocated to your working time. A number of technical challenges were brought up related to the teaching or teaching outcomes.



"Technology X seriously frustrated the students, they asked several times if they could use any other environment to make their videos. It's definitely worth using videos, but not this".

"According to the preliminary results of the first experiment, utilizing videos from the learning platform in both teaching and studying has been challenging, particularly due to technical problems, such as logging in if the password is forgotten; organizing commenting; sound quality.

Other Issues

Within the HuIA framework concern other possible outcomes of the ViSuAL project activities from the point of view of the different groups involved. There were a number of other interesting issues that could be identified from the data. For example, there is a need to various professions to collaborate, because the teachers saw that often the independent decisions made by the technical support do not necessarily support pedagogy. In addition there are urgent issues to work with like ethics and security issues. In addition, a "pedagogical video culture" was called for that is presented in the following quotation.

"It is a matter of development of a pedagogical video culture. I don't think the problem is lack of teachers' technical competence – it is much more about the video as rather new pedagogical competence: What do we connect video with professional teaching and teacher's everyday life? It is a matter of culture most of all."

CONCLUSIONS

This study contains background information on Human Impact Assessment, the framework that was designed for use in the ViSuAL project, and the results of the assessment on the basis of the data that were available by the end of year, 2019. Even though the whole assessment framework could not be utilized at this stage of the project, its structure gave a good basis for the assessment of the early data available. Multiple positive and negative impacts were identified. This information can be utilized in future planning and, if necessary, corrective actions in video use. The insights gathered during the co-creation process have an impact on the innovation capacity of the companies in partnership with their stakeholders, customers and the Higher Education Institutions.

According to the results of this study, the Human impact assessment (HuIA) offers a workable framework to assess the impact of interactive learning tools. The use of videos in education has an impact on different stakeholder groups like teachers, students, educational technology personnel and technology providers. This study concentrated especially on the impacts on teachers. Using video technology in teaching and learning have an impact on teachers' behaviours especially at the beginning of technology use. According to the results of the experiments, utilizing the videos from the learning platform in both teaching and studying has been challenging, particularly due to technical problems, such as logging in if the password is forgotten; organizing commenting; sound quality.

Based on the results, we may sum, that the teacher should consider carefully why and how s/he is using videos and how the use of videos supports pedagogy. That way the use of videos may have positive impacts on teaching and learning outcomes. The attitudes of students are not necessary positive and it had to be explained the role of videos in teaching. There are impacts on other teachers and/or digital learning personnel. The use of new technologies demands technical support that could be official like courses and seminars or unofficial like help seeking from workmates. In addition, the role of teacher is changing more to a motivator or sparring partner. This also means that the teachers highlight the possibility to discuss the impacts of videosupported teaching and learning. The use of video technologies in the teaching and learning affects the role of teachers and calls for digital competence and the development of new pedagogical practices for teachers. Furthermore, the results imply that leadership and school organization are important condition to conduct pedagogical innovation (teachers' time scheduled, teachers' workload, technology access, appropriate physical spaces).

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A QUALITATIVE STUDY ON THE ANXIETY OF IT STUDENTS TOWARDS PROFESSIONAL SKILLS TRAINING

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ABSTRACT

The importance of professional skills in future engineering jobs is beyond discussion. Increasing numbers of universities have integrated training for such skills in their engineering curricula to prepare students to become highly qualified employees. HU University of Applied Sciences Utrecht also implemented professional skills training in the IT Bachelor program to help our students develop towards successful and highly demanded IT engineers. However, these courses consistently score low in our student satisfaction surveys. To find the cause of this negative evaluation, we previously studied the motivation, attitude and anxiety of IT students towards learning soft, or professional, skills. This former quantitative study indicates that our IT students tend to have a positive motivation and attitude toward learning professional skills, while 'anxiety' in learning professional skills increases from the first to the third year.

In this qualitative study, we try to find causes for the increasing anxiety among ITstudents. We interviewed six third and fourth year IT students and after analysing these interviews we found that this students have experienced the need for professional skills during their internship. Besides, they emphasize the need of obtaining these skills for future employment. From the analysis of the interviews, it also appears that IT students rather felt difficulty in obtaining communication skills then anxiety. A possible cause for this difficulty mentioned by students was the character of students and the influence of the teacher. To overcome this difficulty obtaining communication skills, students suggested that training skills in an authentic engineering situation is more effective than doing exercises with simulated cases. However, the results of this study did not yield a conclusive insight in the cause of increased anxiety, hence further research is needed.



INTRODUCTION

The urge for professional skills among technical, and especially IT-professionals, is commonly known and acknowledged (Kyllonen, 2013). More and more universities and academies therefore incorporate these skills into their curricula. Nevertheless, business managers, IT-employers and IT-recruiters are still confronted with young professional IT-employees who are not fully skilled to perform in their jobs; they often indicate that the IT graduates they employ, lack the skill sets required by the industry (Calitz, Cullen & Greyling, 2015). Increasing numbers of universities have integrated soft or professional skills in engineering curricula. Our HU University of Applied Sciences Utrecht has also implemented soft skills training in the IT Bachelor program.

However, such courses consistently score low in student satisfaction surveys. To find the cause of this negative evaluation, we previously studied the motivation, attitude and anxiety of IT students towards learning soft skills (Schipper & Van der Stappen, 2018).

Data in this former quantitative study, indicated that our IT students acknowledge the importance of professional skills for their future profession. Furthermore, our IT students have a positive motivation and attitude toward learning soft skills. The anxiety to train these skills increases from the first to the third year, which was unexpected. The obtained results did not explain the low satisfaction scores, or motivational problems for soft skill courses. Neither did it explain the increasing anxiety among students towards learning soft skills moving forward in their study.

Related work

In advance of our qualitative study, further literature research brought us to several studies which gave possible explanations for the negative attitude toward soft skills. According to Claxton, Costa & Kallick, (2016), Itani & Srour, (2016) and Bancino & Zevalkink (2007) this negative attitude is based on the connotation differing between hard and soft skills. "Hard implies objective, clearly defined and reliable data, while soft often imply subjective, fuzzy, and unreliable activities... Soft skills immediately undermine their claim to serious attention, [...] and implies that these outcomes are impossible to measure and fall outside any framework of accountability." (Claxton, Costa, & Kallick, 2016, p.62). Hard skills are often referring to the technical expertise and knowledge needed for a job, because of its measurability, and scoring outcomes (Horton, 2001). While soft skills are often used to indicate interpersonal qualities, also known as 'people skills', or personal attributes that one possesses (Robles, 2012). For this reason, we prefer the term 'professional skills'.



A framework for Professional Skills

The subject of our study is 'professional skills'. No single widely accepted definition of professional (soft) skills exists (Schulz, 2008). Even the 21th century skills – a variety of skills and competencies – framework is not clear which competence, body of knowledge, or aspects of character define 'soft skills' best (Partnership for 21st Century Learning, or P21.org).

In the Netherlands, universities of applied sciences which offer an IT Bachelor program developed a framework for professional skills. It's called the HBO-i domain description. The HBO-i domain description serves as a functional qualifications framework for universities and focuses on the starting proficiency of future IT professionals. (HBO-i. (2018). *Domain description Bachelor of ICT*. Retrieved January 29, 2020, from https://www.hbo-i.nl/publicaties-domeinbeschrijving/). Also the HU University of Applied Sciences Utrecht uses this model for training IT-students in professional skills.

The model provides a systematic description of the professional skills needed in order to operate as an IT professional. The professional model has three dimensions: activities (what does an IT professional do?), architectural layers (within which context?) and proficiency levels (how complex is it?). An integral part of these skills is the IT professional learning from every assignment and in this way developing his own profile for future work. IT professional duties, skills and personal development are thereby inseparably linked. The professional skills have been formulated into four areas of interest: future-oriented organisation, investigative problem solving, personal leadership and targeted interaction. The four areas of interest overlap one another and complement each other.



Figure 1: fragment of the framework 'HBO-i domain description'. (HBO-i, 2018. Retrieved January 29, 2020, from https://www.hbo-i.nl/publicaties-domeinbeschrijving/)

Future-oriented organization focuses on structuring project activities and ethical issues. Investigative problem solving implies skills as: critical thinking, creativity and research skills. Personal leadership pays attention to personal development and skills like reflecting practice. Finally, Targeted interaction also referred to as 'effective interaction' contains skills as communication and teamwork. This framework is only recently used in our curricula, which is why it is not yet commonly known amongst our IT Bachelor students.

RESEARCH METHOD

We performed a qualitative study in which we interviewed six third and fourth year IT students about their motivation, attitude and anxiety towards learning professional skills, during courses in their IT curriculum. Our goal was to obtain insight in the contradiction between the motivation for learning these skills and the negative evaluation of courses. Also, we hoped to find factors which cause growing anxiety among our older students.

The main research question we aim to answer is: 'Which aspects explain the negative student satisfaction for professional skills training, and the increasing anxiety towards learning professional skills, among IT Bachelor students?'

To further detail the conceptual framework for the object of our study, we first asked the interviewees what their definition for professional skills is.

The other questions in the semi-structured interviews concerned:

- 1) In what way and when did you develop your professional skills during college years?
- 2) How do you evaluate the courses in which you trained your professional skills?
- 3) What –eventually– causes anxiety in learning soft skills and if so: did this anxiety differs between your first year of college and your present year?
- 4) In your opinion, how could we prevent this anxiety?

Participants

To obtain the qualitative data, we interviewed six students who studied various specializations in our IT Bachelor program (see Table 1).



Interviewee	Gender	Age	Year	Specialization
Α	М	23	4th	System & Network Engineering
В	М	24	4th	Computer Engineering
С	F	21	3rd	Business Informatics
D	М	22	4th	Software Engineering
Е	М	25	4th	Software Engineering
F	М	24	3rd	Computer Engineering

Table 1: Characteristics of the six interviewed IT students

The interviewees were recruited during a third-year course in the second semester (the term subsequent to the internship). Although this is a small self-selected sample, the dispersion of students over the specializations is similar to the entire student population in our institute. The gender ratio (less than 10% female) corresponds with the ratio between genders in the entire population.

Analysis

The interviews were recorded (approximately 30 minutes each) and transcribed. The transcripts were next analyzed by open coding using Atlas.ti. This resulted in 233 coded text fragments.

For analyzing these categories and for answering our research questions, first we performed axial coding. This resulted in four main categories, which are similar to the variables in the Social Educational Model (MacIntyre et al. (2012) which was based on the initial model of Second Language Acquisition by Gardner (1985), Figure 2).

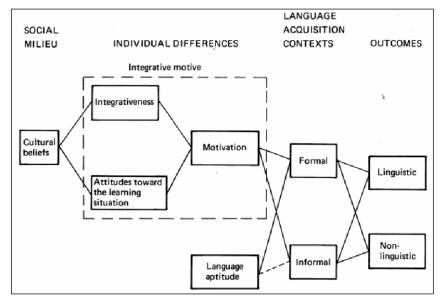


Figure 2: schematic representation of the Social Educational Model of second language acquisition (SE-Model) (Gardner (1985)

In our former study (Schipper & Van der Stappen, 2018), we also used the insight found by MacIntyre et al. (2012) who studied anxiety towards learning musical skills. MacIntyre indicated that motivation and attitude towards training music skills is comparable to second language acquisition. From this point of view, we suggest that although second language learning, related to the content differs from professional skills training, some similarity between their curricula exists. For example: exercising listening and writing skills as well as presentation skills are part of both courses. Hence, we deem it suitable to use this model to measure attitude and motivation towards learning professional skills.

The second step in analyzing our data was to use the Co-occurrence Explorer function in Atlas.ti. This shows us where (groups of) codes appear in an overlapping manner and it helps us to gain insight in the relations between the variables as mentioned in the SE-model.

RESULTS

The coded fragments were categorized into 29 categories. Next, these categories are accommodated within the SE-model (see Table 2).

Axial coding resulted in the four groups of codes based on the variables in the Social Educational Model (Gardner, 1985 and MacIntyre et al, 2012).



These four groups are as shown in Figure 2:

• Social milieu (concerning external influencing factors, such as common of cultural beliefs),

• Individual differences (as character, motivation and attitude),

• Acquisition contexts (learning settings, such as courses (i.e. formal learning) and internships (i.e. informal learning) situations)

• Outcomes (referring to the 'professional skills').

						<			$\boldsymbol{\omega}$,																
Importance of having skills	Future employment	Specialization	Attitude and behaviour	Easy to do	Difficult to do	Motivation	Positive evaluation	Negative evaluation	Students' character	Students' definition for skills	Interdisciplinary	Tutors influence	Skills training	Collaboration	Communication skills	Concerning ethical issues	Creativity	Critical thinking	Doing research	Leadership	Oral communication	Presenting	Problem solving	Reflecting	Sharing knowledge	Social behaviour	Structuring activities	Working in projects	Writing		
•	4	•	ω	•	4	ω	N	N	e e	ω		•	cn .	ω	1	•	N	•	S)	N	-			ch	ω			ω	N	2 10	Importance
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		•	N		œ	N	•	•	00	•	0	•	44	-	ch .	•	•	•	•	-	-	•	•	•	cn .	•	-	-	N	~ ~	Specialization
			0	0	Ch	o	-	N	10	45		0	N		ω	0	0		-	45	N	-	0	N	ω	ω	0		N		Attitude and behaviour
				0	0	•	0	-	-	0	0	0	N	0	-	0	0	0	•	•	0	N	0	•	0	•	0	0	0	In Inc	Easy to do
					•	N	•	ω	20	•	•	-	~4	N	3	•	•	•	44	N	N	o	•	ω	-7	•		0	00	1	Difficult to do
						0	N	o	Un	0	N	ω	5	-	N	0	0	0	-	-	0		0	0		0	0	N	0	Individual	Motivation
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								0	ω	0		-	3 27	ω	N	0	0	0		-	0	N	0	ω	0	0	-	4	4	iffere	Negative evaluation
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														-	0		-		N	ω	N	N	-	0	5	_	0	N	ω		Communication skills
																				0	0				8				0		Concerning ethical issues
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			-																												

Table 2: categories according to SEM-model (see also p.15 for an readable version)

To gain insight into what the students meant when mentioning professional skills we first asked the interviewees to define the construct 'professional skills'. In this way we would be sure we study the right construct. Table 3 shows students' definitions in relation to the outcomes (i.e professional skills). Students mentioned communication, or a variety of communication activities most when they were asked about their education in professional skills. Second most mentioned are collaboration (working in teams) and working in projects (indicating doing structured project activities).

Outcomes	students definition
collaboration	2
communication	10
creativity	2
critical thinking	1
doing resarch	3
ethical issues	0
leadership	1
oral communication	1
presenting	1



problem solving	1
reflecting	0
sharing of knowledge	4
social behavior	1
structuring activities	0
working in projects	0
writing	4

Table 3: student's definition for professional skills – the grey coloured cells are all subskills of 'communication'.

Some of the skills (for example 'ethical issues' or 'reflecting') were not mentioned in students' definition of professional skills, but these skills were nevertheless mentioned as outcomes in relation to their skills training as is shown in Table 4. Table 3 indicates that students not define ethics, reflecting activities and structuring activities or working in projects as part of the professional skills framework.

The analysis of collected answers to our question: "In what way and when did you develop your professional skills during college years?" resulted in a co-occurrence table (see Table 4) *Outcomes* (the professional skills) in relation to *Settings* (the acquisitions context).

Outcomes	Settings											
	Interdisciplinary teams	tutors influence	skills training									
collaboration	4	0	7									
communication	4	0	8									
creativity	1	0	0									
critical thinking	1	0	1									
doing resarch	1	0	10									
ethical issues	0	0	0									
leadership	0	0	2									
oral communication	0	0	3									
presenting	1	1	7									
problem solving	0	0	0									
reflecting	1	0	5									
sharing of knowledge	3	0	4									
social behavior	0	0	0									
structuring activities	0	0	2									
working in projects	3	0	11									
writing	0	1	7									

Table 4: outcomes vs settings

In our curriculum, we offer two specific courses in which we provide skills training; one basic course in the first year in which students learn presentation and writing skills and one course which focuses on research skills in the second year. Beside this, we integrated training in professional skills in student projects.

Regarding this, it is understandable students mentioned communication, working in projects and collaboration most often as the setting to train their professional skills.

For the next research question: "How do you evaluate the courses in which you trained your professional skills?" we search for *Individual differences* (with negative and positive evaluation amongst it) in co-occurrence with *Settings*.

Individual differences		Settings	
	Interdiscipli nary teams	Tutors influence	Skills training
Attitude and behaviour	1	0	2
Easy to do	0	0	2
Difficult to do	0	1	7
Motivation	2	3	10
Positive evaluation	3	5	18
Negative evaluation	1	1	27
Students' character	3	0	10
Students' definition	1	0	0

Table 5: individual differences vs settings

Students refer to their skills training both in a positive (18 times) as in a negative way (27). Below are some quotes illustrating the negative impressions; the Dutch quotes we used below were translated into English.

Student A: For example, we had a 3rd year course this semester, and I saw a huge number of people who disliked this course. It really became probably one of the worst courses that was received under IT student - really nobody liked it.[In Student F: "Eh… we also got professional skills in the first year, well then we get a very useless topic, I thought uh… a very useless topic to write a thesis about. Ehm … also with a fixed guideline. So everyone had a subject that we didn't … uh … not very much … that wasn't very fun." The positive evaluation occurs often in combination with influence of the tutor (5 times).

Student D: "Yes I have had good teachers for professional skills, always, and that made it most of the times fun to train presentations, so yes I have good experiences with that."

The question: "What –eventually– causes anxiety in learning soft skills and if so: did this anxiety differs between your first year of college and your present year?" resulted in *Individual differences* in co-occurance with *the influence of social milieu*.

Individual differences	Influence of social milieu													
	Importance of skills	Future employment	Specialization	Tutors' influence										
Attitude and behaviour	3	5	2	0										
Easy to do	0	0	1	0										
Difficult to do	4	7	9	1										
Motivation	3	8	2	3										
Negative evaluation	2	7	0	1										
Positive evaluation	2	3	0	5										
Students' character	9	8	8	0										
Students' definition	3	0	0	0										

Table 6: Code co-occurrence: Individual differences vs Social milieu (cultural beliefs)

Our most remarkable findings were:

- Positive evaluation occurs in combination with the *influence of the tutor* and when the exercises were related to *future employment*. Training one's skills was valuated negative when the exercises were too theoretical, or not authentic. Student E: "I think in terms of projects I think that it is better for a student if it is a real project, instead of just putting it away into a drawer. I don't know if this is related to learning professional skills or not. But it's great if you're working towards a real product. Instead of something that will disappear in the cupboard."
- 2) Motivation towards learning skills occurs most frequently in combination with future employment. Students realize the importance of professional skills, in particular the ability to communicate, for future jobs. During their internships they experienced the need for communication and collaboration with colleagues in projects and in the interviews, they emphasize the necessity of being trained Student B: "...and I have really noticed that communication in the field is very important, so communication is perhaps more appreciated than someone who is really only technically good. So a combination of these [the professional skills



and technical skills] is appreciated more than someone who is only very strong in one area."

3) The *character of the student* was mentioned often to explain that students encounter *difficulty* in training their *communication* skills (14 times, see table 2 and p.15), for example during *presentations* or in *sharing information* (written or oral) with other students or colleagues during working in projects (*interdisciplinary teams*).

Student D: "Yes, some do [felt difficulty]. For example K ... but anyway, he doesn't open his mouth that easily, while he knows quite a bit." Students themselves suggests that difficult to do has a relationship with the type of specialization; it was mentioned 9 times.

Student C: "I noticed that those two, a software developer and a network engineer, that they really focus on the technical part and that the communication and coordination and making agreements with the project owner is left to us." The students also observed that students specialized in computer engineering found more difficulty in exercising professional skills, comparing to students in business informatics.

CONCLUSION AND DISCUSSION

In our study the interviewees did have a negative attitude (evaluation) towards training their professional skills. However, students are aware of the importance of professional skills (especially communication skills) in future jobs. They acknowledge and have experienced the advantage of having these skills during their internship. Back in college after an internship, they are extra motivated towards training their skills to become graduated high-potential IT engineers.

When training these skills, students mentioned anxiety. Half of the interviewees indicates a relationship between *negative evaluation* and *difficult to do* in learning skills. This might explain the perceived 'anxiety' towards learning professional skills. In case of anxiety, the interviewees suggested that there seems to be a relationship between students character (extravertism vs introvertism) and students IT-specialization (IT-business vs IT-engineering). Because our sample is (too) small, this needs further research.

Unfortunately, we did not gain a clear insight in the cause of being more anxious towards training these professional skills in comparison with their younger peers. However, based on some quotes, in combination with relevant literature, we suppose that students feel anxiety when they train -in particular their communication- skills, because they are worried of opinions of others, potential failure and/or negative evaluation by the tutor, while a positive evaluation is needed for future success (MacIntyre & Gardner (1991), Yashima, Noels & Takeuchi (2009)). In relation to



our sample, most third en fourth year students had finished their internships. During these internships students experienced the need for professional skills, experienced succesfull moments and therefore emphasized the need of obtaining these skills for future employment. This aspect was also mentioned by Patacsil & Tablatin, (2017). Aknowlegdement of the importance of professional skills for future jobs, may hypothetically cause pressure to obtain the skills and create anxiety during training these, but again, this needs further research.

Less anxiety towards learning professional (communication) skills among IT students is needed to achieve these skills successfully; as shown in the Social-Educational Model, anxiety influences the achievement of (second language) skills. The better students have developed their professional skills, the better their skills match the demands for future employment. In this research, students suggested that training skills in an authentic, engineering-based situation is more effective than doing exercises with simulated cases. Students also indicate that the tutor has to be familiar with the IT industry. This is also mentioned by Javernick-Will & Maul (2016), who indicate that engineering students claimed to learn professional skills more from their service learning experiences (for example in voluntary projects) than from their coursework. Even more, "engineering service participation, especially a high level of participation, builds Professional Skills because of the additional experience with realistic, contextualized, and complex engineering projects" (Javernick-Will & Maul (2016), p 86).

A limitation of this study is the small number of participants. Nevertheless the results of our qualatative study are in line with the outcomes of several other studies: although students are motivated towards learning skills for future employment, they felt some anxiety training these skills in formal learning situations. The amount of anxiety depends on one's character. To obtain a positive evaluation or to diminish difficulty in training skills, students suggest to train the professional skills in authentic settings.

In developing future skills training we can incorporate these insights to create a more positive experience for IT students in training their skills, resulting in more positive course evaluations as well. We can conduct empirical research to test whether such skill training indeed overcomes the problems we currently observe in practice.



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		Importance	Future employment	Specialization	Attitude and behaviour	Easy to do	Difficult to do	Motivation	Positive evaluation	Negative evaluation	Students' character	Students' definition	Interdisciplinary	Tutors' influence	Skill straining	Collaboration	Communication skills	Concerning ethical issues	Creativity	Critical thinking	Doing research	Leadership	Oral communication	Presenting	Problem solving	Reflecting	Sharing knowledge	Social behaviour	Structuring activities	Working in projects	Writing									
			Social Milieu												Ind	ivid	ual	diff	erer	nces		Se	ttir	ngs							Ou	itco	ome	es						
	Writing	2	3	2	2	0	8	0	2	4	2	4	0	1	7	0	3	0	0	0	5	0	1	0	0	0	1	0	1	0	0									
	Working in projects	3	10	1	1	0	0	2	2	4	3	0	3	0	11	3	2	0	1	0	0	2	0	0	0	2	3	0	1	0										
	Structuring activities	1	1	1	0	0	1	0	0	1	0	0	0	0	2	0	0	0	0	0	1	0	0	0	2	0	0	0	0											
	Social behaviour	1	2	0	3	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0												
	Sharing knowledge	3	3	5	3	0	7	1	1	0	9	4	3	0	4	3	10	0	1	1	1	1	1	1	0	1	0													
	Reflecting	5	1	0	2	0	3	0	0	3	4	0	1	0	5	0	0	0	0	1	0	1	0	0	0	0														
	Problem solving	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	3	1	0	0	0	0	0															
Outcomes	Presenting	1	2	0	1	2	6	1	4	2	2	1	1	1	7	0	2	0	0	0	3	0	2	0																
Outc	Oral communication	1	1	1	2	0	2	0	0	0	1	1	0	0	3	0	2	0	0	0	0	0	0																	
	Leadership	2	4	1	4	0	2	1	0	1	4	1	0	0	2	1	3	0	0	0	1	0																		
	Doing research	5	2	0	1	0	4	1	4	4	3	3	1	0	10	0	2	0	0	1	0																			
	Critical thinking	0	1	0	1	0	0	0	0	0	1	1	1	0	1	0	0	0	1	0																				
	Creativity	2	2	0	0	0	0	0	0	0	0	2	1	0	0	1	1	0	0																					
	Concerning ethical issues	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																						
	Communication skills	11	12	5	3	1	13	2	4	2	14	10	4	0	8	8	0																							
	Collaboration	3	4	1	1	0	2	1	3	3	3	2	4	0	7	0																								
ŝ	Skills training	5	16	4	2	2	7	10	18	27	10	0	4	5	0																									
Settings	Tutors influence	0	0	0	0	0	1	3	5	1	0	0	0	0																										
	Interdisciplinary	1	1	0	1	0	0	2	3	1	3	1	0																											
	Students' definition for	3	0	0	4	0	0	0	0	0	0	0																												
	Students' character	9	8	8	10	1	20	5	1	3	0																													
nces	Negative evaluation	2	7	0	2	1	3	6	1	0																														
Individual differences	Positive evaluation	2	3	0	1	0	0	2	0																															
vidual	Motivation	3	8	2	6	0	2	0																																
Indi	Difficult to do	4	7	9	5	0	0																																	
	Easy to do	0	0	1	0	0																																		
	Attitude and behaviour	3	5	2	0																																			
eu	Specialization	0	0	0																																				
Social Milieu	Future employment	14	0																																					
Soc	Importance of having skills	0																																						



LEARNING SPACE DESIGN & ENGINEERING IDENTITY DEVELOPMENT OF STUDENTS IN A PBL CONTEXT

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ABSTRACT

Previous studies on the impacts of learning environments and contexts on students' professional identity formation showed how factors like room layout could affect learners emotionally, influencing their motivation, interactions and performance. They also showed how, for example, in problem-based learning situations, and group-work specifically, female students' engineering identity formation differed from their male counterparts.

An ongoing study on an engineering school's project-oriented, problem-based (PoPBL) learning curriculum aims at analysing the interactions between different learning environment and students' personal characteristics. The focus is on how these interactions affect students' engineering identity development. The project aims at addressing diversity in a PBL engineering curriculum, and understanding how different student profiles may respond to various learning spaces, with the purpose of producing recommendations on what types of learning spaces may foster all students' self-efficacy in engineering postures and missions.

Data was collected from questionnaires to a cohort (n=59) of 4^{th} year engineering students in the PoPBL programme.

Students' engineering identity formation was measured using their perceived and recognized acquisition of interpersonal, organisational and creativity skills, and their overall identification to engineering postures, as indicators.

Correlation tests were used to measure the mutual influences of three independent environmental variables and four independent personal. The data collected confirmed that specific environmental layouts might interfere with personal characteristics to affect students' engineering identity formation and self-efficacy.



INTRODUCTION: A STUDY OF STUDENT-ENVIRONMENT INTERACTIONS ON ENGINEERING IDENTITY DEVELOPMENT

Context

CESI is a French multicentre school of engineering. In 2015, it shifted the curriculum of its engineering programme to project-oriented, problem-based learning. Teams of five to six students conduct twelve projects throughout the engineering programme, with a member of the teaching staff tutoring up to six teams at a time.

In this programme, students specialize only during the last year of the school curriculum, when they choose a major. Hence, students with heterogeneous previous academic backgrounds¹ share the same training on the first years. However, due to the PoPBL dimension of this curriculum, with its team-based collaborative learning, these students have to work together and cooperate, to produce deliverables and solve problems in multidisciplinary projects.

A first study on a previous cohort of 587 students (Badets, 2019) showed that, in this curriculum, there were heterogeneity-related biases in the students' engineering identity development. These biases were mostly unrelated to academic background diversity, but rather linked to previous work experiences and gender diversity. For example, female students, who represented only 12.5% of this student cohort, statistically expressed a lower sense of self-efficacy in STEM in this programme². Nevertheless, tutoring was proven to affect student self-efficacy even more strongly than gender or any other personal factors: non-personal factors proved to reinforce or diminish the effects of initial predispositions caused by such personal factors. These data led us to consider the necessity of investigating the interactions of students' personal characteristics with the curriculum's environmental factors, as both could affect the multifactorial process of engineering students' "becoming". The overall aim of the project is to build a better understanding of engineering identity development in a training programme, but also to produce recommendations on what types of learning spaces foster students' self-efficacy in engineering postures and missions.

¹ Freshmen come from any post-secondary degree with a scientific or technical speciality. For example, undergraduates from Organic Chemistry, Sustainable Building and Civil Engineering, Biotechnologies, Electrical Engineering and Industrial Computing, Health, Safety and Environment... are all enrolled in the same engineering postgraduate programme.

 $^{^{2}}$ P-value = 0.094



Theoretical background

Professional identity and developing self-efficacy

Learners' professional identity is a "becoming" process that is iteratively influenced by their interests, abilities, performances in specific contexts, and the recognition, from others, and themselves, as future professionals (Patrick et al., 2016; Verdin et al., 2018). Both Patrick et al. (2016) and Verdin et al. (2018) use this same theoretical framework to define professional identity formation, as shown in figure 1.

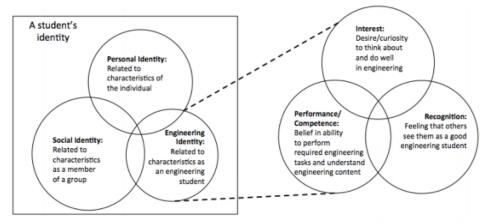


Figure 1 – From Patrick, A. D., Prybutok, A. N., & Borrego, M. (2018), p3.

Professional identity, in this paper, will be mainly defined as recognizing oneself as a future engineer in a training context, and related to students' self-perceived ability to act and think like engineers, namely their self-efficacy as future engineers. We agree with Morelock's (2017, p1242) view of engineering identity that it "must be understood and acted upon by faculty to create a better engineering education environment for students and institutions alike." Indeed, we aim at focusing on how engineering education environments should be designed to enable students' self-efficacy.

Engineering identity, or "professional identity within engineering" (Morelock, 2017, p1243), emerges from the interactions between students' dispositions -himself, his personal characteristics like gender or previous representations on engineering (Atadero et al. 2018) - and the curricular environment of the engineering programme they are enrolled into, including staff, other students, the task they are carrying out and room design. Social interactions, as well as physical environments, indeed affect students' development of their sense of belonging (Scanlon, 2011).

Engineering students will engage in the process according to the experienced value of the programme and its environment, related to their abilities, values, expectations



and representations (Reid et al. 2011). Fowler et al (2018) mention this expectancyvalue framework as key to questioning the impacts of student dispositions on their perception of the curriculum, on their engagement and as key to measuring how engineering identity might develop differently amongst students in the same curriculum (Badets, 2019).

Measuring engineering identity

In literature, we have found studies either aiming at:

- Measuring students' "engineering identity", often in relation to persistence (Patrick et al., 2018; Verdin et al., 2018), using n self-assessed scales of performance, interest and recognition as engineering identity indicators,

- Analysing the influence of one personal factor (often gender) on engineering identity development (Atadero et al. 2018; Chachra et al., 2008),

- Analysing the impacts of classroom design on teaching and learning globally (see next paragraph for references)

- Analysing the influence of a learning environment or curriculum design on a set of engineering skills: PBL and its impacts on interpersonal and cooperation skills (Helmi et al., 2017); technology-enhanced projects and their impacts on communication skills (Bodnar et al., 2017); Room layout on software skills (Rosca D., 2018).

We could notice from the literature review, that no study so far had endeavoured to measure the mutual influences of student dispositions and environmental factors to better understand engineering identity development as a multifactorial process. The tasks is indeed complex, because of the multifactorial aspects of the process. However, focusing on the development of a specific set of engineering skills, as well as on a limited number of personal and environmental factors that may affect this development, seems promising in terms of data streamlining. In terms of methodology, both quantitative and qualitative methodologies have been used in previous studies, but mixed methodologies have permitted to triangulate selfperceived student data with performance evaluations for example, giving more perspective to the data sets. This study will capitalize on such methodological frameworks.

Learning space design and instructional proxemics

Questioning how the physical space of a learning environment is used ("instructional proxemics" in literature: McArthur, 2008), has led to studies on "built pedagogy" (looking into how space can define the way we teach and learn: Luz, 2008), and



"responsive design" (how to adapt the design of environments to the actual needs of teaching and learning: Lippman, 2010).

Built pedagogy advocates (Oblinger, 2006; Graetz, 2006; Beichner, 2014) explain that factors like room design and flexibility affect learners emotionally, thus influencing their engagement, their interactions and overall performance. The concept of sociology of space, or spatial sociology, as Simmel introduced it at the wake of the 20th century, defines how a "dialectical process" is at stake, as "people both construct the socialized space in which they operate and are influenced by this space internally" (Cunningham, 2013, p10), as well as in their interrelations. The field of psychology has also committed to the issue, with studies on the impacts of classroom designs on student engagement (Rands et al. 2017), or more globally on teaching and learning dynamics (Granito & Santana, 2016).

Student-environment interactions and identity development: addressing student diversity

Addressing student diversity is becoming a major field of interest in educational studies. Diversity, as a cultural, ethnic, socioeconomic, gender and/or ability heterogeneity amongst students, is related to questions of underrepresentation, inclusion and non-marginalization of student profiles (Beddoes, 2011; Beddoes et al., 2018; Du & Kolmos, 2009). In a previous study on this school's curriculum and the interactions between PBL, the students 'profiles and their emerging identities, (Badets, 2018; 2019), we noticed that female students tended to express more difficulty dealing with group coordination and to suffer from task allocation dissatisfactions. What is at stake is not only students 'well-being: in the case of engineering education, it is to build a future workforce that does not exclude part of the population. Verdin et al. (2018, p3) express, for example, that "increasing the participation of underrepresented students [...] in engineering plays a central role in sustaining the U.S. research and innovation capacity".

Considering how both learning space design and student-environment interactions affect engineering identity development, it appears that both practitioners and researchers should try to accommodate engineering students' different profiles, to provide meaningful learning to each student. To avoid treating only part of the problem (dealing with gender diversity, but not addressing motivational biases induced by space layout), trying to model the various personal and environmental factors that indeed affect engineering identity development seems an interesting starting point to design curricula that allow all students to thrive and develop their confidence.



RESEARCH PROTOCOL DESIGN

Methodology

Following this literature review, to be able to make recommendations on the types of learning spaces and designs that may or may not foster different types of students' self-efficacy in emerging engineering skills, we have decided to focus on the interrelations between a reduced set of personal and environmental factors that seemed key. The originality of the research design is its intersectionality: it does not focus only on student gender, or on one specific engineering skill.

To set up our research protocol, we proceeded as such:

- 1. First, we determined the engineering identity indicators we would focus on, and how we would measure them,
- 2. Then we chose a limited number of personal and environmental characteristics that may affect this engineering identity development,
- 3. We designed a 3-step protocol, this paper focusing on step 2, as we will explain in the next section.

Choice of engineering identity indicators

In a previous 3-year longitudinal study on engineering identity formation in the context of a PoPBL curriculum (Badets, 2018), we were able to determine that two main engineering skills seemed key to engineering students' development of self-efficacy: organization skills, and interpersonal skills. What is key to their self-efficacy is not only the recognition by their teacher that they master these skills, but their own appreciation that they can "act like engineers" because they are able to manage teamwork, get their projects planned and realized, and their teams working together. Focusing on the following indicators thus seems an interesting starting point: the perceived and recognized acquisition of interpersonal, organisational and creativity skills, and overall student identification to engineering postures. Why add creativity as a key subject? French engineering curricula have recently added this skill as a prerequisite to be a certified engineer, and learning space designers, in the target curriculum, have implemented "Creative Labs", learning spaces intended at reinforcing student cooperation skills, as well as their creative abilities.

How to assess these engineering identity indicators? We have chosen to focus on two types of indicators:

- Indicators students could self-assess like their ability to manage or work with their teammates, plan project tasks, and carry out planned tasks, develop new ideas, etc. They were asked what skills they thought they had acquired during various tasks of the project, and in the different learning spaces that they had used during the project,

and if they felt these skills were acknowledged by instructors. They were also asked what an engineer was to them and if they felt they were able to act like engineers; - Project and deliverable evaluation by instructors, to gather "external" data. In addition to students' self-assessed data, and the external evaluation of the actual skills developed (instructor evaluation), we added in-session observations from the researchers themselves. As we did not want to introduce a bias, with a researcher in the room or spaces during the sessions, students were asked if they agreed to being videotaped during some of their sessions. Four teams agreed (twenty students), which would allow us to compare what students said they felt/experiences, with both their evaluations and a researcher's point of view on the scenes.

Choice of environmental and personal factors

We have decided to focus on personal and environmental factors that previous studies (Badets, 2018; Graetz, 2006) had identified as key to engineering identity development. Three independent environmental variables were selected: room instrumentation (digital resources and tools available), room flexibility (possibility to move furniture, move around, change room layout), and room formality (traditional meeting rooms or classrooms versus "lounge" spaces, with sofas).

Then four independent personal variables were selected: students' gender, their expectations on the programme, their previous experiences (academic and work experiences), as well as their representations on engineering.

We established this shortlist of personal factors both from literature review, as well as from what factors of influence we wanted to look into. Indeed, as a pedagogical advisor in charge of gender equality issues, as well as a researcher, we picked gender to add understanding to implicit biases that seemed at stake in other studies.

Target population and data collection

The target population was a cohort of eighty 4th year students at CESI's projectoriented engineering Master. Fifty-nine students in the cohort actually took part to the study, as answering the questionnaires was not compulsory. Data collection was carried out during a four-week innovation project, where students worked in selfconstituted teams of four to six students. In this project, teams of students have to produce a Business Model for an innovative product of their choice, and will have to hand out three different deliverables (project idea, project added value, Business Model draft) before their Business Model is evaluated during an oral defence, in front of a jury of Innovation experts. The learning objectives of the project range from the ability to present a product concept, to carrying out creativity sessions



autonomously, or performing a usage analysis... During this 4-week project, they were offered:

- Eight hour-long, whole cohort sessions with experts, to introduce them to key innovation processes, intellectual property, Business Models, group creativity or project pitching methodologies,

- Eight hours with an instructor, in small groups of six teams, to help them develop their project and carry out their deliverables (2 hours each week),

- Long stages of team autonomous work, when teams were given the opportunity to either stay in their usual "scale-up" room, with 5 other teams, of book one of six different other spaces in the school's "Creative Lab":



Figure 3 - Usual "scale up" room



Figure 2 - Meeting space



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Figure 5 - semi-private coworking space



Figure 4 - interactive space



Figure 8 - "Lounge" meeting space

As a preliminary to this study, it is important to note that this school of engineering had already implemented active pedagogies and active learning environments, such as « scale-up » rooms, for four years prior to the study. These « student centred, active learning environment[s] with upside down pedagogies » (Beichner et al, 2000), are materialized in this school through rooms with five to six screens (figure 2) and tables that allow teams of students to have their own working space, along with paperboards, to facilitate group work. The six new learning spaces (figures 3 to 8) had been implemented in the school for a few months when the study started, and most students had not yet worked in these spaces, that were designed specifically to develop student cooperation and creativity.

Student were given the opportunity, either in groups or on their own, to try out the learning spaces, and digital tools before the sessions, to get familiar with them. Only a dozen students did come to these training sessions, which is important data to acknowledge, to understand how they actually used and felt in these spaces.

Figure 6 - multimedia space



Implementation

For the sake of reducing bias in this study, we have asked students to give us the following information when they booked the various spaces: a team number, and the task they were carrying out when they booked the space. This would allow us to compare only the experiences of teams carrying the same tasks. Fifty-nine of the cohort's students filled a pre-project questionnaire. The same fifty-nine students answered a post-project questionnaire. The questionnaires contained mainly Likert-type scales. We used statistical analyses (flat sorting, Chi-square correlation tests and Multiple Correspondence Analyses) to analyse and compare data. As we have mentioned, part of their activity was video recorded for activity analysis purposes, but no pre-organized analytical tool was designed for this analysis of the filmed-sequences: these will be used as explanatory or confirmatory elements for the main quantitative study.

A third study, yet to be carried out, will extend this enquiry to another engineering cohort to compare significant factors, with the same protocol, implemented on the same project.

RESULTS AND DISCUSSION

Results

Space use and overall student impressions

Let us, first, mention raw data on space use, and overall student impressions. The most booked spaces were the coworking space (figure 4), with an occupancy rate of 61%, and the "lounge" meeting space (figure 8), with 76% occupancy.

The least booked spaces were the meeting space (41%), the multimedia space (22%), the flexible space (38%), and interactive space (44%). Out of the 16 teams of students carrying out the project, only two teams chose to never use the proposed learning spaces, and stay in the "scale up" rooms. Other teams often navigated between spaces, including the "scale up" rooms.

The overall results indicate that only 2.7 % of the respondents expressed not having used any engineering skills during this project. 77% expressed having marshalled team coordination skills, 72.6% creativity, 60.3% project coordination skills, and, 60.4% interpersonal skills. Only 53.4% of the respondents expressed using leadership or management skills, which means these spaces seem to have fostered « horizontal » interrelations, and a coordination toward a common production, rather that leadership development.



Now, let us look deeper into correspondence analyses, and the mutual influences of personal and environmental factors on the engineering identity indicators we chose.

Student personal characteristics and engineering identity development:

Female students represent 20.3% of the respondents, while they are only 15.6% of the cohort, which already indicates a higher participation of female students in the studies, which was already the case in a previous enquiry (Badets, 2018). Female students tend to get more involved when given the opportunity to express themselves and give feedback on their experience. These respondent female students, even prior to the study, had a different vision and different expectations on their use of the proposed learning spaces. Indeed, they expected significantly more than their male counterparts that the new informal learning spaces would improve group communication (P-value =0.029). This, of course, can be related to female students' tendency, in this curriculum, to suffer from task allocation, and group interrelations significantly more than male students (see previous section on diversity). The actual outcome is that, in the new learning spaces teams used, female students expressed, significantly more than male students, having used coordination skills (Pvalue=0,044). Even before looking into the different impacts of specific learning spaces on both male and female skills self-assessment, we can already state that female students position themselves more than male students as coordinators, and facilitators of group communication.

As far as academic backgrounds are concerned, we noticed that students coming from a more competitive academic background (French « classes préparatoires ») expressed less than other students that they were able to be creative in the more informal and flexible learning environments (p-value=0,004). More familiar with very traditional learning environments, these students would need more time to adjust and feel comfortable and free to be creative in an informal learning space. We can see that informal or innovative spaces are not automatically "better" for every type of students. Built pedagogy should thus take into account students' backgrounds, habits, and resistance to change.

Environmental characteristics and engineering identity development:

In terms of room instrumentation and engineering postures, we expected to confirm that digital tools (screens, interactive tables etc.), would be seen as boosters to student cooperation and interpersonal skills. On the contrary, students expressed that their usual « scale up » spaces (Beichner, 2014, and figure 2), did not allow them to act as engineers as much as the coworking space did (with no digital tool, see figure 4). There might be more than one factor (instrumentation) at stake here, to explain this set of data. These students are used to "scale up" spaces, as they have been using them on a daily basis: the "novelty factor" should be considered to explain how they



experienced spaces such as the coworking area. This does not mean that "scale up" spaces are not suitable to develop engineering self-efficacy, but rather that new, more flexible and informal learning spaces are considered, by a majority of students, to be more suitable. As we have seen, informal spaces were however judged a hindrance to certain types of students in terms of creativity, so all interactions should be considered before assessing that one type of space is or is not more suitable.

Room formality and instrumentation have, for example, had a global impact on how students assessed their creativity (P-value=0,005). « Scale up » rooms, equipped with digital tools, were judged a hindrance to creativity, while "lounge spaces" (informal, non-digital environments) were considered creativity boosters by the majority of students (but not all students, let us repeat this important nuance). This, of course, confirms the previous set of data: instrumentation is not necessarily a self-confidence booster in professional identity development.

Another interesting set of data concerns room flexibility and organisation skills. « Scale up » rooms as well as the « interactive table » (figure 5) were seen as hindrances to project organisation, while students expressed that "lounge spaces" (figure 8) helped them be organised. This came as a surprise, as the interactive table is a project organisation equipment, with specific apps and templates to help students produce and organize ideas in the early stages of their project management. Here, we could gather information from the videotaped sessions. We could notice, from these recorded data, that most teams spent a large amount of time trying to set up the equipment (to log in, find the right file etc.) Some never managed to properly use it. Therefore, organization tools are never automatically helpful and both students and instructors should make sure such tools are mastered properly.

Personal-environmental interactions and professional identity formation

This study allowed us to gather data on specific interrelations between students' characteristics, space design and engineering identity development, that helped us map more precisely what types of spaces may or may not foster certain types of students' self-efficacy.

The « coworking space » (figure 4) was correlated neither to gender, nor to age or background in the way students used or developed their skills. It appears to be the most egalitarian and "diversity friendly" learning space, unlike the « interactive table » (figure 6) where female students reported using more team coordination skills, and male students more management skills. We could interpret this set of data as proof that the use of the interactive space seems to be reinforcing gender stereotyped task allocation, with female students facilitating group coordination, and male students leading the projects. Of course, such statistical data should be triangulated with more qualitative enquiries, and requires to address the issue with the respondents: when male students expressed they developed managerial skills in this space, what does it

mean to them? What types of actions do they label "leadership" or "management"? Moreover, when female students expressed using rather coordination skills, why do they not identify to the label "leader"? As this difference in self-representation is statistically more prevalent in this specific learning environment, rather than in other formal or informal meeting or learning spaces, we might wonder what features in this precise space, can produce such effect: is it the spatial layout, or the group dynamics around the interactive screens? Only an additional qualitative enquiry would help us understand this interaction deeper.

Triangulation with results/performance

Two teams performed particularly well during their final defence and throughout the project. "Team 2" booked five out of six of the new learning spaces throughout the project, sometimes for half-days in a row. They used the different spaces at different times of their project management. "Team 3" spent most of their time in their traditional "scale up" space, using the interactive table and the coworking space once, for an hour and a half, throughout the project. This illustrates perfectly that it is not only about the room. Similarly, it is not only about the students. It is about group dynamics, in a specific setting, carrying out a specific task. Therefore, the interest of such "Creative Labs", or Learning Studios, as similar learning environments are sometimes called, is that they offer the possibility, to different student profiles and different group profiles, to accommodate their type of collaboration.

Similarly, two teams got poor results at their final defence, sometime only collectively, and sometimes both collectively and individually (the students' professional behaviour is graded by instructors for each project). In "team 1", four team members graded poorly for their "professional behaviour". This team never booked any of the proposed new learning environments. This could confirm a poor engagement in the programme, and probably a poor interest in this project. Three of these students failed the final project evaluation. All students in "team 8" failed the project evaluation. This team booked the coworking space twice during the project. So, even if all users of this space expressed that it allowed them to act like engineers and practice efficient project management, this is proof that not all students using this space will automatically develop engineering skills. Lastly, all "team 14" students also failed the project defence. This team booked four different spaces in the last two days of the experiment, which was two days before their defence. We could analyse this set of data as a reminder that frantically trying out new things, including learning spaces, to make a project work, at the last minute, cannot be correlated to skills acquisition or good project management. Space alone cannot account for students' skills development, either self-assessed, or recognized.



DISCUSSION

Learning space design: what about co-design?

The learning spaces implemented were developed to improve group coordination, communication and offer students and teams the possibility to experiment different environments, at different stages of their collaborative project work, to try to foster each individuals' self-efficacy on their professional identity formation. The spaces seem, globally, to be appreciated by the students, and to give most of them a sense of recognition of their emerging skills. However, this seems to be the case mostly for « non-exceptions to the norm » students. Indeed, when looking closer, at underrepresented students like female students, or students with a specific academic background, space use and experience does not correspond to what non underrepresented students express. The bias of these learning environments might be that they were not co-designed with students from different profile-groups. Such codesign enterprise might allow transforming existing spaces into more "diversityfriendly" spaces. For now, students move from one space to another to find the one that suits them and their team the most. Therefore, this experimentation and the recommendations that might emerge from it (about informal, non-digital spaces as self-efficacy boosters for example) are only a first step towards a more inclusive environment.

Understanding biases

Furthermore, the data collected permitted to uncover biases, and interactions between personal and environmental factors in engineering identity development, but did not allow to clearly explicit what specific factors in the different spaces resulted in such biases. This is why the project's next steps will be:

- To use focus groups (either with teams, of with specific profile groups of students), to gather more qualitative data and get more insight into environmental features that affect students the most;

- To carry out the same experimentation with a new cohort of students, to gather more quantitative data and compare cohort results.

CONCLUSION

Engineers are often team leaders, and their communication and interpersonal skills are as important as their technical skills. The need to develop learning spaces where they feel confident to build up these skills is obvious, just like transforming student diversity into a support for all students' professional identity development, is also obvious. However, as this study confirms, diversity is multidimensional and all its facets, meaning all possible interactions of diverse personal characteristics with the physical learning environment, should be addressed and expressed, rather than



overlooked. Instructional designers already endeavour to design learning spaces that are closer to students' needs, but when part of the spaces and tools implemented seem to reinforce group work stereotypes and build up "overrepresented" student's self-efficacy, for example, the question of whose needs, and whose self-efficacy, is at stake should be addressed.

PBL is often presented as a learning environment that is most adapted to a wide variety of student profiles. But we agree with Du et al. (2018) that neither PBL itself, nor flexible, instrumented learning environments are "enough to be used as a recipe" for homogeneous student development in a curriculum. Trying to model studentenvironment interactions and their effects on engineering identity formation has allowed us to pinpoint that the best second option for a more inclusive learning environment, is to give students the opportunity to choose from a variety of room layouts, and to offer underrepresented students the opportunity to express how they develop as future engineers. However, the best option would be to give underrepresented students the opportunity to co-design spaces that do break habits and usual biases, to design diversity-friendly and more inclusive environments.

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HOW SUSTAINABLE DEVELOPMENT STRATEGIES ARE IMPLEMENTED IN HIGHER EDUCATION DEVELOPMENT?

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ABSTRACT

Since 2015 UN's sustainable development goals (SDGs) as a part of the 2030 Agenda for sustainable development has been accepted as a global and common act for solving the wicked problems of the planet Earth. UN member states have had the responsibility of the national implementation of the 2030 Agenda and SDGs. Education for sustainable development (ESD) has been the means to implement SD aims into actions since the 1990s'. Educational institutions have a focal role in the implementation of the 2030 Agenda and SDGs through education. This paper presents a co-creative workshop held in two different educational contexts aiming at finding answers to how SDGs in higher education development. The workshop goal was to find out how SDGs exist and are visible in the daily work of higher education teachers and educational development. SD, only a few concrete examples of daily educational actions could be addressed by the workshop participants.

INTRODUCTION

For a long time, education for sustainable development (ESD) has been recognised to be one of the key fostering elements in the implementation of sustainable development (SD) in societies. In 2015, United Nations (UN) member states contracted to work even further in solving the global challenges of SD through the 2030 Agenda for sustainable development including sustainable development goals (SDGs) (UN, 2015). The UN member states have the responsibility of the national implementation of SDGs into educational objectives and learning outcomes



(e.g. implementation of ESD in Finland Rohweder & Virtanen, 2008 and SDGs in Finland Valtioneuvoston kanslia, 2017).

Higher education institutions (HEIs) have a focal role in the implementation process through the education of future professionals. Even if HEIs have had an important role in the ESD for a long time, the national implementation of the 2030 Agenda has brought sustainable development aims to an even more prominent position in HEIs strategies recently.

The way from a strategic aim to concrete action and change in human behaviour is, of course, the question of the effective implementation of the SDGs. In addition, the quality of the implementation of SDGs is essential. In the beginning, starting from the 1990s' implementing SD issues in education was visible mostly in teaching contents. Today the practical implementation should be visible in learning contents of curricula, pedagogical approaches, and learning environments, learning outcomes (student competencies) and societal transformation (UNESCO, 2014; UNESCO 2017).

UNESCO (2017) SDG learning objectives is a clear and comprehensive document and tool including examples for fostering understanding of the implementation of the SDGs in education. The chance from a content-based approach to learning to a competency-based approach to learning is the primary pedagogical premise.

Even though the topic of this paper is an extremely hot topic worldwide now, less discussion is going on about the actual grass-roots level state of the implementation of SDGs in HEIs among teaching staff and educational developers.

Prior research of the implementation of SDGs exists on how policy documents and HEI curricula include SD themes or SDGs (e.g. Albareda-Tiana, Vidal-Raméntol & Fernández-Morilla, 2018; Farinha, Azeiteiro & Caeiro, 2018; Friman, Schreiber, Syrjänen, Kokkonen, Mutanen & Salminen, 2018). However, the implementation of curricula and its SDG learning objectives into pedagogic actions in actual teaching and learning activities is a crucial point in reaching the objectives of the 2030 Agenda and SDGs.

The prior research by Sinakou, Boeve-de Pauw, Goossens & Van Petegem (2018) shows as well that the dimensions of SD (environmental, social and economic) are not understood holistically. Academics typically use them separately without a systemic understanding of the phenomenon.

It has been recognised that the implementation is not a straightforward process but have a need for a profound discussion among the actors (Dlouhá & Pospíšilová, 2018).

In this paper, I present the idea of a co-creative workshop aiming at reflecting the concrete implementation of SDGs at HEIs. This workshop was developed to study the experiences of teaching staff and educational developers in the implementation of the SDGs in their institutions. The goal was to help the workshop participants to understand different viewpoints of ESD and evaluate the status of the implementation of the SDGs by reflecting the actual evidence and visibility of them in the daily teaching and learning activities of the home institution.

BACKGROUND

The idea of the workshop arose from the discussion with my educational developer colleagues from different higher education institutions about how SD was seen in the HEI strategies and how they saw that the strategies were implemented in their organisations. In this discussion, we all recognised that SD, the 2030 Agenda and SDGs were mentioned in the strategies or in the strategic discourse and communication of the institutions. Commonly, SD issues had gained more focus recently.

In the discussion with the colleagues, we agreed easily that SD is visible in the official instructions and documents of HEIs but it was found unsure, how the statements were implemented and visible in the daily educational practices, it is in learning and teaching activities. In addition and one-step further, we raised a question on how this all should be visible in the work of educational developers.

Implementation of SDGs in HEIs is about turning SDGs into learning objectives and competences (UNESCO, 2017) As importantly, it is an issue of working culture enhancement, in which the overall co-creation competence of the HEI community (staff and students) is crucial. The first step in evaluating the accomplishments of the SDG implementation is the overall awareness of the community members of the SDGs.

In this paper and in planning the workshop I have used the idea of ESD as defined by Thakran (2015) to underline the importance of seeing ESD comprehensively. According to Thakran (2015) "Education for sustainable development has come to be seen as a process of learning how to make decisions that consider the long term future of the economy, ecology and social well-being of all communities".

WORKSHOP AS A METHOD OF ACTIVE CO-CREATION

The workshop aimed to find out what is the grass-roots level phase of implementation of SDGs in HEIs among teaching staff and educational developers.



The idea was to find out the level of pedagogical discourse in HEIs around SD issues, SDGs and 2030 Agenda.

My assumption for the implementation of SD issues and SDGs in HEIs is that they are firstly implemented in the curricula as course learning contents or further as student competencies depending on the pedagogical approach of the HEI and its curricula. Besides, I was even more interested to find out if there exist more advanced and holistic ways of implementing SDGs such as activities involving the whole community (students, teaching and other staff members, interest groups).

Hence, the aim of the workshop was to hear the voices and experiences of HEI teachers and educational developers. The method of a co-creative workshop was used to discuss and reflect on how SDGs and SD goals are visible in their daily educational practices.

The second aim of the workshop was to evaluate how sustainable development strategies and goals of HE institutions are used and implemented in educational development work since the pedagogical approach of the institution is crucial in SDG implementation.

The workshop was designed to be implemented in two different context: national and international contexts. I assumed that the results of the workshop could be different depending on a possibly different pedagogical approaches applied in different countries.

Due to the large amount of the SD documentation of UN, UNECE and UNESCO, the workshop was designed to be based on the documents of the 2030 Agenda and the SDGs illustration.

The working method of the workshop consisted of a "learning café" group work. The workshop is based on active co-creation, peer-group work and joint knowledge building.

In this kind of group work, the participants are divided into several small groups. The workshop facilitator presents questions related to the workshop theme. The questions are discussed within the small groups, each of the groups having its question. After a certain period (e.g. 10 min), the small group members except the one chosen as a group leader, leave the task and move to the next groups questions. Then again, the groups start the discussion with the questions of the former group. The idea of the group leader is to present shortly the discussion of the former group so that the new group can start to construct new knowledge based on the other group's ideas. In the end, all the attendees have had a possibility to participate actively in the discussion and the construction of the new knowledge. After the last



round, the results of the groups are shortly presented for all by the group leaders for common conclusions.

Workshop in the local context

The workshop in the local context was arranged in a national pedagogical seminar for educational developers, in spring 2019 in Finland. Participants were mostly educational developers, which are pedagogical experts working in faculties among teaching staff for example in pedagogical training, enhancement projects, etc.

Group work questions

The questions for the groups were as follows

- 1. What is SD in educational development from the point of view of environmental sustainability? How SDGs are visible in your daily work in enhancing pedagogy and teaching and learning environments?
- 2. What is SD in educational development from the point of view of social sustainability? How SDGs are visible in your daily work in enhancing pedagogy and teaching and learning environments?
- 3. What is SD in educational development from the point of view of economic sustainability? How SDGs are visible in your daily work in enhancing pedagogy and teaching and learning environments?

Workshop outcome

Firstly, the participant felt that the questions were difficult and they had challenges to understand the idea of the questions. That is why we spent time to discuss about ESD and its dimensions (learning content, pedagogy and learning environments, learning outcomes, societal transformation). The discussion facilitated the working in a way that the participants could think over examples other than SD as learning contents.

It was visible that some of dimensions of SD were more difficult to discuss than others. In the local workshop, the participants could present examples of SD dimensions more easily from the viewpoint of environmental and economic sustainability than social sustainability point of view.

The examples of SD or SDGs were connected to course implementations were SD issues are designed as learning outcomes or learning contents using typically projectbased learning as a pedagogical approach.



A few examples of institutional level implementation of SD and SDGs were presented as institutional instruction for example in recycling and energy saving.

During the joint discussion, in the end, the participants shared the principal and overall feeling that the group work was difficult mostly due to the lack of prior discussion about the concrete implementation of SD or SDGs at the own institution.

Workshop in EAPRIL 2019 conference

For the EAPRIL workshop, the questions were slightly changed due to my experiences of the workshop in the local context. The questions were designed more clearly and concretely to SDGs and their implementation.

Unfortunately, the workshop at EAPRIL had only little participants. For this reason, the workshop progress was not possible to be implemented as it was planned but anyhow it was carried out as applied for the small number of participants. The participants were teachers, educational developers, and administrative staff.

Group work questions

The questions for the groups were as follows

- 1. How sustainable development strategies (SDS) and goals (SDG) of HE institutions can be seen in daily educational practices?
- 2. How sustainable development strategies (SDS) and goals (SDG) of HE institutions can be seen in educational development?

In the EAPRIL conference, "the learning café" had three different viewpoints from which the questions given were discussed. The viewpoints were the dimensions of SD: social, economic and environmental sustainability.

Workshop outcome

Due to a few numbers of participants, the workshop was carried out as a joint group discussion so that all the viewpoints of the workshop questions were discussed at the same time as one joint dialogue.

The discussion in the workshop started slowly, which I interpreted, as the participants did not have participated in such discussions in their own institutions or that the institutions did not have had such discussions at all. Therefore, in the



beginning, it was not easy for the participants to find concrete examples of the implementation of the SDGs.

To my surprise, I quite soon realised during the discussion that not all of the participants were familiar with the SDGs at all and have not seen the SDGs illustration before. Therefore, we spent time discussing the aim of the 2030 Agenda and SDGs thoroughly starting from the basics.

After the slow start, the participants started to find examples and reflect on SD issues in their institution. The majority of the implementation examples of the participants were from a single course implementation perspective, it is how SD issues were implemented in the curricula as separate courses for the interested students. Typically, courses were multidisciplinary course implementation around some SD issues, for example, voluntary work or recycling problem-solving. Typically, the examples of the courses including SD themes or meeting some of SDGs were elective courses for students to be added to their own degree programme studies.

REFLECTIONS

The principal reflection from both of the workshops and the fact that was surprising to me was that the sustainable development goals and the 2030 Agenda was not well recognised among the workshop participants. The question of the implementation of SDGs was difficult for the participants. Many of them elaborated that SD or SDGs are not concretely connected to their daily work or they have not participated in such discussions in their institution. How I interpret, this result is that I believe that sustainable development strategies and the systematic implementation of SDGs are still in the starting phase at HEIs. SD plans start to be built in the HEIs as well as very good examples of ESD but it has not reached the level of common, shared and concrete understanding of the whole community. For the successful implementation of SDGs time for joint reflection is a must.

In both of the workshops, the participants could easily spot sustainable development as a learning content in the curricula. The typical concrete implementation example was sustainable development courses, which are offered as optional courses, separate from the degree programme studies for such students that are interested in the topic. No example of a more holistic view, for example, discussion on sustainable development competences or a degree programme level approach of implementing SDGs was presented.

As a result of these workshops, it seems that SDGs and their concrete implementation has remained unclear for teaching staff and educational developers at HEIs. This does not mean that there are not such SD activities in the HEIs, but it



shows that more joint discussion inside the institutions is needed to put sustainable development strategies in action.

In addition, it is of utmost importance that SD and SDGs are not left outside the obligatory learning outcomes of the degree programmes as elective studies. In this case, SD competencies of the students depend on the student's own motivation.

From the experience of these workshops, I suggest that more joint discussion of the 2030 Agenda and SDGs should be conducted at HEIs. The discussion should involve the whole community being students, staff as well as interest groups. More grass-roots level actions should be invented to involve the HEI community members in a way that they find the connection between SDGs and their educational efforts. An excellent tool for concretising SDGs is the UNESCO SDG learning objectives. The discussion has to be concrete and not only at an abstract strategic discourse level.

Today people have a volition towards sustainable development and have personal goals in their way of living. However, the change in HEIs requires durable educational development, pedagogical change and a strong understanding in developing a competency-based approach to learning and teaching. It is about a learning process for all, students, and staff as well as for the interest groups.

To develop this workshop further I suggest that the starting level of the participants, meaning the awareness of SD, the 2030 Agenda and SDGs should be identified at the beginning of the group work. In addition, the workshop surely benefits from the questions that are concrete and on the right level of the SD knowledge and competence of the participants.

It is necessary to emphasise that the results of these workshops present a very small sample of HEI teachers and educational developers. Nevertheless, the participants of such educational development seminars and practitioner research conferences are commonly active experts in education and educational development.

The method of the workshop presented in this paper may be useful and can be used in HEIs as a tool for implementing SDGs and as a starting point of a joint discussion.

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THE ESCAPE GAME: A TOOL TO FOSTER STUDENT CREATIVITY

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ABSTRACT

The 21st century is one of evolution and change. The impact on education is now being felt at all levels and concerns students of all ages. Keeping in mind the changing skills set that industry expects from graduates, one that includes competencies such as creativity, flexibility, and critical thinking, it behoves educators to find ways to innovate in their classrooms in order to develop such skills. Drawing on experiential learning and principles of gamification an ongoing mixedmethod's project is currently evaluating the use of an interactive exercise as a way to impact student engagement and motivation as well as examining the creative processes brought into play and the emotions felt by the participants. An escape game was designed specifically for final-year Masters students (n=10) in answer to these objectives. An in-depth analysis was carried out using a variety of methods from observation to text analysis. Both quantitative and qualitative results support a positive relationship between motivation to learn, creativity, and emotions felt. This paper presents an in depth analysis of the qualitative results alone. Quantitative results will be published subsequently. Findings are discussed in terms of innovative classroom practice and will be of interest to educators, instructional designers and programme directors alike.

INTRODUCTION

Educational paradigms are currently undergoing change and this due to several factors. Two of these, and not the least of which, are ease of access to information



and the evolving time-distance conundrm. Additionally the skill sets that are now in demand are different from before, including many more soft skills such as creativity, collaboration and problem-solving (World_Economic_Forum, 2016). Not only does industry recognize a need for such skills but the next PISA administration will also be looking to assess "flexibility in thinking and habits of creativity" (Anderson, 2019, p. 3).

A major implication of these factors concerns the role of educator who, more than ever before, needs to provide value to the learning experience through orchestrating the course delivery in a manner so as to actively involve the students. Without entering into the intrinsic versus extrinsic motivation debate, the onus, in the Western European higher education classroom, is largely on the shoulders of the educator. Although less to motivate the students but rather to create conditions under which the student is motivated on their own (Mishra & Kotecha, 2017) and provoke the kind of engagement that will result in learning.

Here we touch on experiential learning theory (Mandeville, 1998, 2001, 2004) or "active learning where the learning is a student-centred activity" (Banfield & Wilkerson, 2014, p. 291). This in turn has led us to examine a subset of experiential learning which is gamification. Here one finds the use of game elements in non-game settings (Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011) in order to engage, motivate, encourage problem-solving and learning (Kapp, 2012). Game theory also provides insight into student perceptions (Barata, Gama, Jorge, & Gonçalves, 2013; Cheong, Filippou, & Cheong, 2014), on how their participation might be improved.

Within the realm of games, one finds serious games, simulations and more recently classroom escape rooms. The practice-based research presented in this paper looks specifically at the development and implementation of an escape room in answer to some of the afore-mentioned challenges.

LITERATURE REVIEW

This research is at a crossroads between the development of skills such as creativity and divergent thinking and the use of innovative techniques in the classroom. Accordingly we have drawn upon two bodies of literature. The following sections provide a brief review of creativity and gamification.

Creativity

Creativity is a subject widely discussed by a large number of disciplines. It touches on many different fields such as psychology, art, personal development, business management, etc. Creativity is a very broad concept and cannot be restricted to a single definition. Depending on the discipline and its theories, there are many definitions in the field of psychology (Guilford, 1950; Sternberg & Lubart, 1995,



1996; Torrance, 1972). This research refers to Lubart's (2003) and (Sternberg & Lubart, 1999) multivariate approach to creativity for its theoretical framework. The evolving nature of teaching and learning paradigms coupled with changing demands on the graduate skill set, makes Lubart's model, which advocates the development of creativity and flexibility, particularly pertinent.

According to Lubart's multivariate approach, creativity is defined as "the ability to achieve production that is both new and appropriate to the context in which it occurs" (Lubart, Mouchiroud, Tordjam, & Zenasni, 2015, p. 10). In this approach, creativity is seen as a combination of four factors: cognitive, conative, emotional and environmental factors. Cognitive factors refer to the intellectual abilities that facilitate and influence creative thinking; conative include personality traits and motivation. Moreover, the emotions influence creativity in different ways depending on their status. Finally, environmental factors such as school, family, cultural and social backgrounds and new technologies influence the creativity. In this representation, creativity, like any other cognitive skill, can be stimulated and evaluated: due to the fact that there are several components that influence the realisation of creative potential. In education, creativity is seen as a perspective for improving student performance. As such, Craft (2005) emphasizes the importance of promoting creative learning to merge and assemble the knowledge.

Creativity is also increasingly present in both academic curricula and in students' training (Capron Puozzo, 2016a). In order to allow students to exercise cross-curricular skills (Coppey Grange, Moody, & Darbellay, 2016) such as critical and divergent thinking and creativity, the educator's approach to teaching and learning needs to be innovative if not different. By training student teachers, as in our sample population, in methods of creativity, they in turn will be better able to develop such skills in their students.

Encouraging creativity in a school context can refer to various performances that would be proposed in class (Capron Puozzo, 2016b) such as the production of texts or songs, choreographies or sketches. As Rey and Feyfant (2014) state, "creativity is often associated with innovation, whether at the level of the system, the educational institution or the individual" (p. 1). In this sense, it is necessary to integrate creativity into the learning process. The latter consists in implementing learning methods with the aim of stimulating the learner's creativity by inviting him/her to use his/her imagination.

For the development of creativity amongst students one must address the question of how best to do this. This project chose the path of games.

GAMIFICATION

The use of games in learning is age old with the more recent game-related literature having its roots in the pedagogical concepts of constructivism of the 1980's and 1990's and closely related to experiential learning theory (Kolb, 1984). The concept of gamification, sometimes still incorrectly referred to as Game-Based Learning (GBL) (Caponetto, Earp, & Ott, undated) has now come into its own. As can be seen in the publication of several comprehensive reviews of both the research and the academic literature (Caponetto et al., undated; Huang & Soman, 2013) there is no longer any real doubt that the gamification of education is making its way into mainstream learning. Its use is in line with the 21st century push towards learner-centred education.

The definition of gamification used here is taken from Deterding et al. (2011) where "Gamification is the use of game design elements in non-game contexts" (p. 10). In order to understand the context, one must first see what is meant by "game". According to Deterding, Dixon, et al. (2011) game studies distinguish between "gaming" and "playing" with the former being considerably more structured versus the latter which remains exploratory and with little or no restrictions.

As Salen and Zimmermann point out (2004) "the real domain of game design is the aesthetics of interactive systems. Even before computers existed, creating games meant designing dynamic systems for players to inhabit. Every game, from Rock-Paper-Scissors to The Sims and beyond is a space of possibility that the players explore. Defining this space is the collaborative work of the game design process" (p. 2). Such learningscapes may be in either virtual or physical worlds.

Finally, although there is little empirical evidence on concrete benefits of using games in education there are clear links with an improvement in student participation and motivation. Games can be seen to provide challenge which can prevent students "from becoming bored or frustrated and allows them to experience flow" (Barata et al., 2013, p. 1). This can be linked to the idea that the participants "inhabit" the time/space of the game.

One option within the panoply of game designs available to educators desirous of integrating game elements in their teaching is the use of escape rooms. Following the successful introduction of a video escape game in 2004 in Japan by Toshimitsu Takagi (Lock Academy, undated), it was only a matter of time before a live escape room also in Japan and in 2007 was made available to the public. The use of escape rooms took on and in the past ten years has made its way around the world. Originally considered a leisure activity, escape rooms have now made their way into education and are now used as a pedagogical tool from primary through to higher education.

All escape rooms, whether in or out of the classroom, follow "the principles of gamification wherein the features of games (e.g. rules, challenges, immediate feedback, permission to fail) are applied in contexts normally not associated with games and play" (Carrion et al., July 2018). Such activities are generally carried out with several teams and can a variety of objectives from fun and games to collaboration and teamwork (Zhang et al 2018), the exercise or development of soft skills (Clarke et al, 2017), or even for exam preparation (Carrion et al., July 2018; Vörös & Sarkozi, 2017).

Given the versatility of an escape room it seemed an obvious choice for this project. The research focused on the student's perception of the use of an escape game as a pedagogical tool. Our main research question was "To what extent is an escape game a creative exercise".

The objectives behind the use of an escape game use were two-fold, on the one-hand strictly pedagogical and on the other research-oriented:

- 1. to increase both student engagement and motivation through the use of an escape game focussed on the development of a literature review and;
- 2. to see what emotions the students themselves identified during the exercise;
- 3. to get feedback on the student's perception of the escape game activity.

METHODOLOGY

The field was a College of Teacher Education. Participants in the research comprised students (n=10) on a master's degree course for secondary school teachers. Three students were female and seven were male (mean age=28,6; sd=2,22; span=23-31). An escape game was developed for use within the scope of an elective course on creativity development. The choice of an escape game was to allow the integration of game elements in the course delivery with the learning outcomes being:

- the exercise of critical and divergent thinking in a creative manner;
- a hands-on creative learning experience that teachers in training could later adapt for their own practice.

The game itself was created to include three main educational objectives: appropriation of theory, literature analysis, and concept association. The resources at hand included access to the entire Teacher College building, sufficient staff resources to accompany the student teams, technical support for the filming of all the student teams as well as containers and locks for the game. In terms of puzzle path design, a linear path, which calls for the solving of the first puzzle in order to proceed to the second and so on, was chosen. This provides a more guided experience, is easier to design (Wiemker, Elumir, & Clare, 2015) and works well with small groups promoting collaboration amongst team members as they all work



on the same puzzles together. In order that each team, three in all, could work simultaneously, three different scenarios were developed. Each scenario had a variety of puzzles and different types of hints were used.

This paper presents selected qualitative findings. Quantitative analysis based on the Creative Process Report Diary (Botella, Nelson, & Zenasni, 2017) is currently ongoing and will be published subsequently.

Throughout the semester students were invited at the end of each creative activity, only one of which was the escape room exercise, to keep a record of their experience in their course diaries. The qualitative findings discussed below are based on student records of how they perceived the experience in terms of learning and emotions felt.

Qualitative methods of analysis (Miles & Hubermann, 2003) were drawn upon for the diary analysis and observation and included:

- 1. the coding of student course diaries;
- 2. triangulation (Tashakkori & Teddlie, 2003) through observation and filming of the student participation in the escape game;

Complementary to the above was an in-class debriefing session for which notes were taken.

The game itself was conducted during regular class time. Three student groups worked on different scenarios which drew on required reading texts in a novel manner calling for students to be creative in their search for solutions to the puzzles.

FINDINGS

In response to our main question, the qualitative course diary results show that students were unanimous in their evaluation of the escape room exercise as a creative way of learning and felt positively about their experience. The debriefing with the students that took place immediately following the exercise was in line with this and will be further developed in the discussion.

- Objective 1 was to impact student engagement and motivation. The results, as shown through the observation and filming as well as through course diary analysis, were positive.
- Objective 2 allowed for the identification of the emotions felt by the students during the exercise. The most pertinent were: curiosity, enthusiasm, pleasure, and frustration.
- Objective 3 provided feedback on students perception about the escape game activity.



The course diaries have allowed us to illustrate students' perception about this creative activity. From the questions asked to participants (i.e. "What emotion(s) did you feel during the creative experience ? "; "Free comments about the activity ?"), we chose to code the word or phrase by inferring the category of their perception, if it was not explicitly named, based on the lexicon used as well as the wording of the phrase, which could show students' engagement and motivation in activity, interest, critical posture, emotions felt).

In this type of case, the coding is explanatory (Miles & Huberman, 2003) (see Table 1 below for a detailed verbatims).

In the coding, it appears that the participants report positive statements such as enthusiasm, excitement and motivation about Escape game. Interestingly, participants have identified these statements at the beginning of the creative process experienced.

Most participants find that practicing of this creative activity was a good idea. They have also noted this activity useful as a pedagogical tool in the classroom. Emotions felt identified include: joy, curiosity, enthusiasm and pleasure Nevertheless, some participants were critical of the proposed activity and expressed disappointment and demotivation, especially at the end of the activities. In addition, some of the participants felt frustrated during this activity.

 Table 1. Students' perception about Escape game

Engagement and motivation:

- "I was motivated and enthusiastic about doing the activity. The challenge of solving puzzles is very exciting."
- "I was very excited. I loved it. I wanted to go faster, run, etc. Sometimes I was a bit afraid to be wrong, but at the end I had some good ideas."
- "Excitement at the beginning of doing an escape room, slight disappointment at not being stuck in a room "escape room.""

Positive perception (Interest):

- "A creative way to bring material to a student."
- "Otherwise, the TOP idea! Thanks for the commitment." // "It was a very good idea."



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- "Do it again!" ... Do you have any resources for history and geography?"

Negative perception (Critical posture - evaluation): - "Annoyance "

- "Disappointment with the word imagination" Boring towards the end."

- "At first I was very enthusiastic but then after having struggled with 3 enigmas, I felt demotivated. The riddles seem a little rough to me."

Emotions:

"Joy"; "Pleasure"; "Curiosity", "Frustration at the end"; "Anger".

DISCUSSION

This research takes up the challenge of integrating creativity in educative practice through exposure to such practices in the realm of teacher-education with the goal of their being duplicated in the classrooms, present or future, of those involved.

In terms of engagement and motivation the results support the use of an escape game, in other words, experiential learning, to create optimal learning situations in which students are engaged. Not only was the written diary feedback positive but the observation and preliminary film analysis confirmed the high degree to which the participants were involved.

The feedback obtained during the debriefing went considerably further than the students' perception of the activity as noted in their diaries. As seen above the perception reported was both positive and negative. Students explained that they found this activity useful for their teaching practice: "A creative way to bring material to a student."; "It was a very good idea."; "Do it again!"... "Do you have any resources for history and geography?". However, some of the participants provided a more critical evaluation of the Escape game experience: "At first I was very enthusiastic but then after having struggled with 3 puzzles, I felt demotivated. The puzzles seemes a little rough to me."; "Disappointment with the word imagination" ... "Boring towards the end." These statements referred not only to the



context in which the exercise took place but also to the experience of the creative process. The results of this study show that, overall, this creative activity was appreciated by future teachers who chose to participate in the module. It is also shown that positive emotions were particularly intense during the escape room activity. Although participants felt in particular enthusiasm and pleasure, to a certain extent frustration and disappointment where also felt during the exercise.

CONCLUSION

Educators, more than ever, need to respond to both the demands of students as well as those of society. Teacher educators are at the forefront and need to be cutting edge in their course delivery. This research goes the distance by integrating competence acquisition through experiential learning providing participants with the kind of tool that will allow them to go confidently into the future as it will have a positive impact on their educators need to bring added value to their lessons if they want to have motivated students. Pushing students to develop the skills they will need in their professional lives without teaching them the skills but by allowing them to discover and experiment themselves is one such value-adding option.

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TO OBTAIN A NETWORK OF COMPANIES FOR HIGH SCHOOLS TO ENRICH SCIENCE EDUCATION

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ABSTRACT

This summary is composed by two separate and complementary products of research. A network of companies is only useful if the school is able to connect it to its education programme. Both part of this article are focused on this perspective. The first part of the article is a very practical narrative, based on seven years' of research and intense experience in connecting industry partners with high schools. It addresses the challenges that networkers as entrepreneurs have to overcome to build this network. The second part of this article is a literature study on the interpreneurship of the teacher connector. It makes a connection between the insights of Teacher Leadership and the networkers facilitation within the school. This pursuit began when a pupil posed the question, "Why should I learn this?". The author realised she couldn't provide the right answer because a lack of knowledge about the technical work field, so she sought out to learn all that she could in these areas, finding a job that allowed her to connect local companies to high school programs. After seven years in this role, a summary was composed and reviewed by colleagues that were tasked with a similar mission; this collaboration helped solidify the findings of this summary. She also experienced that building a solid network does not immediate lead towards a valuable connection within the educational programme of the school. The insights gained from teacher leadership literature provided a useful insight in conditions for success.

HOW TO BUILD A NETWORK AND TO KEEP IT

The development of a network of companies for a High School is not complicated, but can be more effective if you are well prepared. This summary is to serve as a guide through the authors successes and failures in the pursuit of partnering up local industry with High School programs; a direct result of this is a detailed account of things that worked well, and others that did not. The subject of this summary are:



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- Awareness of what you want to accomplish
- What's in it for them?
- Networking takes time and effort
- Cultural differences
- Ownership
- To prepare for collaboration
- First contact
- Be realistic

The chapters are enriched with the experiences of teachers, company members and experienced networkers.

Awareness of what you want to accomplish

Before starting a collaboration between a company and a school, it is important that you have a clear mission that you want to obtain. For a one-time-only activity the company expects that the school has a clear question about what the company should deliver. If the school wants to work towards a long term collaboration, it's more wise to have a clear mission about the added value of companies for the educational programme. This mission should be presentable within an elevator pitch, which the company will use that to make a decision whether or not the collaboration is a good fit. It's important that this mission is embraced by the school administration, teachers and parents, because there are always moments when a collaboration is tested. In these moments, it's important that colleagues are in line, and consistent in their actions. Therefore it's also important to recommended that the company and the school work together to translate the mission into a vision. This vision can be underlined with an agreement that will be evaluated and updated every few years. This will result in a more flexible form for the collaboration and a chance to learn from earlier experiences to become more effective in what both parties want to accomplish.

"Teachers have to be pointed to the positive consequences of making education together with companies. It's a way to make their education more updated and motivating for pupils. That's why it's smart to visit the company with a small group of teachers, so they can see how the collaboration can result in concrete products and the mutual expectations can be brought up." Alida Luteyn, Manager of Heerbeeck Transfer Office



What's in it for them?

The motivation for companies to collaborate with local High Schools is universal: grow the talent needed in your own area. Depending on the size of the company, the size of the region is delineated. A multinational will define the region as nationwide and small companies will define the region as the local community, though there can be exceptions to this. Small local companies sometimes have a more broad focus because of production facilities in several countries or selling their products all over the world, than to be expected from the outside. Or they look for very specialized workforces, so they need to look abroad. On the other hand, multinationals don't always see the benefits to invest in young children because the effect might be too small for them for the long term. In this situation they often choose for vocational education to invest.

The second reason for companies to collaborate with schools is because these professionals are also parents, parents with an opinion about the educational programme at High Schools. The author noticed that there is no direct correlation between being successful at High School and being a successful entrepreneur. The cases in with the company owner or member had a tough time during school, the motivation of this person is very strong and they want to be strongly involved in the educational experience that will be developed. So there is a complex balance between what the company wants to offer and what the school wants to receive. It's rather often that the ambition of the company is larger than the ambition of the High School. So it's very important to be very clear about mutual expectations.

Networking takes time and effort

Building a network takes time. Creating a broad network is an investment of years and it's important that the network is to be maintained. The most effective way to build-up a network is to organise a big event for with you need a little effort of many companies. These companies can be found in the present warm contact of school members, like parents of pupils, family and friends of colleagues and so on. The evaluation of this event is a fine start to talk further about the benefits of collaboration. Yearly events are useful to maintain the contact with the network. Besides that, it's important that the High School is approachable. Teachers spend most of their days within the classrooms, so they won't be able to answer telephone calls and emails very quickly. Therefore it's important to think this over beforehand.

In addition to locating suitable industry partners, it is very important that the school is addressed as a serious partner to collaborate with. The school must be present at

important network meetings to be seen as a member of the local community. So the task for building a network for a High School should not be just another teachers task. It's not just organizing an event, but it's also a task with a lot of impact on the educational programme and therefore very enwoven with the activities of all the teachers. It needs a strong support from school administration and good facilitation.

"To build a network takes a lot of time. You have to go to network meetings to meet people and get acquainted. Than you can find out which companies might bring added value for your High School." Ellis van Kemenade, Teacher Christiaan Huygens Lyceum

Cultural differences

If you look closely to the failures within school and industry partnerships, it appears that there are a lot of cultural differences between companies and schools. Those cultures influence the expectations of both parties. The expectations therefore must stay implicit. Companies exist by the quality of being proactive and assertive on questions and needs. So if a school asks a question, they are often willing to get into action. Schools on the other hand, are used to long-term processes. And besides that, a teacher doesn't need intensive collaboration for the execution of the primary process of teaching. In companies it's more often that people are strongly dependent on each other for success. So there are different mind-sets. The ownership of the collaboration though lies within the school. They are the case holders, but do respond slower than companies expect and handle sometimes with a different feeling of urgency. The companies want to help, but the slow forward movement within the school's bureaucracy often frustrates industry partners.

Asking for someone's help is very common in the business sector. There is less discomfiture to "use" someone to get things done for one selves, because it's just clear that you can return the favour. Teachers often feel more embarrassment to ask for favour or support.

"To connect my colleagues with a collaboration is quite a challenge. A lot of teachers think its troublesome to communicate in a correct way with companies. Especially those teachers who don't have experiences with business as an employee." Ellis van Kemenade, teacher at Christiaan Huygens Lyceum.

"It's important that school communicate effectively, to get to the point. They have to be realistic about the fact that all we do to support school are extra to the daily routine and responsibilities we have. Effectiveness in communication and a clear case holder to contact with will succeed or break the collaboration. Make sure that



in forehand there is a meeting agenda, that there will be meeting minutes with an action list." Sander van Asten, employee of Vencomatic group.

Ownership

The ownership within the collaboration does strongly depend on the type of collaboration that is organised. If the High School takes the initiative to collaborate, the ownership will be at the school. So the school will have to take the lead. Although this seems obvious, it is often overlooked by school administration. this process gets more complex if the initiative to start a collaboration between a High School and a company is provoked by an organization. There are a lot of platforms within the Netherlands that supports and initiates this kind of collaboration. Mostly with the mission to encourage children to choose a career path leading to technology-based jobs. For this situation schools and companies are asked to join a project or programme. Then the ownership for this collaboration lies with these organisations. Actually, the case holder is the branch of industry who is dealing with a lack of future talent. They are the owners of the problem. But the solutions must come from the schools. Within these cases a good collaboration can only arise if the company and the school embrace the branches problem en feel the ownership together. But more often this will result in a non-committal participation of the school. They will stay connected as long as the activities ensue expectations, pupils appreciate the experience and it takes not too much effort to join.

"I'm often confronted with schools who ask if every student should find a career within the technical sector? No, it's about broad talent development, but the technology is always an important part of this development, no matter what your profession will be." Lianne van den Wittenboer, Jet-Net coordinator Noord-Brabant.

To prepare for collaboration

Before contacting a company it is important to know what the core business of the company is. Most companies are not simply business-to-consumer organizations, but are a conglomeration of many supporting entities. They deliver business-to-business functions. For schools this world of business-to-business is less obvious to understand. The author experienced this several times when dealing with trade organizations. They don't always have highly educated technicians that can educate pupils about the process of development and production. Something along the lines of "the first connection proved to be out of alignment to the purpose at hand. If more research was carried out on the onslaught, this could have been avoided. It is

important to know who you are going to meet, and what functions are carried out by the department or individual, because different positions do have different perspectives and expectations for a future collaboration. Someone from Human Resources Management has another mindset than a director Research and Development. HRM often thinks in terms of exposure for the company as future career options and R&D often want to develop thinking skills and knowledge for pupils. For teachers it's not always clear what the position titles stand for. Some desk research is necessary before the contacting takes place.

First contact

The size of the company is very prescribing for the most effective way to make the first connection. For small companies, with about twenty employees, the manager director is an effective start. For middle-sized companies, with less than five-hundred employees, there are departments that might be interested in the schools question. These are the departments of employment market communication, employment and organisation or human resource management. Research on vacancies of the company delivers the contact information; otherwise it is helpful to use the central telephone number and to ask for specific departments. For large companies it's often more complex to find the right connection. Sometimes the same methods will be successful, but keep in mind large companies also have departments for internal training. They might be interested because they already feel the connection with education. Otherwise there is an option at the department of sustainable entrepreneurship. Within the Netherlands there are a lot of large companies and multinationals connected with organisations that support companies and they aspect schools to choose this route to get connected. The most unsuccessful way to make a connection with a company is to send an email to the companies general information address. The questions schools ask often out of alignment to the mission and goals of the prospective organization. It's more effective to make well prepared phone call for cold acquisition.

"It's my experience that a wheelbarrow is a useful tool to build-up a network. It's much easier and more effective to use your own network and that of your colleagues, then to aim for large and interesting companies where you don't know anyone." Leander Bouwens, former technator at 2@college Cobbenhagen

Be realistic

The size of the company dictates the scope of the ask. Small companies with little space are not able to invite complete classes for a company visit, but they are very

willing to deliver a guest lecture or an activity at the school. They are willing to be present at a job market or to develop a challenge for pupils. Those companies are often very motivated to meet pupils and are willing to offer more than a school sometimes expects. Middle sized companies often do have experiences with organizing visits and are pleased to show their business. They also like to provide challenges. But customized activities are sometimes a little more complex. They are more careful with the balance of time and effort for the primary process and the extra activities they offer to the local community. Large companies often want to collaborate in a well organized network with several schools. If this infrastructure is provided, sometimes great companies even create their own network, they are willing to invest in huge events for many pupils.

THE NETWORKER AS TEACHERLEADER

Teachers that develop and maintain a network and take care that their colleagues can use this network to enrich their education, fulfil a form of informal leadership. This informal leadership is been called Teacher Leadership in the international context. Wenner& Campbell (2017) define a teacher leader as an educational professional that, besides their teaching activities also take responsibility to strengthen the culture of professional learning and to make meaningful connections. Fairman & Mackenzie (2014) define a teacher leader as a professional learner, coach of learning or teacher connector. So they base their definition of teacher leadership on the activities of those teachers. On both articles they point out the roles teachers poses to make connections within and outside the school, to support the educational environment and pose that as a form of teacher leadership. Teacher leadership can have a large impact on the educational environment of the school. Teacher leaders foster a culture of learning within the school and that is an important contribution to the school to work on sustainable and enduring educational development (Muijs en Harris, 2003)

The position of a teacher leader within the school is not always uncomplicated. Schools are relatively egalitarian organizations in with teachers have a strong professional autonomy. If this culture dominates the culture of collaboration and professional learning, this can have an inhibiting effect on the development of the school. If the teachers acknowledge cooperation as a form of professional culture, than teacher leadership van arise (Fairman & Mackenzie, 2014). After the start of a teacher leadership, there is still a lot of development to come. Informal leadership demands specific competences of the educational professional, that not can be assumed to be obtained. The development of those competences is not often a common part of the professional development support for teachers (Mangin and Stoelinga, 2008). To accomplish something as a networker within the school, the teacher has to enter into interactions with individual colleagues and the whole community surrounding the school. The teacher has to take risks and build complex relations, that will have a strong demand on the teachers social skills (Fairman & Mackenzie, 2014).



Beside the awareness for teacher leadership in professional skills development programmes, the school administration can also support by the positioning the teacher leader, by acknowledgement, job specification and delineation. This prevents abuse or underestimation of the teacher leader (Margolis and Huggins, 2012). On the other hand, a teacher leader that doesn't have the support and facilitation of the school administration, and still capable to hold the position is always an effective leader. This form of leadership is after all not been supported by the formal position that the teacher holds, but it has been confirmed by its output with the colleagues (Fairman & Mackenzie, 2014).

Effective Teacher leadership

The effectiveness of the teacher leader is rated by the amount of set goals that were reached. The goals that teacher leaders set for themselves are most often focused on the improvement of pupils learning (Fairman & Mackenzie, 2014). Their own behaviour on professional learning is being used as model behaviour to strengthen the professional culture. Teacher leaders show that they can reflect on their own practice, try out new strategies and contemplate on them regularly. They share their assumptions, ideas and results with their colleagues. And on that they are willing to take the risks within collaborations and discuss their ideas. At the same time they act as coaches for there own colleagues (Fairman & Mackenzie, 2014). The success and the effectiveness of the teacher leader is determined by the ability to bind others to de goals set and to incorporate them within the learning culture. To be successful as a teacher leader among colleagues, the teacher leader has to possess a lot of important personal characteristics. Communication skills like honesty, openness, reflective skills, being respectful are mainly named. They also have to be able to create an environment with trust, safety and a positive work environment. And within that there has to be a support of the schools administration (Fairman & Mackenzie, 2014). The teacher leaders who are able to accomplish this environment, are building this on the professional relationships they developed overtime with their colleagues. This is a form of intrepreneurship of teacher leaders.

Fairman & Mackenzie (2014) address the need to involve the schools external network towards the achievement of the goals on educational changes and the culture of professional learning. Within that network they address the parents of the pupils, but also the broad environment of the school. Considering the fact that one of the functions of the school is the socialisation of children for the (local) community, companies and institutions are also a part of this network. On regional level, but also on the national level. The importance of networking for a teacher leader is clear.

To facilitate Teacher leaders

To leverage the most effective use of a teacher leader, it is important that the facilitation and positioning of the teacher leader is thought over. This starts by



capturing the job description, on with the teacher leader and the school administration confirm what the responsibilities of the teacher leader will be. It also clarifies the facilitation that will be needed for the teacher leader to be successful (Wenner & Campbell 2017). The conversation about the facilitation is also about the delineation of the autonomy of the teacher leader to make decisions. Those decisions have to be supported by the school's administration. Regularly contact between the school administration and the teacher leader will set a foundation of balance between this autonomy and the position of the teacher leader. The teacher leader can benefit from conversations with the school administration for constructive dialogue, support and alignment (Chamberland 2009).

Beside the school administration, the teacher leader also can have benefits from a team of colleagues in a parallel position on different topics. They can discuss the items they are dealing with and work together on the educational change they want to accomplish within the school. On his way the alignment between the different topics of the teacher leaders is kept (Fairman & Mackenzie, 2014). The formal leaders also have a task to align the teacher leaders efforts (Chamberland, 2009; Muijs & Harris, 2006; Podjasek, 2009). This means that the school administration will have to develop an equal culture of professional learning, in the same way the teacher leader has accomplished with his or her colleagues. That's the way to create a safe environment of risk taking and enduring learning (Beachum & Dentith, 2004; Gonzales, 2004; Brosky, 2011; Hunzicker, 2012).

Other aspects of facilitating a teacher leader are far more practical. For collegial consultation it has to be possible to meet each other. The adaptation of schedules (Borchers, 2009; Gaffney & Faragher, 2010) and the facilitation of a pleasant meeting space are therefore important (Chesson, 2011; Chew & Andrews, 2010). It doesn't always have to be a form of financial compensation (Borchers, 2009), although this does contribute to the feeling of acknowledgement for the exceptional position the teacher leader possesses (Vernon-Dotson, 2008).

For a teacher it is an investment to choose to step in to a teacher leader position. The challenge is often not the collaboration with the school administration, but with the interaction with the teacher colleagues and the formal leaders (Fairman & Mackenzie, 2014). From a study of Beacher's (2012) it appears that as a result of gaining a teacher leader position, the teachers are often noticed by the school administration. Beside that the teacher leader develops an enlarged insight in how the interaction between teachers works and how they influence each other (Fairman & Mackenzie, 2014). In this way a teacher leader position contributes to the professional development of teachers.



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INTERDISCIPLINARY ENTREPRENEURSHIP EDUCATION - UTILISING LEARNINGS FROM HIGHER EDUCATORS AND STUDENTS

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ABSTRACT

Study programs utilising multi- and interdisciplinary way of education in higher education are in the minority. Based on the experience, establishing an interdisciplinary education program is considered to be challenging. This practice focused case study describes the key challenges of an interdisciplinary entrepreneurship education program establishment. The case study is combined from two different studies; (1) a study performed by a network consisting of 30 higher education experts from 11 countries and (2) a study performed during development of a new interdisciplinary entrepreneurship program. The data for this study was collected (1) from teaching staff during an international conference in June 2019 and (2) from students during the development pilots in autumn 2018. The findings indicate that interdisciplinary entrepreneurship in higher education is in a pioneering stage, as universities internal structures and staff mindset lack support for the interdisciplinary way of education. In addition, students are benefiting from the early stage entrepreneurial studies in supporting growth of their entrepreneurial mindset and understanding of their entrepreneurial attitude.

BACKGROUND AND THE STUDY QUESTION

Collaborative learning is a growing trend among educators. Knowledge workers, professionals operating in the knowledge society (e.g. Drucker 1993), are supposed to be able to create new solutions and innovations by crossing disciplines, professions and perspectives. For solving complex global problems knowledge workers are supposed to master skills, which will help people to utilise and create new knowledge, entrepreneurial mindset and skills, and meta-cognition where new



knowledge is produced, used and shared within and between communities of practice and within teams. (Heikkinen 2018).

Even though there's a need to increase collaborative learning among educators, based on a study there is an indication that it is not common in higher education institutions. Historically interprofessional education, a collaboration using several professionals that are collaborating with each other, has been a common way for training professionals among the nursing, social sciences and medicine disciplines. However, based on research among and between many other disciplines (Heikkinen & Räisänen 2018), interdisciplinary (Davies & Devlin 2007, Klein 1990) and multidisciplinary (Petrie 1976) way of education seem to have room to grow. If multi- and interdisciplinary way of higher education is not common, one reason for this might be that establishment of an interdisciplinary entrepreneurship study program is considered to be challenging.

European Union has recognised need to develop the entrepreneurial capacity of european citizens. Recently European Commission published the Entrepreneurship Competence definition, also known as EntreComp-framework. EntreComp offers a tool to improve the entrepreneurial capacity of European citizens and organisations, and thus can be used as a basis for the development of curricula and learning activities fostering entrepreneurship as a competence. (EntreComp 2018). In addition, in their joint publication "Entrepreneurship gamebook", the Rectors' Conference of Finnish Universities and The Federation of Finnish Enterprises define recommendations for the promotion of entrepreneurship at higher education institutions. The recommendations are grouped under three thematic entities; Entrepreneurial attitude and capacities; New entrepreneurship; and Evolving entrepreneurship. (Entrepreneurship gamebook 2018).

Two universities, University of Oulu and Oulu University of Applied Sciences, in Northern Finland's city of Oulu, have 20 years of history for new entrepreneurship study programs, i.e. programs focusing to build new businesses. Two years ago, both universities recognised a need to develop a collaborative study program for increasing entrepreneurial attitude and capacity of its students, i.e. a program focusing on the early stages of entrepreneurship. Inspired by the above, a study question was set to be explored: "What are the key issues to be considered when establishing an interdisciplinary study program for increasing students' entrepreneurial capacities in higher education?" The study was considered to be a case study with a practical approach, utilising the experience of educators being establishing and working in an interdisciplinary study program within higher education institutions.



STUDY BACKGROUND

Oulu University of Applied Sciences (Oamk) has set a challenge to create an interdisciplinary entrepreneurship study program, called "Towards Innovation and Entrepreneurship". Development of the new study program utilises the learnings from the entrepreneurial studies co-creation project (MindBusiness) of two universities, Oamk and the University of Oulu. The new program will be focusing on early stage entrepreneurship, i.e. entrepreneurial attitude and capacities of the students, which the Entrepreneurship gamebook (2018) defines to include; strengthening the ownership of learning, meaning that learners should be in a central and entrepreneurial position in the learning environment, resulting in stronger ownership of the learning; establishing conditions for entrepreneurial learning, meaning offering better resources and environments by genuine and functional training conditions and broad and complex national and international networks with the world of work and other partners; building entrepreneurial teams, meaning accelerated learning by teams that promote common objectives, create new competence and innovations. This can be achieved by forming teams with care, owning their learning and have sufficient freedom; embedding a culture of experimentation, meaning the operational culture is experimental and permissive towards trial and error. Also, the expertise is strengthened by forecasting, exploring and practising new methods of learning, research and development.

As implication of the above recommendations, the objectives for the new Bachelor level program were defined to include; *innovation creation* (A); *early stage entrepreneurship* (B); *interdisciplinary teamwork* (C); *large coverage of students* (D); *classroom and virtual implementation* (E).

The study program objective A was defined to include new innovation creation by a student team and a project, to emphasise accelerated learning by teams that promote common objectives. The innovations were defined, based on definitions by Siltala (2009) and Vehkaperä, Pirilä & Roivas (2013), to have three characteristics; *it has to be something new or renewing; useful; and implemented into practice.* In addition, the innovation creation should be connected to a real need to offer genuine training conditions. The innovation development process was chosen to be incremental, grounded on Design Thinking, thus providing a simple process for a new solution development.

The study program objective B was implemented to educate students entrepreneurial skills, which Shane and Venkataraman (2000) propose to be vitally important in the society. Entrepreneurship is supposed to create new jobs, prosperity and well-being for the society. Thus, education institutions are seeking ways to implement entrepreneurial skills education. As Matley (2000) proposes higher education institutions to consider educating educated, skilled and motivated entrepreneurs, EntreComp (2018) lists the competencies of entrepreneurship to be trained.

The study program objective C was defined to include real interdisciplinary teams to establish conditions for entrepreneurial learning and building entrepreneurial teams. Interdisciplinary is defined as a model not just random professionals speaking to each other. Instead it refers to the combination of more than one area of knowledge requiring 'more or less integration and even modification of the disciplinary sub-contributions while an inquiry is proceeding' (Davies and Devlin 2007). In addition, students need to consider the contributions of their team colleagues to make their own contribution (Petrie 1976). Thus, interdisciplinary team members are required to communicate and collaborate across disciplinary borders and discourses along the way to achieve a common goal. In Oamk the above means in practice covering a total of 27 different degree programs, since the study program is planned to be obligatory for all students.

The study program objective D is due to the decision of being obligatory for all Oamk students, 1500 students per year. The degree programs can also decide the timing of the program to their curriculum, so the students are from the 1st to 4th year undergraduate Bachelor students. In addition, a student team consisting of participants from different stages of their studies is an interesting opportunity for the interdisciplinary study program.

The study program objective E, virtual implementation, meaning student teams working remotely without necessary meeting each other during the course, concerning also teachers. The physical implementation has period dependency, including workshops in teams and independent work, both in a classroom and off-classroom. The virtual implementation builds up virtual teams, which are instructed as the teams in the physical implementation. The difference between these two implementations are the "non-stop" principle of the virtual implementation. Non-stop principle has a non-periodic dependency for their study program participation.

The previous experience about innovation and early stage entrepreneurship education was utilised. The best practices from the previous programs, MindBusiness and LAB studio model, were drawn together. MindBusiness is a development project initiated by two universities, the University of Oulu and Oamk, for the need of a new early stage entrepreneurship study program. The project included three pilots with focuses on building individual entrepreneurial attitude, personal contact network and innovation creation. The pilots were realised during the year 2018 by an interdisciplinary teacher team, in collaboration with the two universities. Altogether 47 students and 5 teachers were participating in the pilots, during which the feedback for the development was collected. LAB studio model is a permanent interdisciplinary entrepreneurship education program developed in Oamk since 2012. The program is suited to the early stages of entrepreneurship and is focusing the business pre-incubation and incubation. The program includes yearly round 260 students and teachers. LAB studio model was also an initiator for an



annual Blender event, which calls together higher educators interested in interdisciplinary higher education since the year 2018.

STUDY

Study for finding the key issues for building a new interdisciplinary entrepreneurship program included stages of collecting and analysing the challenges from the existing study programs. The case study was performed in two different educational settings; LAB studio model and MindBusiness-project. Both settings programs are implemented in the city of Oulu, Finland.

The data collection for the LAB studio model study was performed during the Blender event in June 2019. In the event 30 educators from 13 different higher education institutions and 11 different countries having interdisciplinary entrepreneurship programs contributed to the study. The collection was performed in two stages; first to collect the topics of the challenges, second to collect challenges under those topics. The topics were collected in a workshop by asking a question: "How might we..." to be fulfilled, e.g. "How might we create a living curriculum". The second stage of the data collection was done by with a question under each topic: "What do we think is the problem?" The collection of these was turned to challenges.

The abductive data analysis was performed by experienced researchers in the area of interdisciplinary education. Altogether ten topics and 59 challenges were identified and collected to Padlets and later transferred into spreadsheet. The data analysis was performed by two researchers during the autumn 2019. First the topics and challenges were read and similar challenges were combined. Secondly, the challenges were further combined and categorised to form a hierarchy of challenges. This was done by combining the challenges belonging under similar higher-level challenge, i.e. forming levels of challenges, to a tree format. The number of challenges under each level was following: level 0 (the original) 59 challenges, level 1 51 challenges, level 2 26 challenges, level 3 (university internal challenges) 7 challenges.

The data collection for the MindBusiness study was performed between June and December 2018. The data was collected from the students participating in three course pilots by an e-survey at the beginning and at the end of each course. Altogether 47 students answered the survey, which included both quantitative and qualitative questions. Quantitative data was collected by questions including different propositions regarding entrepreneurial attitudes, which were asked to be evaluated by using Likert scale. Qualitative data was collected by using students' reflection diaries. The mixed method data analysis was used for both data; by reading and categorising the student reflection diaries and by using statistical averages of the quantitative data. The analysis was performed by a researcher belonging to the



University of Oulu's Kerttu Saalasti Institute Micro-entrepreneurship (MicroENTRE) research group.

FINDINGS LAB studio model study findings

The study findings are focusing to the university internal challenges building an interdisciplinary entrepreneurship study program. The higher-level challenge findings are; *university practices or policy don't support the interdisciplinary way of operating (A), transformation from mono- to interdisciplinary way of studies (B), transformation from teaching to learning (C).*

The finding A include recognised challenges in the university's infrastructure, practices and staff attitude. This was recognised e.g. in a lack of flexibility in curriculum development, as both the practices and tools (infrastructure) are not fully supporting the interdisciplinary curriculum development. Challenges with the teacher (coach) work allocation were recognised as part of the attitude challenge. In general, the support from leaders or supervisors or administration was considered to have room for improvement.

The finding B include recognised challenge of disciplinary differences or needs blocking the development. This challenge was recognised as part of no direct reasons for increasing collaboration between faculties or degree programs, thus resulting as reduced interest towards interdisciplinary studies. Also lack of knowledge regarding interdisciplinary studies topics was recognised as a major influencer to the challenge.

The finding C include recognised challenges from two different points of view: coach team and student point of view. The coach team view includes the following challenges; lack of knowledge and skills; lack of courage or attitude to change the way of doing; not recognising and sharing expertise among colleagues. The students' point of view include the following challenges; students not having emotionally safe learning environment; missing tools for self-awareness growth; students don't know why coaching should be used.

MindBusiness study findings

The study findings recognised are; *entrepreneurial mindset (A), attitudes towards entrepreneurship (B), eagerness on starting a company (C) and development of entrepreneurial skills (D).* 47 students answered the survey. As the data was analysed by using mixed methods, the findings are from the reflections and the e-survey. Finding A: The study for the students shows that after accomplished the course, they find entrepreneurs are more respected socially and they have better social status. They also think that they could earn more money as an entrepreneur and have more



power. It can be assumed that there was a change in the entrepreneurial skills. Although, the amount of the answers is not that high, so there must be some room for assumptions.

Finding B: Students find out that the image of entrepreneurship rose after the course. They find out that entrepreneurship is interesting and valued. What we found interesting is that while studying the entrepreneurial mindset, students find out that they have a chance to earn more money as an entrepreneur. While asking the same when focusing on attitudes towards entrepreneurship, was that students think that employee can have better earnings than entrepreneur.

Finding C: while asking about the desire of starting own company, the eagerness grew. The most significant change was with those who found a business idea during the course. On the other hand, some students learned from themselves that entrepreneurship is not for them during the course. They were very eager to start own business after graduation. This is also very significant result for the student. These early stage entrepreneurship studies offer a safe environment to reflect the entrepreneurial thoughts. Everyone does not need to be an entrepreneur.

Finding D: in this study we could not see any development of the entrepreneurial skills on students. One assumption is that the course was that short entrepreneurship education (8 weeks). In that time, students could not see any change in their skills. Another assumption is that this is an early stage entrepreneurship course. For many students, this is the first time they are in contact with the entrepreneurship.

DISCUSSION

This practice focused case study concentrated to describe the key challenges of an interdisciplinary entrepreneurship education program establishment. The study was performed among experienced higher education educators, combined with students' point of view. The findings contribute to the establishment of an interdisciplinary entrepreneurship education program and to the focus areas of such a program in higher education.

The results indicate universities challenges in their transition towards interdisciplinary way of education. Based on the results can be stated that interdisciplinary entrepreneurship higher education is in a pioneering stage. The educators in this study find themselves to be change makers inside their organisation, often facing a constant challenging for their study program. This statement can be justified by the case study's findings, as they indicate universities internal challenges in transformation from mono- to interdisciplinary and in transformation from teaching focus to learning focus. The findings indicate also the focus areas of a small



size interdisciplinary entrepreneurship study program, as it should be more on students' entrepreneurial attitude and entrepreneurial intentions.

As the case study is practice focused, the authors would like to point out some practical implications to be considered while establishing new entrepreneurial education programs to higher education. The practical implications from the study are; ensure the support from the most critical supervisors and student union (A), respect for disciplinary differences and needs (B), support the transition from teaching centric to learning centric (C), building the entrepreneurial mindset and attitude (D), development of the entrepreneurial skills (E).

The implication A: The authors consider this topic to be the most critical for the interdisciplinary study program success. The educators in this study have faced a lot of resistance towards the new way of education, so it can be considered as a change process inside an organisation. Thus, support and commitment is needed not only from the top management, but also from the middle management. The authors point also the students support. Their feedback should be also considered during the development phase of a new program.

The implication B: Since their own characteristics and needs, buy-in from the degree programs or faculties should be ensured. The authors consider good practices, such as; purpose focused communication explaining the need; showing learning results; and student feedback. In addition, if possible, feedback from the respective industry professionals should be utilised.

The implication C: Support for pedagogical transition to learning by doing and project-based learning should be ensured. The authors consider teachers transition of teaching to coaching to be supported by training, often learning by doing coaching and reflecting. Also, the students are supported for their learning, e.g. by encouraging and advising how to utilise coaching.

The implication D: As the course focuses on early stage entrepreneurship, it is crucial to influence on building the students entrepreneurial mindset and attitude. Traditional entrepreneurship teaching can be passive as well as it deals with formal lecturing types of actions. In order to influence student's entrepreneurial mindset and attitude, innovative method can create interaction between the learner and teacher. Bennet (2006) showed it to be stimulating and encouraging process of the students. Earlier studies of Lee & Poh-Kam (2003) and Sheppard, Hartwick and Warshaw (1988) show that there is a link between positive attitude toward entrepreneurship education leads to higher entrepreneurial intentions and entrepreneurial intention by itself is closely linked to the entrepreneurial behaviour, we propose that a positive attitude towards entrepreneurial behaviour.

The implication E: As stated earlier, there was no change in the student's entrepreneurial skills. Still the authors find this as an important result. Entrepreneurial skills are needed to be taught in order to give students a set of tools for their use in future. The finding supports also the implication the growth of finding a business idea during the course and the entrepreneurial mindset.

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DOEDACTIEK, AN EXPLORATIVE CASE STUDY ON PEDAGOGICAL ICT USE IN CLASS

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ABSTRACT

In the past decade, An enormous increase in investment in personal devices for students in schools took place, but the pedagogical use of these devices lags. At many schools, there are teachers with sufficient expertise on the pedagogical use of technology that they could share. In this case study, 36 proficient technological teachers of various subjects at 11 different secondary schools in the East of The Netherlands were followed for five years. The teachers took part in the professional learning community "New ways of teaching with modern technology" with the objectives to increase the personal proficiency of participating teachers with the pedagogical use of technology in class. The other objective for these same teachers was to share their acquired ICT expertise with colleagues at their schools. Participatory action research took place to gain insight in the pedagogical uses of technology of the teachers, in what ways they share this expertise amongst their peers and which support they voice towards their school leaders to do so.

Findings are that teachers have the pedagogical skills to integrate ICT into their lessons and expand their pedagogical repertoire by regularly trying out new apps and tools. Teachers find it valuable to share technologies that have proven to work well in a teaching practice. Teachers can support their colleagues, but the complexity of this process is high. Teachers benefit from close and active support from both peers and their school leader.

INTRODUCTION

Around 2012 an invasion of digital devices in schools took place in The Netherlands, initiated mainly by a few public opinion influencers who expressed their worries about what their children learn at school. One parent started Steve Job Schools at which all students work on an iPad.



Many schools picked up on this and saw the introduction of digital devices as a means to attract new students. These decisions were mainly hardware driven.

Few schools undertook actions to support teachers who suddenly found themselves confronted with the digital devices the students brought with them in their classrooms. At that time, practical knowledge in schools about the use of ICT was available at many schools, but till then, teachers who did not want to use technology in their classes could easily do without. Staying clear of technology became a lot harder when the students were allowed to use laptops and tablets in class. Against the backdrop of an enormous increase in investment in personal devices for students in schools (Brummelhuis & Binda, 2017) with a lack of knowledge on the practical pedagogical use of these devices (Muijs & Reynolds, 2018) a Professional Learning Community (PLC) called "New ways of teaching with modern technology" was formed. What 'new ways of teaching' were supposed to be was not specified, nor what 'modern technology' could be. The objective of the project was twofold. One objective was to increase the personal proficiency of participating teachers with the pedagogical use of technology in class. The other objective for these same teachers was to share their acquired ICT expertise with colleagues at their schools.

Schools were encouraged to allow two teachers per school or school unit for large schools, participate. Teachers were supported to participate in the PLC with a grant of 80 - 120 hours yearly. The PLC had about 8 to 10 meetings yearly. To gain insight in how teachers acquire new expertise and how they share this newly acquired expertise amongst their colleagues the teachers were followed from the start of the project in 2014 and are still followed to this day.

Research questions are:

- What findings do teachers have during the exploration of pedagogical uses of technology in their classes?
- What expertise do teachers find valuable to share and how?
- Which support needs are voiced towards school leaders to help teachers share their expertise about the pedagogical use of technology amongst their colleagues?

METHOD

In 2014, 36 teachers from 11 different schools started in this PLC guided by two teacher trainers from two teacher training institutions. By 2016 about half the participating teachers had left the PLC. At the close of the PLC in 2019, 6 teachers from six different schools still participated, under the guidance of two different teacher trainers.



Participatory action research (Migchelbrink, 2015) took place. Minutes of all monthly meetings were collected (N=37). Many monthly meetings were also video recorded (N=26). Based on the minutes of the meetings, selections of the video recordings were transcribed. Inductive analysis took place on quotes about the pedagogical use of technology of both PLC participants and their colleagues at the schools and the desired support for increasing this proficiency.

To explore the pedagogical uses of technology in their classes, the teachers either made video recordings of the learning activities with technology they undertook with their students or explained their experiences. Video recordings and experiences were discussed at the monthly meetings and uses of technology described in a shared document. Artefacts made during the meetings, like Flipboard, padlets, posters, folders and presentations were collected and archived.

After two years, the teachers expressed the need for 'something' to share their expertise with. The group then decided to move the content of the shared document to a website for easier reference for their colleagues. During about a year, short design cycles took place to identify the filters for the website. During this process, discussions took place that deepened insight into the expertise the PLC participants found valuable to share and ways to unlock this expertise for their colleagues.

Participatory inquiry (Migchelbrink, 2009) took place to identify the support the participants needed to share their expertise about the pedagogical use of technology amongst their colleagues.

RESULTS

Three stages were identified in the process the PLC went through

1. an exploratory stage,

2. a stage in which the teachers made preparations to share their expertise

3. a stage in which the teachers took initiatives to implement opportunities to share expertise regularly.

The three stages took place parallel to one another during most of the project. In the following paragraph, the stages are described in the order in which they emerged.



Stage 1, Exploring pedagogical use of ICT

The first one and a half years of the project was mainly exploratory with a focus on increasing personal proficiency with the pedagogical use of technology of all PLC-participants.

During monthly meetings (8 to10 per year), the teachers exchanged their operational skills. The TPACK model (Mishra & Koehler, 2006) and Puentedura's SAMR model (2012) helped to clarify and better understand the differences between their experiences. The different pedagogical ways of working with the various technologies were noted in a shared document. A collection of short descriptions of pedagogical uses of technology resulted that was frequently consulted and supplemented by all PLC participants.

During this first stage, over 250 apps & tools were tested on their pedagogical usefulness in the classroom practices of the PLC participants teachers. The participants shared their ideas in the group, and the following few weeks, another teacher would try out that tool in his or her teaching practice. At the monthly meetings, the teachers noted the experiences with the tools and the way used in a shared document.

Rigorous selection of useful and workable apps and tools took place. Some apps disappeared over time. Other apps became part of more extensive tools or became unavailable behind a commercial license after a year or two.

The teachers were very keen to use technology in a way that supports the learning of their students and asked questions like:

" Why do I use this app? " (Physics teacher)

" what can a student do more with ICT than with a book?" (Visual arts teacher B)

Disappointment also occurred when experiences with technology that did not support student learning occurred:

"...but in this class, it did not work, why not, because my pupils have difficulty with reading. They just clicked answers randomly and then said 'done'. They took two minutes to read a text and answering 20 questions. For them, that's impossible. This experience sobered me down. Not all digital stuff works for my pupils" (English teacher)

During the monthly meetings, the teachers spoke of different apps and tools with similar functionality as different learning activities. For instance, having students answer questions through the app kahoot, was considered a different learning activity with added value in a different lesson phase than having students answer questions through the app socrative.

At many times the teachers made mixed references to learning activities and the apps and tools they used:

"Students can process information using ICT differently than in regular lessons, like making a story or a movie or something with Puppet Pals." (mechanics teacher)

This teacher starts off describing the learning activity 'making a story or movie' but then switches over to the name of the tool when she can find no equivalent learning activity that describes what happens when students work with Puppet Pals.

Over time teachers have named different perceptions of the added value of ICT in their teaching practice:

- 1. Expansion of personal proficiency: *"My pedagogical repertoire as a teacher has enlarged considerably with ICT"* (Mechanics teacher)
- 2. Changes in learning objectives: "Images are becoming increasingly important in this digital world. So, instead of teaching my students how to use pen and ink first and then teach them design techniques, I teach them design techniques straight away and let them use graphical tools and apps to create their images" (teacher of visual arts A)
- 3. Changes in approaches to learning and teaching: "With ICT, I now look first for what the students need. I now rethink my lessons and the use of digital learning materials from a student perspective. Yes, that has certainly changed since I started working with ICT in my classes" (Maths teacher)

"With ICT, I can identify which students need more attention on the topic. I let them do a socrative at the beginning of the lesson. Based on the results, I divide them into three groups, a group that works ahead, a group that works in pace and a group that needs some more explanation. Once all are at work, I sit with the last group to help them reach the learning goals" (Chemistry teacher)



Stage 2, Preparing to share expertise

After two years, more attention was paid to the process of sharing expertise with colleagues at school. Again the TPACK model (Mishra & Koehler, 2006) helped to understand the differences in knowledge between colleagues. The SAMR model (Puentedura, 2012) helped to realise that enhancement (bottom two) are feasible within classes and teachers can do so privately, but cooperation between teachers and between teachers and school leader is necessary to transform (top two). The participants expressed their desire to have 'something' to show their colleagues to inspire them to use ICT.

The participants of the PLC acknowledged that they had colleagues in their schools who could benefit from the ICT experiences of other PLC participants, especially for content-specific pedagogies. Not all participants were familiar with content-specific pedagogies, for instance, for learning the grammar of a foreign language or for learning to experiment with simulations for science. The shared document developed during Stage 1 proved to be of value because the PLC participants could look up what was in there at any time wanted. In this way, they could help the colleagues at their schools with content specific questions on ICT use.

At a very creative meeting, one of the participants suggested publishing the content of the shared document through a website that could be filtered by using words that are familiar to all teachers.

A period of about a year followed. Parts of the online environment were prototyped, tested with the colleagues at the schools, adjusted where needed and finally implemented on the website. In this way, the digital platform

During the design of the website, the PLC participants spoke several colleagues at their schools and shared their findings at the monthly sessions. First, the PLC participants compared their situations at their schools. By comparing, it became clear that the use of technical vocabulary in school formed a barrier in conversations with colleagues (i.e. names of operating systems, names of browsers, names of apps and tools). A focus on learning goals resulted in more pleasant conversations with colleagues.

It also became increasingly clear that colleagues with little experience with the pedagogical use of ICT, search the internet in a different way than teachers with experience. ICT inexperienced colleagues use general educational language that leads them to sites with general descriptions and not to inspiring uses of ICT. Teachers with more experience actively follow other teachers and educational researchers via social media and draw ideas for their experiments in their classrooms from these virtual conversations.

The leading design question that resulted for Doedactiek was 'If teachers use general educational language to search, how then should we make our collection available to them?' After about a year of short design cycles, consensus was established on the set of filters to use for the website: School subject, Lesson phase, Cognitive process, Learning activity, Group size (single student, pairs, small groups, class exchanges), User (teacher only, students only, both). The website Doedactiek (www.doedactiek.nl) became available in 2018.

Stage 3, Sharing expertise in school

From the monthly discussions, the shared document and the iterations for the design of the website, an increasingly accurate picture emerged of the personal expertise of the teachers to the background of their different school environments. The teachers voiced what they needed to share their expertise about the pedagogical use of technology with their colleagues. At the different schools, this was received differently.

To share expertise with colleagues, we chose an accessible way of exchanging experiences. We invited PLC participants to talk to their colleagues about their ICT experience in class. We also invited PLC participants to talk with their school leaders about systematizing the sharing and joint development of pedagogical uses of ICT at their schools.

Before sharing with colleagues and school leaders, the e-capacity model of Vanderlinde (2011) was used to obtain an overview of each PLC participants' school. This overview made it possible to identify what was in place, not so in place and in need of attention, according to the perception of the PLC participant. What resulted were different 'portraits' of the schools, see figure 1 and 2 for examples.



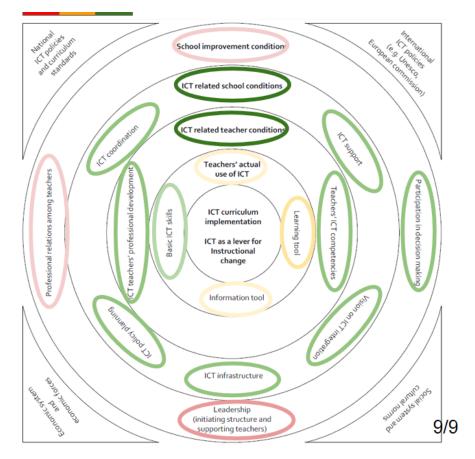


Figure 1. An example of a schoolportrait. The darker the green the better in place according to the PLC participant



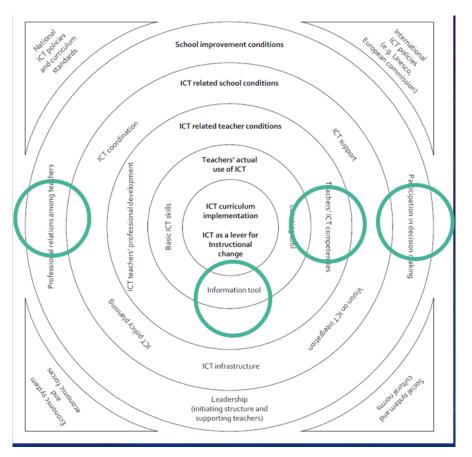


Figure 2. Another example of a schoolportrait. Note the differences with the portrait of figure 1.

During the collective reflections on the school processes, the differences between the PLC participants in handling conversations with both colleagues and their school leaders became visible. Two PLC participants experienced support from the school leaders. Four other PLC participants experienced difficulty in phrasing their needs towards the school leaders. After careful consultation with the teachers, the teacher trainers contacted the school leaders to hear their thoughts about how the PLC participants could share their expertise within their school. The results of these contacts were input for the monthly meetings. Based on this input, ways were explored for each PLC participant to converse in their school organisation. The outcomes per school were very different.

In an organized, joint meeting, the school leaders and the PLC participants discussed the differences between the school portraits. All school leaders but one actively



participated in the discussion and agreed on actions to take at their schools. One school leader suggested to co-operate more intensively between schools. However, a year after, four PLC participants had not experienced any initiatives or changes.

The PLC participant, whose school leader that did not take part in the discussions during the joint meeting decided to quit trying to share her expertise in her school.

At another two schools, the frequent changes of school leaders hampered continuity. During this time of organizational instability, the PLC participant went home with a burn out for a couple of months. However, she continued to participate in the monthly sessions of the PLC because she did not want to miss out on the group process. The conversations helped her to come to terms with what had happened.

The PLC participants at the three schools described above focused primarily on their activities with ICT in their classes. They did not actively share their experiences with their colleagues. They also said that their colleagues hardly asked them anything about the use of ICT.

The two PLC participants that felt supported by their school leaders were supported financially to promote ICT integration among their colleagues. These teachers said that colleagues proactively approached them with questions. Both also regularly consulted with the school management (once a month or more frequently).

LESSONS LEARNED

During this project, it became apparent that teachers with experience with pedagogic ICT use actively explore new technologies and look critically at the effect of a specific tool or app on the students' learning process. The teachers also expand their pedagogical repertoire by regularly trying out new apps and tools with their students. Amongst peers, experienced ICT teachers use the names of tools and apps and learning activities interchangeably. The experienced ICT teachers find useful tools and apps on the internet, primarily via social media. Teachers with less ICT experience search with familiar general pedagogical terminology. This terminology does not help them find useful examples of pedagogical ICT use.

Teachers experienced in the pedagogical use of ICT use their prior knowledge about how certain apps and tools work (for example, the difference between Kahoot and Socrative) when designing their lessons. With this knowledge, experienced teachers and can assess the pedagogical effect on their students beforehand. Teachers with less IT experience lack this tool-specific knowledge.



The PLC participants found it valuable to share technologies that have proven to work well in a teaching practice, preferably their own. The PLC participants were well capable of developing a website as one of the means to share their expertise. The PLC participants needed active support in phrasing their needs towards their school leaders.

Joint actions that supported the colleagues in their learning how to use ICT pedagogically took place at the schools where both teachers and school leaders developed routines to speak to each other regularly.

The PLC has shown that teachers have the pedagogical skills to integrate ICT into their lessons and can support colleagues, but also shows that the complexity of the integration process is high and that teachers benefit from close and active support. In Estonia, highly trained 'educational technologists' actively support the development and implementation of technology in lessons, especially before and during the first few lessons when the teacher is still insufficiently familiar with a specific technology (Laanpere, 2018). In the Dutch approach, IT coordinators/coaches hardly have time to be in the classroom with their colleagues. Several PLC participants would like to do so, but their tight schedules hold them back. IT managers could do this, but many IT managers at Dutch schools lack the pedagogical skills to develop and initiate learning processes. Perhaps the Estonian way of working can be translated to the Dutch situation.

Digital platforms such as Doedactiek can inspire teachers to expand their pedagogical repertoire. However, the findings at the PLC show that the school environment in which they work influences the extent to which actual changes in the teaching and learning practice can be made.

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STEER-YOU-PLAY: Improving the quality of make-believe play and the role of the teacher in self-regulation

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ABSTRACT

Research states that make-believe play is an excellent context for children to practice self-regulation (Berk and Meyers, 2013; Leong and Bodrova, 2012). It helps them to develop good executive functions, which plays a key-role both in (lifelong) learning and in quality of life (Diamond, 2013).

However, there seems to be a wide variety in the quality of make-believe play in preschool classrooms. Moreover, teachers don't always have a clear view on the quality of the play in their classroom and on how to improve the quality of play. This is worrisome as teachers' interaction quality is decisive for the quality of play (Singer e.a., 2015).

'Steer-your-play' is research project in which 18 teachers participated in a two-year professionalization trajectory focused on improving the self-regulation during makebelieve-play in preschoolers. This project combines insights from experiential education (Laevers, 1995)), developmental psychology (Leong and Bodrova, 2012) and cognitive neurosciences (Diamond, 2013; Blair and Raver, 2014). The professionalization trajectory consisted of several input moments, (video)coaching, and (individual and group) supervision. These teachers were stimulated to explore their own learning questions concerning self-regulation and were continuously challenged to put them to practice in their classrooms. In this article, we reflect on the teachers' learning about self-regulation within young children's make –believe play and their struggles about stimulating them.



INTRODUCTION

One of the most charming features of working with young children, is the observation of children engaging in make-believe play. Mature make-believe play is often called the summum of play because during the pretend, children are challenged in a very rich and profound way. Research provides more and more evidence of the positive effects that play has on child development. It has a positive effect on different developmental areas, for example social and emotional skills, mathematic ability and early literacy, and self-regulation (Singer, Golinkoff & Hirsh-Pasek 2006).

On the other hand, children who don't engage in play, are a topic of concern for a lot of teachers. Their play often remains limited to manipulating things or playing a very stereotypical and primitive scenarios even though the learning environment offers many opportunities for a richer play. Teachers rapport they need extra support to stimulate these children in their play and in their development.

Research points to self-regulation as a key-concept in the (play) development of children. In this article the term "self-regulation" is used, although the literature uses different names for (different aspects of) this concept (e.g., self-management, self-organisation, executive functions). This study combines insights of cognitive neuroscience about the development of executive functions and insights of educational science focussing on the role of (make-believe-) play.

The importance of self-regulation in young children

The concept of self-regulation goes back to Vygotsky (1987). He stressed that children who lack the ability to regulate themselves tend to become a slave to their environment. They only learn in reaction to the impulses in their environment but they don't take the initiative to learn. This lack of self-regulation is of great concern to many teachers even today.

In cognitive neurosciences, the concept of 'executive functions' (EF) is used to describe the underlying elements of self-regulated behaviour.

Diamond (2013) defines executive functions as a collection of top-down control processes that we use when we cannot fall back on automatisms, instinct of intuition, because these latter are in adequate or impossible.

These executive functions play an important role in learning and in the socioemotional development of children (Diamond, 2013).

The development of those functions is related to the development of networks in a specific area in the brain, more specific the prefrontal cortex. This development is a long process that starts shortly after birth and continues throughout adolescence and early adulthood. (Zalazo, 2013).

Very impressive is the major increase in executive functions between the ages of 3 to 5. This appears to be a very important period to stimulate the EF. Moffit (2011) found, after using observations of 3- to 5-year-old children, even a long-term impact of well-developed self-regulation on health, welfare and crime in young adolescence. Although the socio-economical background has an important impact on the development, strong EF appear to compensate for low socio-economic status. Zalazo & Carlson (2012) emphasize as well that there is an emerging evidence that indicates that executive functions are malleable.

The three main executive functions (EF) are working memory, cognitive flexibility (or shifting) and inhibitory control. Working memory refers to the ability to hold information, manipulate it and recall it when necessary. Working memory is necessary for executing complex cognitive tasks and cognitive flexibility is the ability to change and adjust mental effort. We need it to be able to adapt to our behavior and to think in constantly changing situations. Inhibitory control is the ability to resist distraction and control impulses, often in the face of tempting rewards or distraction. Together, these dimensions ensure that children are able to develop sustained attention.

Research on self-regulation and make-believe play

Tijtgat, Van Camp & Vloeberghs (2015) describe educational neuroscience as a promising young science, but also point to the risks of for example neuromyths. There is a difference between measuring executive functions in a research setting and stimulating executive functions in an educational context. Therefore, they suggest to start from <u>neuro-pedagogy</u> in which they look for an ecological valid setting to measure and practice self-regulation in education.

Berk and Meyers (2013) called up for research on the relationship between EF-skills and make-believe play, both theoretically and practically, as well. They warned against focusing too rigidly on training executive functions in an educational context.

For young children, self-regulation becomes most visible in daily life during free play. "Because play continually requires children to overcome impulse in favor of rule-governed behavior _ to wait, share, cooperate, and abide by social conventions_the child, achieves her 'maximum display of willpower; her greatest self-control during pretense'." (Vygotsky, 1978)

Especially make-believe play is rife with opportunities to sustain attention, to inhibit impulses, to follow social rules, to plan in the service of attaining child chosen goals and to flexibly redirect thinking and behavior. Leong and Bodrova (2012) even claim that mature make-believe play is an important and unique context, providing opportunities to learn not afforded by other classroom activities.



"Practicing other regulation and self-regulation in play prepares the foundation for more advanced intentional behaviors, including such metacognitive actions as the planning and monitoring of mental processes." (Leong & Bodrova, 2015)

On the other hand, Leong & Bodrova (2012) marked that not all make-believe play is of equal quality, the role of the teacher can be important. However, "*adult involvement in play can either support or impede both play and EF-skill acquisition, depending on the quality of adult-child interactions.*"

The research of Singer, Tajik and Otto (2015) points to teacher interaction style and timing as important challenges in stimulating make-believe play. "The difference in position between the child and the teachers makes it difficult for the teacher to participate in the child's play: all attention will automatically go to the teacher. The teacher must be careful not to disturb the play or take it over unintentionally."

Ivrendi (2017) points out that exposing children to many adult-led play activities may remove them from a natural source of learning through play. So she continues 'the process of determining when and how teacher involvement is appropriate can be challenging.'

Research on the impact of make-believe play on the development of children is hard to conduct with tightly controlled experimental studies.

Bergen (2013) points out two important reasons: "(1) substantial child control over the direction of play appears essential for complex, sustained pretense; (2) adult direction had been found to reduce the quantity and complexity of young children's make-believe."

In our project we wanted to contribute to this challenge by professionalizing teachers in observing, evaluating and improving preschooler self-regulation in make-believe play.

Research Questions

The project "Steer-your-play" aimed to improve preschooler self-regulation during make-believe play. Therefore 18 teachers in seven schools participated in a two-year professionalization trajectory focused on:

- Improving the teacher's <u>knowledge of neuro-pedagogy</u> concerning preschooler self-regulation and make-believe play (Van Camp, T.)
- Improving the teacher's skills on creating <u>a stimulating play-learning-</u> <u>environment</u> with <u>qualitative teacher-child interactions</u> (Laevers F., De Haan, D.)
- Improving the teacher's <u>growth mindset</u> (Dweck C.) concerning preschooler self-regulation



Research Design: Educational Design Research

Plomp and Nieveen (2013) described the concept of Design Research:

"To design and develop an intervention (such as programs, teaching-learning strategies and materials, products and systems) as a solution to a complex educational problem as well as to advance our knowledge about the characteristics of these interventions and the processes to design and develop them, or alternatively to design and develop educational interventions (about for example, learning processes, learning environments and the like) with the purpose to develop or validate theories..."

In our project, we aimed to design a professionalization trajectory for teachers on stimulating self-regulation for young children in educational settings. This professionalization trajectory consisted of several input moments, (video)coaching, and (individual and group) supervision. Teachers were stimulated to explore their own learning questions concerning self-regulation and were continuously challenged to put them to practice in their classrooms. A mix of quantitative (e.g., questionnaires) and qualitative data (e.g., observations, videos, reflection questions...) was collected. The focus of data-analysis was qualitative (thematic) analysis, complemented with documenting changes in teacher growth mindset. Some insights of the teachers' self-understanding were derived, showing different accents and struggles between teachers.

RESEARCH PROCESS AND RESULTS

During the 'Steer-your-play' project, the teachers who participated in our professionalization trajectory received two types of tools: (1) observation tools aimed at understanding self-regulation of children during free time (make-believe) play and (2) reflection tools to critically question their own actions on improving self-regulation and the quality of make-believe play. These tools intended to stimulate meaningful conversations between teachers and to enhance deeper exploration of the meaning of what they saw in their classes. Moreover, these tools aimed to enhance awareness of the teachers' role in promoting self-regulation within young children.

We stimulated the teachers to explore their own learning questions and challenged them to put it into classroom practice. By closely monitoring these reflections, we tried to grasp and strengthen their own mindset and their own self-regulation. This became our main focus as researchers during the implementation.



Observing the quality of self-regulation during role-play

To observe the self-regulation of the children during free play, we started with the concept of self-management and entrepreneurship of F. Laevers.

"This domain is about the disposition to organize oneself effectively by making adequate use of opportunities available in the surroundings and in oneself. This rests on: (1) will-power (engage and persevere), (2) the ability to make choices and set goals, (3) to come up with scenarios for actions and to put them into practice and (4) to step back and learn from experiences. Self-organisation combined with creativity produces 'entrepreneurship': the sense of initiative leading to innovative actions. In essence this is all about the 'art of living' (Laevers, Declercq & Moons, 2012)."

We made an observation tool using the four mentioned components, added the social component and linked it to the extent to which teachers where satisfied about the play and the progress they wanted to see amongst the children.

The results indicated that the teachers knew very well which child did seem to be able to choose and which didn't. On the other hand, they became aware that after choosing, they didn't always know for sure if the child could make a fitting play scenario. They had to look closer to see if the child was able to plan, to overcome problems and to adapt their planning to these problems. Questions about keeping distance and reflection about play, were really hard to evaluate. During this reflection, the teachers acknowledged that they didn't know this was all part of selfregulation.

	Satisfied (34/50, 68%)	Not satisfied (16/50, 32%)	What progress do you want to see ?
Choice/ goal	Knows what he wants		Learns how to choose
	Shows initiative, starts role play by himself	Does not dare to contribute much, follows the others	Takes the initiative More contribution
Scenarios	Fantasies, comes up with new ideas		
	Seeks depth (material, extents, variates)	Does not come to mature play, always the same scenario	More depth (more, longer, broadening, other combinations)
	Performance with a lot of empathy, completely involved	Limited empathy	



Percistance	Highly involved (concentrated)	Chang a lot	More involved
Keeping distance	Not mentioned !		
Playing together	Contributes to the idea of others, Inspires other children with his ideas A lot of interaction, playing together well	Alone Dominant when playing in pairs	Play with (other) children Submit more if it goes to another direction
Other	Language Sticks to the agreements Responsible tasks in play Little or no need for role play – and that is allowed	Needs control or escalates Does not do role play	Controlling emotions More role play

We used the PRoPELS (Leong & Bodrova, 2012) complementary. This instrument shows five stages in child's make believe play and explicitly links it to the elements that can be assessed and scaffolded by the adults, namely: the plan, the roles, the props, the extended time frame, the language and the scenario.

In the first stage, the child is mostly engaged in exploring objects. He copies the teacher or another child in a very simple and often repetitive script.

In the second stage, the objects become props. It is only during the action that the meaning of the roles becomes clear. Modelled roles and actions are incorporated.

In the next stage, the roles and rules become more meaningful. The children start to plan more.

The fourth stage is recognized by the planning that becomes more advanced and by the growing complexity of the roles. Scenarios are discussed and changed in reaction to each other and last for 60 minutes or longer.

In the last stage, the dramatization, the planning can finally take more time than acting out the play. The play can take several days, can be interrupted and it can be restarted.

The reflections on this instrument focused on the growth in play and the link to the age of the children. Yet, some children of 3 years already played very rich makebelieve play (to stage 4) while on the other hand, some 5 years olds didn't exceed the second stage yet. To stimulate these children, teachers realised that they most of the time, steered children immediately to the fourth or fifth level and that they seemed to forget the levels in between. We discussed the challenge to understand what the children were actually engaged in and what their play meant for them. This is important help for teachers to know how to react and stimulate the children in their play.

Improving the quality of self-regulation during role-play

We also used some tools that focus more on the actions teachers can take to stimulate the self-regulation of children.

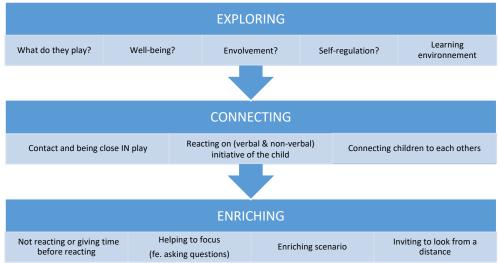
The first instrument is the POMS, an observation scale for self-organisation and entrepreneurship of Laevers. They integrated five topics:

- A positive class- and group climate
- An organisation that supports child initiative
- A rich and challenging offer of activities & material
- A stimulating and supportive teacher style
- The theme of entrepreneurship is continuously placed on the agenda

This tool was very important as a stimulus not to keep questioning if the children are able to self-regulate or not, but to focus on the opportunities teachers give in their classrooms to develop the ability of self-regulation. They scaled their own learning environment, reflected on the choices they made during class management and chose aspects they thought were meaningful to optimize.

Because powerful interactions during play are an important aspect of the stimulation, we also developed an own instrument on stimulating self-regulation by playing along. To do so, we were inspired by the three-fold model for sensitive interaction of De Haan, e.a. (2008): exploring – connecting – enriching.





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We used this tool for video-coaching and peer tutoring. Therefore, the teachers videotaped their interactions with some children during free-play. They talked about what they were doing well and also discussed other possible options to do in this sort of situations. This was a very confronting, yet powerful learning tool for the teachers.

Analysing the learning process of the teachers

The use of the reflection tools, the meetings, the class-visits and the coaching delivered a lot of information about the professional self-understanding of the teachers and their learning process. We collected and discussed it with the teachers, so they themselves could feedback us about our data.

Here are some conclusions they made during these evaluations:

Teacher 1

- I used to help more... I wanted them to feel save. But it's better not to help, to let them do it themselves!
- I look at free play differently: not just saying 'go and play along...' but I see my role to support, for example by asking thinking questions.
- It's still hard to let go: it feels like they have to do it all alone without me. To give time is hard...

Teacher 2

• Self-regulation is more than self-help or independency, also for toddlers of 2,5 year.



- When I look at my class and see of the amount of material, now I think: less is more! And it works!
- I learned to observe differently... especially when children walk around all the time. I'm aware of the need of impulses, but yet, it can be too much... For example I learned not to talk all the time.

Teacher 3

- I offer a lot of structure, but I know that it's often too much. I'm a person who always wants to fix it... like I want it.
- It's hard. I always want it to be the best quality...
- I need to practice. I need feedback.

Teacher 4

- It's getting easier when you encourage self-regulation and play along.
- I think more about the tools and materials in the corners in my class, what to combine... I was afraid they would make a mess.
- I try to steer less... I think it works. I've become more at ease. But I still need to grow. I can't change it all at one.

A cross-case analysis of the data shows five learning themes for teachers about stimulating self-regulation of young children:

(1) Teachers express the need to reassess the way they look at play in the classroom and at self-regulation.

The concept of self-regulation needed to be broadened. Some teachers realised they only focused on stimulating children to do things on their own. They didn't realise that free play in their classroom was such a challenging and stimulating situation for young children's brains. To really understand it, they had to observe the play in class more profoundly. They learned to look differently, more systematically and more accurately at play. Play, and especially make-believe play, became more valuable to them.

(2) The learning environment is important to improve pre-schoolers' self-regulation.

The teachers marked that the changes they did in their learning environment had an impact on the self-regulation of their toddlers. For some, it meant reorganizing an area in the room and bringing in flexible boxes with new material. For other teachers it meant taking away some of the toys, because there were simply too many. Some even organized an 'empty area', so the children could fill it themselves with own goals and plans. So, both enriching and impoverishing the learning environment can be helpful.

(3) It is difficult to interact and not to interfere during make-believe play.



Not only did teachers learned they underestimated their role in the free play of children, they also learned how being too intrusive as a teacher is not helping the child in taking steps themselves. They discovered the power of an open-ended questions and the power of waiting for the right moment to intervene. This way, they really learned to understand the principle of scaffolding: going step by step to a bigger goal.

(4) Teachers struggle with 'letting go' to give pre-schoolers more opportunities for developing self-regulation

Stimulating self-regulation is a process that takes a lot of time in the beginning. The teachers discovered that they are struggling with taking time and 'letting go'. Very often, they take over a task of fill in an idea for the child, just to make it all go a little bit faster. They also realise they like to have control. Developing selfregulation is not a learning content, but a process. Now they realise that, by giving it time and investigating in the own initiatives of children, they regain the seemingly 'lost time' because the children become more and more self-regulated.

(5) Teachers struggle to give themselves time to learn. On the one hand, teachers realise the importance of self-regulation and want to stimulate it. On the other hand, they became insecure and noticed they need practice. They need time to adapt their teaching. It was very confronting for them to deal with this process. To make stimulating self-regulation part of their daily practice, they have to choose it as an explicit and systematic goal in their own teaching.

CONCLUSIONS AND DISCUSSION

Researchers found that most practitioners stayed out of children's play (for example Fleer, 2015). They fear to interrupt it or they just think it wouldn't be appropriate. Especially, when talking about make-believe play. For some practitioners, their attention goes more to the adult-led activities, the 'real work'. Whereas during free play time, they think it is important to let children play freely, without an adult looking over their shoulder.

On the other hand, some practitioners find it very important to stimulate children during make-believe play. Sometimes they acknowledge a problem during free play, whereas they are disappointed about the quality of the make-believe play. They refer to the power of play for learning and so they want to intervene. Very often however, this is translated as inviting the children to count the cups on the kitchen table, to discuss the colour of the napkins, to explore what 'behind' or 'next to' the glass means, or to explain how to use a microwave. These practitioners utilise play to teach (academic) skills to the children. Nevertheless, such questions may lead children to



stop playing. They are waiting for the next question, and when the teacher leaves, they even seem to have forgotten what they could play. The 'logic' of the children's play seems to be lost. Researchers report findings where teachers disrupt the play of children, because of their often very directive interventions. Pressure about academic readiness can be one reason for this attitude. Understanding the logic of the children's play, on the other hand seems an important issue to intervene on a more facilitating way.

During this study, we found that focussing on self-regulation in play can be an helpful way of dealing with these dilemma's, because cognitive neurosciences pointed out the importance of self-regulation, both for academic learning and for the broad development of children. It is clear that teachers acknowledge the importance, but don't realise that it also means giving children time to play freely and scaffolding their play on an non-intrusive way. To do so, self-regulation must become an explicit and systematic goal in their daily practice. Teachers need to get the chance to revalue the power of play and their role in it. By investigating in playing along during (makebelieve) play, they will be more cognisant of children's play needs. By following the principle of 'exploring, connecting and enriching', the children's 'logic of play' will become clear. They will realise that it is not the amount of interactions that matter, but 'how' they interact with the children that stimulates them most.

Finally, we want to conclude with some implications for teacher-training. Teacher professionalization concerning improvement of self-regulation in makebelieve-play needs to be

- (a) tailored to teacher's needs
- (b) focused on in-depth reflection close to the teacher's practice
- (c) have a long trajectory with frequent contact moments to ensure in-depth learning of teachers.

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THE PROBLEMATIZATION IN PROFESSIONAL EDUCATION INTEGRATED TO SECONDARY EDUCATION

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ABSTRACT

This paper aims to analyse a Problem Based Learning (PBL) proposal developed between the years 2013 to 2018 with the objective of making alternative experiences and reflections of the body culture of movement, health and quality of life. Teachers and students of high school integrated with professional education from the Federal Institute of Education, Science and Technology of Mato Grosso do Sul (IFMS/Brazil) started the collaborative problem solving strategy sought to align with issues of global educational change, such as student-centered learning and active learning. The design of the project includes steps of dialogical mediation during regular classes and personalized guidance with students in the identification of problems, definition of coping strategies, operationalization, data collection for evaluation and public demonstration of the developed process. In addition to promoting meaningful learning based on cognitive, social and affective skills, this strategy seeks to review the role of knowledge and content in the curriculum and school culture in a concrete context. It is also worth mentioning the integration of teachers through multidisciplinary and collaborative learning, factors for developing countries to rethink the training of subjects who will enter the world of work with the skills of the 21st century: critical thinking, collaboration and social awareness.

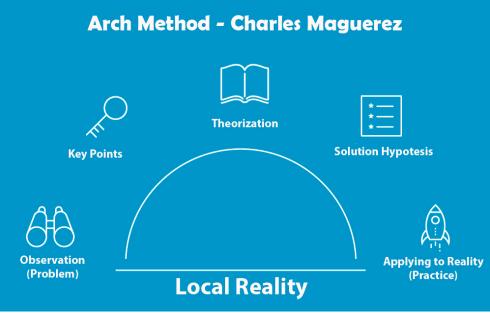
GETTING STARTED: THEORY MEETS REALITY

This action research was based on the assumptions of meaningful learning and Problem-based learning (Delisle, 2000; Woods, 2000) as a fundamental demand for 21st century schools. To propose alternative strategies to traditional didactic work centered on students, approaches were made with the Method of the Arch, by Charles



Maguerez, which had a scheme presented by Bordenave and Pereira (2004), in which there are five stages that develop from reality or a snapshot of reality:

Figure 1. Maguerez Arch



Source: Adapted from Bordenave and Pereira (2004)

The school and formal education go through significant changes worldwide, in order to incorporate new demands and trends that are presented by current social and technological innovations, with direct effects on productive relationships and in the world of work (Dachs, 2018).

In this scenario, the changes in the media and social interaction deserve to be highlighted, especially from the popularization of the internet, social networks and virtual communities (Teng et al, 2014).

Even though the current context represents a new era and a challenge for teaching and learning relationships, traditional teaching approaches, founded on the centrality of the teacher as a transmitter of knowledge, remain widely applied in Brazilian basic education.

The result of the low historical quality of public schools in Brazil has been the recognition that people can be tutored and even achieve good levels of productivity, but they still have a low capacity to develop more complex tasks, which require skills to articulate competencies. communicative and social. Thus, actions to lead, create



new knowledge and make decisions that require historically more sophisticated analytical skills are reserved for restricted parts of society (IPEA, 2006, p. 122).

The traditional model of education, based on the transfer of knowledge by the teacher to the student, on the valorisation of technical training (know-how) and on the dissociation between information and the social context, was widely criticized due to the fact that it does not connect effectively and significantly to interests, needs and particularities of apprentice subjects (Freire, 2011).

Although the origins of the use of active methodologies in formal education have been recognized since the last century, these strategies are considered modern technologies that enhance the active participation of students in the educational learning process, and focus on developing the ability to understand and act in the world. Such action is projected in a critical and conscious way as, when reflecting on reality, skills and competences are developed in practice, both for reproduction and for the transformation of the lived reality, in an autonomous and collaborative way.

With such pillars, the active methodologies seek to promote: (i) alterity, by the centrality of the communicative and collaborative action through which the individual potentialities are united to overcome the difficulties; (ii) sharing, through the establishment of agreements with students regarding the educational process, which becomes meaningful, contextualized and, therefore, endowed with legitimacy and commitment by the subjects involved; (iii) transformative initiative, for sharing students' problems and desires to the same extent that alternatives are sought to overcome them, based on dialogues and practices; (iv) dialogical collaboration, by developing social skills and competences such as knowing how to listen, developing empathy and enhancing learning by putting oneself in the place of the other; (v) critical and creative reasoning, through the experimental exercise of intervention in its own reality; (vi) resilience, through collaboration and cooperation among participants from different points of view and expectations that converge in unified projects (Bonwell; Eison, 1991; Hannafin; Land; Oliver, 1999).

The theoretical framework of this practice-based research involved the idea of professional learning communities as drivers of educational change (Philpott & Oates, 2017) and, in the same way, the research results of networked expertise in empowering teachers' professional development and innovations (Ryymin, E., Kunnari, I., Joyce, B. & Laurikainen, M., 2016).

In addition, we recognize that the theoretical knowledge implemented in real life contexts could be consolidated as the basis for an experimental project focused on learning: the critical reflections of the learning results would represent the culmination of a different training project (Herrington & Oliver, 2000). We also pay attention to the ideas of constructive alignment developed by Biggs (Biggs & Tang,



2011), through which we kept in mind that all teaching and learning activities and assessment methods are planned according to the expected learning results.

As our goal involved creating collaboratively new knowledge on pedagogical change with students, we also rely on the "Peer Group Mentoring", which can be an important catalyst to the interaction to promote continuous professional development as well as learning environments implementation, among other things.

PRACTICAL ISSUES: PROBLEMS AND LEARNING

At the beginning of the project, a wide range of adverse conditions permeated the work developed in our context. Lack of materials, lack of adequate physical structure, teachers 'discredit about students' skills and competences, lack of a clear project of professional training integrated with basic education. In this scenario, some initial questions that motivated this project was:

- How to promote critical and creative training in an environment of traditional people and curriculum, with a reproductive bias?
- How to overcome problems to learn and learn from the problem?
- Can a problem situation itself be an opportunity for learning and overcoming the problem itself?
- How to build a new culture of teaching and learning in which students and teachers are active and interested in the process, as well as becoming confident in the results, regardless of the degree of effectiveness at first?

The problematization that we made to the questions that were presented to our teaching performance were, diametrically, the origin and the tool for the desired transformation of reality.

The context of the problem

The problematization strategy, in our context, appears as an alternative for the pedagogical treatment of the problems faced by students in the scope of the Brazilian public school, and involves issues that hinder or disqualify the adequate training of these subjects.

Our students report that, from a very early age, they are faced with realities and training requirements that differ significantly from those that existed ten years ago, and the skills and competences developed in the traditional school do not enable them to fully cope and solve problems and current conflicts. In the perception of teachers and managers involved with the educational process for the integrated technical training of secondary level, when these students graduate and enter the world of work, they will be professionals who will have to solve problem situations



that go beyond the barriers of the disciplines, requiring innovative approaches and complex (Duch, Groh, Allen, 2001, p.4).

We dare to affirm that, in general, professional education in Brazil progressively approaches this understanding, especially due to the impulse of some teachers and managers who, based on progressive conceptions and interventions that are still punctual, act daily to promote training that goes beyond the domain of professional qualification integrated with basic education (Viamonte, 2011).

Although professional education in Brazil is centenary, a concept aligned with the integral, humanized and humanizing formation of the subjects had a significant impulse through the Federal Institutes. Such institutions, due to their legal nature as an autarchy, have administrative, patrimonial, financial, didactic-pedagogical and disciplinary autonomy, with an organization and functioning structure similar to that of federal universities.

Data from the Nilo Peçanha Platform show that the Federal Network of Professional, Scientific and Technological Education currently has 38 Federal Institutes, two Federal Technological Education Centers (Cefet), 24 Technical Schools Linked to Federal Universities, the Federal Technological University of Paraná and the Colégio Pedro II, from Rio de Janeiro, distributed in 643 teaching units, which together offered, in 2018, more than 11,000 courses for approximately 1 million students enrolled (Plataforma Nilo Peçanha, 2018).

In the central-western region of Brazil, the state of Mato Grosso do Sul joined the Network in 2008, with the implantation of the Federal Institute of Education, Science and Technology of Mato Grosso do Sul, IFMS, by Law nº 11,892, of December 29, 2008.

Turning problems into learning tools

The present teaching experience has been promoted by teachers in the field of physical education in attending students of technical vocational education courses at the high level, in the period between 2012 and 2017, when research and extension actions were incorporated into regular physical education teaching activities at IFMS, Campo Grande campus, located in the capital of the state of Mato Grosso do Sul, Brazil.

In the first two years of offering places to students in the capital of Mato Grosso do Sul, between 2011 and 2012, physical education teachers started discussions and experiments on pedagogical approaches and interventions, due to the recurring difficulty in developing daily didactic work.



The difficulties resulting from the implementation process were perceived in several aspects. With functioning in provisional facilities and without material or logistical resources for the adequate attendance to students, it became evident the need to adapt the teaching work to the spaces and materials available, until didactic resources were incorporated into the institutional patrimony.

In 2013, physical education teachers decided to consolidate differentiated practice practices and build alternatives to the persistent difficulties in complying with the discipline's menus, while institutionally, the overall retention and dropout rates of students increased.

While school failure was associated on the part of teachers in the technical fields with the students' lack of prior knowledge, these requirements weighed as much as the intense volume and pace of new content presented in classes at IFMS, compared to the general scenario of public schools. and regular private.

The debates between managers, teachers and students about such problems became more and more latent, sometimes shading the contents taught by teachers in the fulfilment of their menus.

The constant discursive resumption of students regarding the difficulties they faced caused the physical education team to reflect on the possible contributions of the area to address the issues of learning, permanence and success of students in integrated technical courses.

From this scenario emerged the proposal to systematize problematizing and research practices that focused on the students' daily lives. This proposal was subsidized by the scientific research methodology, with themes and problems presented and developed from the students' perspective, starting from regular classes.

The research activities aimed to stimulate learners in reading and writing, based on the theoretical and methodological assumptions of the scientific approach. As a significant part of the incoming students presented difficulties of expression and written and oral comprehension, the proposal went through a phase of language adjustments in the spaces and times available, the approach to the rules of scientific writing and the sharpening of the critical and creative look at reality.

Experiments were carried out to promote the understanding and appreciation, among students and managers of the institution, of teaching practices that went beyond the comfort zone historically consolidated in physical education classes, commonly taught in the form of theoretical lectures or, still, in practices without due guidance from the teacher.



The dilemmas of the approach were felt throughout the process. In order to overcome the students' previous experience, which summarized their interests in activities such as football and few other sports, practical classes and reflections on the body and its manifestations in the social and historical context, inside and outside the school, were incorporated.

In order to set up the way for the analysis and understanding of the different possibilities of approaching reality and intervening on it, the planning of the area incorporated into sports classes a scientific initiation approach, lasting four semesters.

Based on the assumptions of meaningful learning and Problem-based learning, teachers reorganized their work methodologies to ensure that students could investigate, analyse and seek solutions to everyday problems faced by them or evidenced in their contexts, with themes linked to five axes: physical activity, sport, leisure, health and quality of life.

Since then, the problematization, called by us the approach to scientific initiation, has started with students entering the institution. This first moment represents for students a significant break with the traditional organization of school times and spaces in elementary school, especially considering the change to the semester regime, partial progression and the approval and disapproval by curricular units.

During the first four semesters, physical education classes are distributed in such a way that every 3 weeks there is at least 1 meeting, of two 45-minute classes, for the specific approach of the projects. Thus, in the 20 weeks planned every six months, in 7 of them classes are dedicated to project discussions.

In the first semester, the challenge presented to students consists in recognizing the scientific methodology and the criteria and standards associated with scientific writing, and in the exercise of autonomy, with the collective identification of concrete problems experienced by students in their daily lives based on reflections in the classroom.

After a brief explanation about the proposal and its consequences, through the brainstorm-based approach technique, students are motivated to freely expose their ideas and discuss them in class, collaboratively, for their problematization. Such a strategy seeks to modify the mythical view that science is a field restricted to established researchers, which is sometimes capable of inducing behaviour and inhibiting thinking (Alves, 1987, p.11).

Along with the progressive security in speaking and listening, the group understands that doing science is a collective and solidary exercise, and as social action it is



something possible, viable and compatible with basic education, the stage of teaching in which they find themselves.

Still in the first semester, discussions in the classroom are guided by questions such as: what is science? What is the role of scientific research in the school? How to identify a research problem? How do you identify, define, analyse and act on a problem? What are data collection instruments? What is scientific methodology? How to describe and communicate a scientific initiation work? What is the role of language in this process?

In the transition to the second semester, students are motivated to identify everyday problems, and to take the first steps to formulate problematizing questions. For that, the project files are placed in a virtual folder and shared with the whole room, so that they can read, collaborate and follow the projects mutually.

With the diversity of themes and problems suggested by the students, as well as the difficulties in orienting and monitoring this volume of proposals, in addition to the debates in the classroom, teachers foresee and disclose to students the opening hours, called Student Residence (PE), for individual and collective oriented studies on each theme and methodologies suggested by the students.

Between the second and third semesters, students are motivated and oriented to delimit the listed problems, develop and test data collection instruments, develop statistics and quantitative and qualitative data analysis and, in view of the consolidation of the approach, propose effective actions for application together to the target audience, discuss through alternative practical activities to improve the problematic conditions identified.

As a result, in the fourth semester activities of the most diverse strands began to be incorporated into students' scientific initiation proposals, such as physical capacity assessments, selective waste collection actions, application and website development, social technology prototypes focused on the well-being and quality of life, social snack projects, automation tools for monitoring the use of school spaces and times, educational support resources for people with specific educational needs, political training activities, preparing environments for expression and learning through music and dance, actions aimed at improving self-esteem, self-defence exercises, among others.

At the end of the fourth semester, students analyze and write their experiences in order to demonstrate their learning, displaying banners and presenting works at the Physical Education Exhibition of Scientific, Cultural and Innovative Works, Technologies and Innovations - MOTICEF, an event held annually on campus.



In the opportunities in which the approaches to the problems led to proposals with potential for further developments, students are oriented to integrate institutional projects of extension and research, supported by public notices.

In the development of the work, students are encouraged to seek connections with the technical and professional training of the course, towards achieving the end of course work (TCC), which occurs in the next three semesters. As noted, the continuous increase in the number of TCCs presented with themes from physical education work reinforces the positive impact of the project with students, which can be associated with significant learning.

As it represents something unusual for most incoming students, the approach to scientific initiation faces many difficulties, especially in the first semesters, as barriers to writing, problematization, adaptation to scientific methodology, data collection and analysis demand a lot of time for teaching guidance, and for sometimes they limit the possibilities of further theoretical deepening or even the search for partnerships for the development of certain actions or products in addition to prototyping.

In general, however, the proposal has been highly praised by the local community, including students, who recognize its relevance and differential in the process of training young people served by IFMS, Campo Grande campus, towards their training for the exercise of critical citizenship, creative, reflective and innovative, both in academic spaces, in the world of work and in social life.

CONCLUSIONS

Along this path, students are led to investigate, analyse and seek solutions to everyday problems faced or evidenced in their contexts, in contrast to the traditional teaching model, focused on the teacher and the content. Also, it was based on the assumption that theoretical knowledge implemented in real life contexts serves as a basis for critical reflections on learning outcomes.

The main success factors of the project are associated with the collaborative action reached between the teachers who started it in 2013 and who, in turn, have been able to make several mediations with other teachers from different areas of knowledge to develop proposals for research, analysis and intervention that went beyond the limits of physical education.

In addition, as it is a newly opened school, linked to the federal government and with a technical education modality integrated to high school that did not exist in the state, the differentiated practices proposed could be implemented as experimental and were progressively negotiated, incorporated and adapted to students, who in turn felt



contemplated to discuss and develop selected projects with themes and objects for them, for the improvement of conditions experienced in everyday school life and sometimes with a social impact that went beyond the school walls.

It remains a challenge to overcome the comfort zone historically consolidated in the Brazilian school, with disciplines commonly developed in traditional models, with lectures or in decontextualized practices, with the teacher and the teaching of contents as the center of the process. Under these conditions, sometimes the teaching work, delimited and fragmented by the barriers expressed in the menus of the subjects, cannot provoke students' interest. The shift to student-centered and active learning requires the mobilization of integrated and collective work, which is still to come.

Because it represents something unusual for most incoming students, the problemsolving approach in the form of scientific initiation faces many difficulties, because barriers of writing, comprehension about method, data collection and analysis require a lot of teaching time, and sometimes limit the possibilities of further theoretical deepening or even the search for partnerships for the development of certain actions or products other than prototyping. In general terms, however, the proposal has been highly praised by the local community, including students, who recognize the relevance of the approach to the formation of a new vision and attitude towards the reality and the challenges faced. The lived experiences constitute a differential in the process of training of the young people attended, towards the formation for the exercise of critical, creative, reflexive and innovative citizenship, in academic spaces, in the world of work and in social life.

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IMPROVING WORKING LIFE LEADERSHIP WITH VIDEO REFLECTIONS – MANAGING YZ-GENERATIONS

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ABSTRACT

Videos have been proposed to promote reflective processing that may result in changing one's interaction practices in social situations. Therefore, videos may be utilized to support recognition of individual managerial behaviour as interaction practices in social situations with different generations.

In this study, managers from hospitality sector in central Finland used videos to capture everyday management situations in order to reflect on their managerial practices with the generation y and z employees. Managers analysed and reflected on their own and peers' videos, as well as shared their reflections in small groups in workplaces facilitated by two researchers from the research group. Thus, managers co-constructed the understanding of managerial behaviour stimulated by the recordings. These discussions were analysed to depict collaborative learning. In addition, managers filled in pre- and post-surveys to assess the change of their interaction practices in the company.

Initial findings revealed that analysing one's managerial behaviour, as interaction practices in structured and supported way could be a tool in changing managerial behaviour as interaction practices in companies. Results underline the importance of reflections and collaborative learning to increase understanding of generational



differences to promote the development of servant leadership as well as general wellbeing at work.

Keywords: collaborative learning, workplace learning, video reflections

AIM OF THE STUDY

Managers construct their occupational knowledge continuously in socio-cultural work surroundings (Billett, 2008). To see behavioural change in real life situations, education needs to promote engagement and changes in thinking according to the classical model by Donald Kirkpatrick (1994). In this pilot study, managers' managing practices referring to social interaction with employees are investigated in hospitality sector. Workshop-type training education with reflective discussions are applied to support managers to consider the workplace specific culture as managerial behaviors and employee features as well as socio-emotional aspects in daily working life. We investigate if video observations promote reflective processing supporting collaborative learning to help managers to recognize results of their behaviour and ultimately change management behaviours to consider for example generational differences at work.

Research questions:

- 1. Can videos be utilized to support recognition of individual managerial behaviour as interaction practices in social situations with different generations?
- 2. Can reflective, structured and supported analysis of one's interaction practices be a tool in changing managerial behaviour in companies?

In this first pilot study, as a beginning for longer follow-up study, we present research protocol and preliminary results for video utilization as a tool for reflections. Later in the study, we will focus on the changes in managerial behaviour as social interaction practices at workplaces and if the changes were promoted by the video supported reflection process and collaborative knowledge building.

PRAXIS: MANAGERIAL BEHAVIOUR AND CHANGING WORKING LIFE

Managerial behaviours as communicational and social interaction practices have been emphasized in working life today (e.g. O'Donnell, 2018), as assumptions on management have changed as y and z generations have entered the working life (e.g. Davidson, McPhail & Barry, 2011). Also in workplaces, behaviours are driven my motivations, and in the learning theories, the successful motivation to change organizational behaviours can be described as positive reinforcement (Luthans & Youssef, 1998). In the social context of working life, the individual learning process of managers are intertwined in a socio-cultural work performance requirements, as managers re-construct the occupational knowledge constantly (Billett, 2008). In addition, managerial behaviour can have various consequences to for example follower well-being (e.g. Dierendonck et al., 2004, Kuoppala et al., 2008) and organizational culture (e.g. Tsai, 2011).

As organizational culture reflects for example the beliefs and norms of the employees, including prejudices or incomprehension towards different generations, shifts in the managerial behaviour may affect the whole organizational culture (Robbins & Coulter, 2005). Work culture has been even suggested to be one aspects determining the possible outcomes of the companies (Woods, 1999). Here behaviour can here be defined as how people act in social situations, therefore concentrating on the social context. Therefore, to shift towards servant leadership with coaching style management, behavioural changes of managers could be a driver for a positive change in workplace culture, resulting possibly in better job satisfaction and wellbeing.

Reasons for different managerial behaviour can rise for example from earlier experiences or workplace culture, and be related to self-efficacy beliefs or personality traits. Additionally, personal values of managers can also results in different managerial behaviour (O'Donnell, 2018). Therefore, it is a complex mission to change the behaviour. Nevertheless, it can be assumed, that change in thinking and a new view on social environment and understanding of the results of managerial behaviour and people skills among the managers is prior to changes in (managerial) behaviour (e.g. Kirkpatrick, 1994).

In the context of changing work, the hospitality sector shares many of the challenges of contemporary working life, as in hospitality sector the work days are hectic with constant flow of customers, with shift or 24/7 work environment and a high turnover of workers (Davidson, McPhail & Barry, 2011). Additionally hospitality sector is the largest employer in the world, and employs a large amount of minorities and young people (e.g. Davidson, McPhail & Barry 2011, Kalargyrou & Costen, 2017). Therefore, hospitality sector workplaces provide an interesting multigenerational surrounding to investigate managerial behaviour.

THEORY: VIDEO SUPPORTED REFLECTION TO FACILITATE CHANGE IN BEHAVIOUR

Education interventions may be utilized to pursue a behavioural shift in organizations via reflection. In practice-based organizational intervention studies, aim is often to see behavioural change in real life situations after the change in thinking brought by educational intervention. The classical model by Donald Kirkpatrick (1994) differentiates four levels in evaluating learning. According to the theory, the changes in behaviour or performance in workplace environment may be seen only after first making learning experience engaging and favourable, having increase in level of skills or knowledge via learning transfer, and finally implementing new in behaviour, attitude and/or capabilities at workplace (see also Frash et al., 2008).

The Kirkpatrick (1994), model can be also applied to education that aims to change managerial behaviour in the workplaces. First (level 1: reaction) education needs to change thinking and view on social environment - such as human or generational differences - in a way managers would see it favourable and useful in their work. Second (level 2: learning), education could promote increase in knowledge on how the behaviour can be changed, for example how different kinds of followers can be managed hence transferring the new learning results to practice. In this phase, process might include also changes in attitudes behind the behaviour. Third (level 3: behaviour), managers would implement new knowledge after noticing how they may change their behaviour according to what they learned. Practically this means how much has behaviour changed due to the education. As a result (level 4: results), behavioural changes at workplace social environment would become rooted as new routines in managerial social behaviour, that could lead also changes in workplace atmosphere and managerial culture. (Kirkpatrick, 1994, Kirkpatrick & Kirkpatrick, 2009).

Capability to learn is often considered as a social construction with emotional and cultural aspects (e.g. Pintrich, 2000, Billett, 2008), and can be seen from agency perspective as a possibility to influence the course of learning events (Bandura, 2009, Leijen et al., 2019). In this framework, engagement can be seen as a premise or enabling learning (Meyer, 2014). It is also associated with to the first level in Kirkpatrick' model that could be seen as an expression of attaining "learning mode" as perquisite for learning. Learning mode can hence be described as "a growth mindset" for learning (Heslin & Keating, 2017). Heslin & Keating (2017) emphasize the importance of learning mode in learning leadership skills at workplaces. After all, learning stems from different motives, and building trust as well as open and communicative learning atmosphere facilitates engagement and learning mode as one educational action before knowledge building. However, mediators and moderators may have an effect on experiential leadership development (e.g. Heslin & Keating, 2017).

Reflection can be a tool to turn experiences into learning (Boud, Keogh & Walker, 1985, Zeichner & Liston, 1985). To reflect on justifications of behaviours (why we act the way we act) would in this sense make it possible to increase comprehension on the results of different behaviours (Zeichner & Liston, 1985). Managerial behaviour practices are in the core on servant leadership, but the change in leadership

skills in managing situations is gradual. Reflection might endorse this gradual change by supporting the observation cycle from concrete authentic experiences on behaviours, to formation of more abstract understanding (Kolb and Fry, 1975, as cited in Boud, Keogh & Walker, 1985) possible resulting in a behaviour congruent with coaching style management. Since as in Kirkpatrick model, bahaviour may change after phases of learning and understanding.

If the aim is to promote changes in managerial behaviour, or more precisely communication and interaction practices in workplaces, authentic videos from social situations can be proposed to promote reflective processing (Tochon, 2006). Work days can be hectic and recollections of situations and own behaviour may change by time, and therefore it is helpful for recollections that videos capture the dynamic process of personal and organizational interaction culture, as well as emotions and their expressions as behaviours. Overall, video observations enable seeing own actions from the outside, and make it easier to create a new understanding of own experience. Hence, authentic videos may be utilized to support recognition of individual managerial behaviour in social situations. Videos can additionally be utilized to enhance collaborative learning (see e.g. ViSuAL-project publication, 2018).

Learning is often seen as mediated by social constructions, which would mean that knowledge itself is socially shared (Reynolds, Sinatra, & Jetton, 1996). Collaborative learning refers to practices where students learn together, but it possesses slightly different focus than knowledge building, which refers to process where new cognitive artefacts are created as a result of common goal setting, group discussions and synthesis of raised ideas (Scardamalia & Bereiter, 2003). This requires sharing for example ideas, experiences or for example videos, and building new common understanding or concepts in a shared environment. In this way, sharing videos for the foundation of reflections, can promote new perspectives for building broader understanding, and also management behaviours. Sharing also opens opportunities to compare individual behaviours to those of others', as a starting point for understanding different people in work context (Scardamalia & Bereiter, 2003). Additionally, if reflective processing after sharing is done with possibility for scaffolding, participants can develop in their individual zone of proximal development. In this way, it is possible to influence the development of different managers in different issues.

Overall, promoting positive changes in managerial behaviour to enhance coaching style management is supporting professional development. Joyce & Showers (2002) also point out the importance of learning to learn during professional development: it is seen as important as acquiring new skills and obtaining novel knowledge to implement in workplaces. They also mention among others reflection and collaboration ways to promote development, that support the ideas of earlier research (e.g. Kirkpatrick, 1994 and Boud, Keogh & Walker, 1985).



METHODS

To intervene managerial behaviour at the hectic work today, intense education with supported reflection processes between the compact and limited number of contacts might be achievable for managers' in hospitality sector. Additionally, as authentic videos and reflections can both be utilized as a tool to promote recognition of behaviour and managerial practices in situations with different generations, they could be useful in educational training interventions described.

The research was executed in private, small to medium size, hospitality sector enterprises in central Finland. Two of the enterprises are located in central city surroundings, whereas others are located in suburb and rural area. All of them serve lunch and/or cafeteria products, but two also serve as site for events from which one also serves outdoor activities.

Research design is an observational study with four longitudinal follow-ups conducted in half-a-day workshops. In this paper, only preliminary results from the first and second workshop from the second wave are presented, as the study is still on going. The study can hence be seen as a pilot to reveal new insights into utilizing authentic videos to support reflection, and finally after the last workshops and results from post questionnaires we will be able to analyze possible changes in manager behaviour in daily working life context.

Research is part of two EU funded projects both conducted in JAMK University of Applied Sciences. Study aims to promote work and careers, and it is also one aim of the UAS education institutions where the study was performed in addition to handson experience in practice-based research. In the Video Supported Collaborative Learning ViSuAL (<u>visualproject.eu</u>) pedagogy is developed for video-supported collaborative learning in education practices. In YZ-generation project main aim is to produce practical solutions for managers to improve managerial behaviour in daily work and boost collaborative learning.

In this research, behavior was defined as managerial interaction practices, and relevant indicators of experiences of changes in behaviour were analyzed from self-reflections and collaborative reflections and knowledge building, as well as lay opinions from all employees.

Study protocol

This ongoing pilot study is conducted in central Finland from autumn 2019 to autumn 2020. Total of 10 managers from four small to medium scale hospitality sector enterprises are involved in this second wave of the study, and all of them gave their written consent to participate in the pilot study. Educational intervention in all



four waves consisted of three workshops, video recording of authentic management situations shared with via video platform (Flowboard by Flowbox: www.flowbox.fi/en/home/) and facilitated supportive and reflective discussions passed over about 6 months. Last fourth workshop later in 2020 will gather all four waves of managers, of which only second one is discussed in this paper.

Managers and their followers were asked to fill in electronic pre questionnaire (Webropol) to assess the state of practices and behaviours as organizational culture in the company. This e-questionnaire was sent to all employees in the organizations consisted of background questions, managerial status, former video utilization, openended questions and a question battery. The question battery was divided into two parts: level and importance of multiple aspects from themes: communality, coaching style management and meaning and relevance of own work. Responses to question battery were given in Likert –scale. Later a post questionnaire will be sent to same recipients.

The first workshop was held in a comfortable rustic surrounding in a wooden inn. In the workshop, aim was to build trust, raise new ideas and thoughts on coaching style management, outcomes of managerial behaviour, generational differences and phases of career. After the introduction, managers were given time to discuss on given topics, and later already concentrate on coaching style management and feedback, based on the anonymized summary results from pre questionnaires. Managers discussed the results in small organizational pairs or teams with support from the UAS research team. The structure of the workshop was designed to alternate between educational sessions and discussions supporting mutual trust and open dialogic environment, so that managers were able to receive new theories and ideas, and right after apply and elaborate information and share experiences over organizational boundaries. In addition, hands-on practical guidance was given to utilize the video platform. To build trust for open discussions on sensitive issues, emphasis was targeted on a warm welcome, and facilitating managers to participate and share experiences on and impact of managerial behaviours as interaction practices.

After the first workshop, managers recorded videos to capture a short solo video with a topic "me as a manager", where the emphasis was on factual reflection (Zeichner & Liston 1985). Afterwards, managers analysed and reflected on their own and peers' videos.

Personal contact after workshop was critical to build up trust and boost making videos, and hence experienced research pair visited organizations for appreciative interview (Cooperrider, Whitney & Stavros, 2003). They also gave support and motivated the managers to plan, produce and share the video recordings, if not yet made. During this meeting, managers also shared their reflections in small manager-groups in workplaces facilitated by the two researchers. Thus, managers co-



constructed the understanding of managerial behaviour stimulated by the recordings. Idea on this second round of reflection was on procedural reflection to assess actions (Zeichner & Liston, 1985).

In the second workshop, themes and discussions were deepened with similar structure and ideas behind the workshop plan. After the second workshop, managers use videos to capture everyday management situation (social situation with one or more followers possibly from generation y or z employees) in order to reflect on their interaction practices. Similarly, personal contact from the research team supported the process, with procedural reflection.

Finally, in the third workshop, managers will focus on dialog, communication and interaction practices as managerial behaviour. Group reflections and collaborative knowledge building discussion on managerial behaviour and coaching style management based on authentic videos will be video recorded in the workshop. In the final stages, aim is to reflect on justifications of behaviours in certain situations (Zeichner & Liston, 1985), in order to find grounds for change in behaviours.

Data analysis

To gain picture of the currents starting point for the educational intervention, quantitative questionnaire data from pre questionnaire results were analysed first with partitioned descriptive analyses, followed by cross tabulations, before the first workshop. Open-ended questions were classified into themes. Later pre-survey results will be compared to with the post survey results. Analyses were performed with IBM SPSS 25.0 and R programs.

All video-material posted and shared in the video platform after the first workshop were analysed for subsequent workshop, where they were discussed and collaboratively reflected on. Videos, summaries and observations of behaviour at group discussions and reflections in workshops as well as video recorded appreciative interviews and notes from visits to companies were utilized to point out critical points in learning and gain overall picture of the process and in educational intervention following the Kirkpatrick's model (1994) and levels of reflection (Zeichner & Liston, 1985). From first workshop notes, videos after the first workshop, notes from visits to companies and notes from second workshop were utilized for preliminary results, to assess if videos utilization in a supported way may work as a tool for reflections.

Additionally, from workshops, the video recorded group reflections and collaborative knowledge building discussion on managerial behaviour and coaching style management will be analysed later with concept and social network engagement analyses to depict collaborative learning and concept building. Analysis



will be watched simultaneously with the video recording to combine the information from network-analyses and real-time behaviours.

RESULTS

Participants and descriptive baseline results from questionnaires

Total of 10 managers from four hospitality sector enterprises took part in the first workshop in the second wave pilot follow-up study with four workshops. Only results for these participants will be utilized in this paper. Managers were mainly first level managers. One of the participants was male, rest being females.

Total n=67 employees answered the pre e-questionnaire, from all four hospitality sector enterprises. The questionnaire results give overall glimpse of the current situations in the enterprises, even though the response rate was not high. Of all participants in the questionnaire, 18% were managers of different levels, total of 70% were women, 48% had permanent jobs, and 55% worked full-time. About a third represented generation y (born 1980-1994), and less than a fifth were born after 1994 and hence represented generation z. At the time of the study, generation y participants were maximum of 39 years old, whereas generation z were maximum of 25 years old. Over half of the participants had secondary education, and about a fifth had higher education. Over 60% had been under contract for at least 5 years, but in contrary more than 10% less than one year. Considering the results, sample brings out the diversity of employees in the hospitality sector.

From the whole pre-questionnaire sample (n=67) the most important aspects in communality-theme represent appreciation of the work of other co-workers and experienced social support. On the other hand, level appreciation had lowest average in the theme, but still estimated as "good". In the coaching style management –theme all parts were seen important, such as if manager listens, appreciates and discusses with the follower. However, guidance and feedback were experienced by employees to be only at average levels in practice. This means, that the difference between importance and level of regular feedback was notable, the level not reaching as high. In the third theme (meaning and relevance of own work), all aspects from flexibility and possibilities to influence to meaningfulness were seen important, but overall feedback lacked in the level. To sum, feedback and personal contact with discussion and listening, in addition to guidance from manager were seen as lacking, compared to the high level of importance. These main results especially on feedback were congruent in all enterprises.

From the open-ended questions, different generations had similar answers to meaning of work: flexibility, professional expertise and hospitality, but millennials



(generation z) emphasized more solidarity, fairness and "being yourself". Everyone wished better communication and equality, but less work or hurry.

Preliminary results from videos and workshops

From the discussions in the first workshop, it was evident that first level managers received lots of new information from the ideas of coaching style management, and were able to apply ideas already to their workplace. Managerial good practices, e.g. types of feedback were shared and discussed openly in the workshop. Especially negative feedback and non-formal feedback craved by the younger employees were discussed. Already at the first workshop, managers told that their understanding of the different results of managerial behaviour on different employees (from different generations) changed, and that they received lots of new ideas and thoughts for their managerial work.

On behalf of the videos, as expected, most of the managers were not comfortable in utilizing video technology at the first place, and personal support from the research team was needed to try the video recording to the cloud at the workshop for the first time. After the first workshop, they were encouraged to post the first video soon after the workshop also to allow time for reflections to arise. As managers recorded the "me as a manager" –videos they were shared with manager –colleagues in the same organization. Utilizing videos needed to be personally supported, with hands-on guided first trials with videos and with an easy app or platform to share the videos.

From every enterprise, some videos were captured before the supportive visit with appreciative interview, but not all (n=4) were able to post them before the visit. Face-to-face supportive meetings with professionals and teachers were needed to build trust, and support in video utilizations and start reflection process and to awake the ideas presented and discussed in the workshops. During the visit in the recorded appreciative interviews, managers discussed their factual reflections, expressed their lay opinions and analyzed the generational differences at their specific workplace in hospitality sector. As a summary, many managers noted that "younger" workers might not be committed to work in a same way as the young before. In addition, they reported that "younger" ones speak out, are hardworking, and work community might not be the most important community for them. Generations y and z were mostly seen in positive light. Nevertheless, it was mentioned, that younger have always been different, but now life situations seem to change very quickly, and it has an effect on work, too.

To share the videos, trust building was vital, as managers are already allowed in this first step to peek into these self reports as a starting point in the process. From the videos, we made first preliminary analyses how managers view their work and see themselves as mangers. Few term selections and short notions they utilized drew a narrow picture of managerial work, as some seemed to view managerial work as



mainly giving practical orders to employees. On the other hand, especially the younger managers mention they feel as if they are not "above" other employees or followers, and feel like co-workers instead, but still they have different job description.

Additionally, the importance of formal and non-formal feedback in the core of managerial work raised from the pre questionnaires as well as in the discussions in the visit. Therefore, in the workshops one aim was to discuss and reflect what is managerial work in the sense of coaching style management with different interaction styles. Dialog practices will also be introduced to support the search for mutual understanding in workplaces. In the second workshop in the procedural reflections (to evaluate activity or managerial behaviours), managers discussed meaning of adjusting the style of speaking depending on companion. As a conclusion, many noted that small changes in communicative practices may result in changes in work well-being.

DISCUSSION

Results underline the importance of discussions and reflections to bring understanding of generational differences to promote the development of managerial behaviour as well as general well-being at work. Overall, initial findings revealed that after getting used to making videos, recording and analysing one's management practices in structured and supported way could be a tool in changing thinking, and may result later in changes in managerial behaviour in companies. The results from questionnaires also pointed out the need for training in for example feedback as one interaction situation in managerial work, as a basis for this study.

As practical results, videos utilization in a supported way was a busy process, and may succeed as a tool for reflections if and only if there is enough support accessible and time to spend to facilitate the utilization. I this pilot, we still recognized the need for even more time for discussions and support, as making videos was challenging despite the easy app, and content itself was multisided. However, more emphasis was on purpose not put on theoretical delivery, but on application and open reflection. Overall, discussions had large role in constructing understanding together – workshops concentrated mostly on reflections in addition to theoretical information on generations, new work and management with coaching style.

To utilize videos with employees, personal face-to-face support with easily applied video recording program and platform are vital. Learning mode (Heslin & Keating, 2017) or engagement and enthusiasm towards the understanding of managerial behaviour (as the first level in the model by Kirkpatrick 1994) were enhanced during supported discussions with manager peers. However, to share the videos, discuss and reflect, building trust was planned carefully, and workshops held in comfortable surroundings outside work environment. This sharing and discussions facilitated the

increase of understanding of managerial work, managerial behaviour as interaction, and gave new insights to (generational) differences of employees as well as to daily practices at hectic workplaces. From the appreciative interviews and second workshop, it seems like views and understanding of the participants on managerial behaviour was extended after factual and procedural reflections. Therefore, the workshops were seen as very supportive and important for the increases in learning (level 2 on the model by Kirkpatrick, 1994), and managers already verbally reported changes in thinking (level 3 in Kirkpatrick model) already after factual reflections.

In hospitality industry, many of the enterprises are small scale, especially in central Finland. Therefore, the managers may not have many follower, and they often work next to each other, managers only having some extra tasks. Therefore, it was understandable for many managers to feel, as they are not that different from their followers, and some felt giving feedback difficult. Growing to manager position takes time, and support for communication skills and soft skills may support this development in working life context.

Nevertheless, as managers switch back to working life might the reflection process be seized, and only later we will be able to see if reflections (Zeichner & Liston, 1985) will result in changes in the practical behaviours and if managers in this pilot are able to build knowledge collaboratively in later workshops. Nevertheless, as earlier research already shows, change in leadership style takes time after the recognition of attitudes and behaviours, and sometimes the changes are difficult to apply as the work tasks and work community itself stays the same.

In this paper, generational differences are seen as multifold dissimilarities of the employees. Still, from the point of view of the generational differences, it is notable that the followers and managers were often from different generations, so that younger employees were more often in follower positions. Especially the generation z employees (maximum 25 y at the time of the study) were often still students, or only in the beginning of their careers, and it explains some of the differences. Situations in life are not attached to age, but different phases of life have their special characteristics, also through generational experiences.

As a result, video observations from one's management practices and stimulating managers' learning mode may promote the development of interaction practices and lead to general well-being at work. This knowledge can be applied also in educational context, as teachers may facilitate a change in learning mode with peer discussions and utilize videos as part of assignment or course to promote reflective processing of course material or attitudes towards learning. Additionally, as in education overall, as Joyce & Showers (2002) point out, one aim in professional training is also to learn interaction skills and communication as soft skills development, as well as learning to learn. These educational actions can also support agency.

For future practice-based educational research, this pilot study reveals challenges in utilizing videos, and the importance of building trust in the face-to-face meetings. Discussion and sharing of practices over the company boundaries already introduced new ideas and promoted thinking and seeing own managerial work in new light. Later we will be able to analyze possibilities of interactive training to change managerial behaviours in this type of model with repeated workshops and visits to companies. In the end, as organizational culture reflects for example the beliefs and norms of the employees, shifts in the managerial behaviour may also later affect the whole organizational culture (Robbins & Coulter, 2005). This approach seems to increase the understanding of diversity of employees and generational differences, but as earlier research already shows, change in leadership style takes time after the recognition of behaviours in daily working life social situations.

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CO-CREATION OF EDUCATIONAL INNOVATION IN A SCHOOL-UNIVERSITY PARTNERSHIP. THE EDULAB MODEL

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ABSTRACT

In this paper we introduce the EDULab model, a methodology that aims at connecting educational research, teacher training and school practice when adopting educational innovation. We propose a four-phase implementation model that helps to build a context for (a) developing, testing and spreading innovative teaching methods, and (b) collecting evidence about the suitability of the innovation. We illustrate the proposed model and its phases with four practical cases from Estonian educational settings. The cases focus on co-creation of teachers' technology- classroom practices to support students' learning. The invention phase (0) is based on a math learning case of developing and piloting appropriate digital learning resources. The investigation phase (1) is based on an outdoor learning case of students taking part in a project day at the university to test new technology-enhanced learning practices. The scaling phase (2) is based on "Robots in Early Childhood Education" case of a novel teacher professional development program format, and the sustaining phase (3) is based on Robomath case of teachers jointly with university researchers co-developing new technology-enhanced learning designs and practices. The model supports and encourages social practices in teacher professional development that lead to development of ownership, builds competence and helps in the adoption of innovative teaching and learning methods. For the future, we need to improve the ways of helping teachers to re-use more extensively knowledge created by other teachers, and to formalize and standardize the new educational practices for wider applicability.

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INTRODUCTION

Several previous studies have indicated that adoption of innovative teaching practices is challenging for the teachers (e.g. Webb & Cox, 2004), hindering thus the deployment of educational innovation. Also, the education systems around the world are having trouble with implementing innovations as research findings do not easily end up being adopted by teachers' or being put to use in their classroom practice (Broekkamp & Van Hout-Wolters, 2007). So far, the teacher education for supporting the adoption of new technology-enhanced teaching strategies has usually focused on teachers' individual skills and beliefs (Twining et al., 2013). However, the recent research indicates that coconstruction of knowledge and appropriate practices (Alderman, 2018) could lead to more efficient adoption of innovations in the classroom. Several researchers have suggested different approaches to tackle these challenges, with school-university partnership models as important aspects in majority of these solutions. The Living Labs concept has been introduced in the context of such collaboration models. The Living Labs are used to establish platforms where schools, industry, researchers, government, and other stakeholders can co-create new ideas and concepts to support teaching and learning, as well as improve their skills in a quest to address various challenges (Callaghan & Herselman, 2015).

In this paper we are introducing our Living Labs concept inspired *EDUlab Model*, which could help leading the educational systems to more sustainable, scalable and evidence-based changes in teaching and learning practices. It is a new collaboration model that contains a set of appropriate methods, tools and resources, and involves several stakeholders, including teachers, school leaders and researchers, to create an environment that supports sustainable collaboration. This collaboration stimulates involved teachers' professional learning, and ongoing exploration and exploitation of innovative teaching and learning methods, tested in real settings and accepted by school communities. Theoretically the model relies on conceptions of social learning and knowledge creation, on dynamic theories of innovation adoption, and on teacher professionalization through the means of boundary crossing and inquiry into student learning by using the knowledge appropriation model (KAM) (Ley et al., 2018). In KAM model it is assumed that knowledge appropriation is a key process, mediating between the new knowledge being created and individual's capacities to employ that new knowledge in practice (Ley et al., 2019).

The aim of this paper to introduce the EDUlab implementation model through four different cases and to evaluate its applicability, based on the early evaluations of the case studies. Each of the cases aims at bringing technology-enhanced educational innovations to real classroom by employing extensive collaboration between university researchers

and school teachers. Based on above we have formulated the following research questions that guide this paper:

- a) What are the key characteristics of each phase of EDUlab model when implemented?
- b) What challenges and obstacles can be identified in the EDUlab model implementation process?

EDULAB IMPLEMENTATION MODEL AND CASES

The main challenge of bringing evidence-informed educational innovation to the classroom in a school-university partnership lies in the fact that a common context needs to be created where innovation, learning and research can all happen at the same time. We therefore conceive such a process as iterative, and going through four phases (see Figure 1). Each phase takes the knowledge created in the previous phase and the experiences gained as an input and systematically builds up complexity until a final mature state is reached.

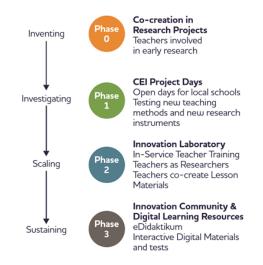


Figure 1. EDUlab implementation model¹.

The main purpose of each implementation phase is to build a common context where:

• Innovative teaching and learning methods can be developed and tested, and spread throughout an educational system;

¹ See also <u>http://edulabs.ee/english</u>



- Professional teacher education can happen; and
- Research about the innovation can take place in order to build a strong evidence base about the innovation's validity.

Next, we are going to describe four cases that were designed to pass the four phases of the EDUlab implementation model. Of these cases, each is in a different phase of research. Although the data collection methods are to some extent different in each case, the cases, however, are connected by various similar aspects. For instance, in all of the cases, we are investigating the innovation adoption in a school-university partnership, using KAM as an analytical tool (Ley et al., 2019). All of the participating teachers were asked to fill in a web-based survey during the different phases of the training. In addition to analyzing knowledge appropriation in a school-university partnership, each of the cases had their own student-centered focus: e.g. concept formation, engagement, and motivation, and therefore the individual cases followed different research strategies and used different research instruments.

Invention (Phase 0)

The lifecycle of an EDUlab implementation process starts with an invention phase of the innovation that will be the core of a future training program. In this phase, literature is reviewed, most appropriate theories and methodologies are chosen, and intervention materials and methods are co-created with selected teachers. This period lasts generally from 6 to 12 months. Research activities falling into this period are literature overview, designing and testing of chosen research instruments, improving of the methodological plan, prototyping etc. Funding in Phase 0 usually comes from a research project's budget and the involvement of teachers is covered by the research project.

The case, illustrating the invention phase, was a project named as "Digital Learning Resources for Secondary Education" for mathematics, natural sciences, social sciences and arts and music. In this study we're focusing on mathematics part that aimed at developing digital learning resources for Estonian secondary schools. The project was running for 10 months and the digital learning resources were co-created in collaboration with 21 Estonian secondary school math teachers, and four university experts (didactic, educational technologists and methodology expert). The participants supported each other practically, methodologically, didactically and technologically. The team met once a month at the university, having trainings on different topics, and co-designing materials together. An online community was created to support teachers in the process. Materials were later piloted by 6 math teachers and ca 130 students – each teacher had to create a learning design around a chosen topic, implement it and participate in the research. The research focused on two aspects: first, we aimed to understand how the

pedagogically and technologically novel digital learning resources were embedded to the teaching process. For this purpose, classes were observed and teachers' reflections about the classroom practices collected. Secondly, we aimed to understand how such a school-university partnership supports teachers to adopt the technology-enhanced educational innovation. For this purpose, teachers filled in a reflective questionnaire, which enabled us to identify the knowledge appropriation practices leading to higher adoption of classroom innovation (Leoste et al., 2019).

The results of Phase 0 (investigation) indicated that it is not enough to make the digital tools available for teachers, expecting that merely this act would lead the innovation to happen. Teachers need to be involved in the co-creation process to design meaningful pedagogical scenarios in technology-enriched classroom, and practices should more systematically integrate the elements of subject, didactics, educational technology and educational psychology. In addition, there is a need for a variety of methods to monitor the implementation of the innovation from the teacher side, but also from the researcher side.

Investigation (Phase 1)

Once the innovation has passed such screening, it is officially admitted into the incubation process. In the investigation phase, the teaching approaches, methods and materials are further developed for use in classroom settings so that their use can be demonstrated to participants (teachers and students) who were not originally part of the research. This should help create awareness about the innovation. Typically, this phase consists of a series of project days in which teachers together with their classes are invited to experience the demonstration of the innovation at the university or at the place the lab has been established. These project days are prepared by researchers together with subject didactics. The participating teachers will experience a possible implementation of the innovated method with their students and should thereby be motivated to participate in further events in the next phase. Because students are participating in these project days, researchers and didactics can test their research instruments that focus on student learning in a fairly controlled but still realistic setting. By organizing several of these events, sufficient data can be gathered to get first solid evidence of the intervention.

Illustrative case under this phase is named 'Mobile outdoor learning'. The project day 'Mobile outdoor learning' was planned as a 4-hour event for secondary education in autumn 2018. This learning event consisted of individual and collaborative learning activities in- and outdoor, which were organised around an authentic and timely socio-environmental problem in Tallinn - construction of a new 4-line road at a seaside. The

main focus of the learning task was to provide students a number of different interdisciplinary learning activities (collecting, analysing and interpreting data for mapping the current environmental situation in the location of a planned road and based on that drawing conclusions) to form an evidence-based opinion about the impact of the road to the surrounding environment. The learning activities were supported by a web-and location-based application Avastusrada, participants' own smartphones, Lego EV3 robots, iPads, a set of Vernier sensors, presentation papers and pencils. The aim of the research around the project day was to test the mobile, inquiry-based learning design supported by a set of mobile technologies to reinforce students' scientific literacy in distributed outdoor settings. In particular, changes in students' conceptual understandings, students' challenges while operating in constantly changing contexts with different technologies and students' overall experiences while being part in this learning event were explored.

The project day design followed a cyclic action research, in which every project day (total 3) was analysed and reflected by two teachers/researchers and necessary changes were made to the design. In the outdoor learning case data was collected with a survey for the students (N=68) before and after the project day, observation notes about students' activities during the group work, students' challenges and progress report during the learning event and by analysing artefacts created by the students in outdoor learning settings.

In the case of outdoor learning, the study demonstrated that the innovative learning design supported with a set of digital and physical tools was considered interesting and engaging for the students and was supporting the students' acquisition of content knowledge. The students got better understanding of the cause and effect relations between the road construction and environmental conditions through hands-on inquiry and environmental data collection activities. Their main challenge during the learning activity was to set up working hypothesis, which were supposed to guide their inquiry activities. The students reported hardly any technological problems. It can be concluded that the learning design for mobile outdoor inquiry-based learning facilitated with various mobile technologies worked out successfully having a positive impact on students' mindsets and improving their conceptual understanding of the topic that was studied.

Scaling (Phase 2)

With the EDUlab method, scaling of the implementation is achieved through a series of in-service teacher trainings, organized by the initiator of the EDUlab and actively supported by the research staff. The goal of this phase is to implement the innovation

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and study its performance in several classrooms across a number of schools. The inservice trainings are planned according to a model called "*Teacher Innovation Laboratory*" (TIL). These trainings are built around the following components (see Figure 2): co-creation activities taking place in teacher-researcher collaboration; activities coordinated by the researchers and didactics experts, instructional practices carried out by teachers, and inquiry activities to monitor the impact of the innovation to students' learning. Teacher-led inquiry, where the teacher's practices are under investigation, can be seen as a way to improve regular teaching in the classroom level, but also as a professional development process for teachers (Hansen & Wasson, 2016).

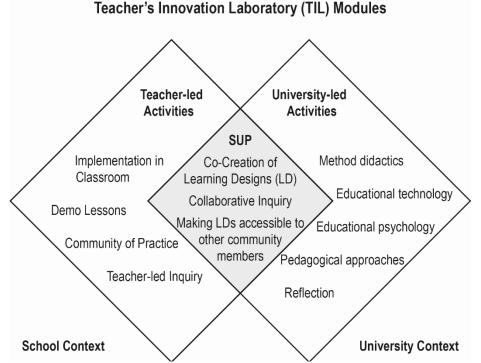


Figure 2. Modules of the TIL Teacher Professional Development Program.

Leoste et al (2019) have described that *co-creation* practices, involving practitioners, didactic and methodology experts, are taking place in such collaborative settings. It is extremely important that the whole process is monitored through a collective inquiry to understand the effect of the new methods, proposed by the university, on innovation adoption by teachers, and on student learning. To study the effectiveness of TIL, a knowledge appropriation questionnaire consisting of closed questions with rating scales

on some key constructs (intended adoption of the method, perceived ownership, perceived maturation, scaffolding, and knowledge appropriation practices) had been developed. This survey was to be filled in by all of the teachers participating in the program during the different phases of TIL.

TIL program was implemented in 2019 in early childhood education with the aim to integrate math or other kindergarten curriculum disciplines through robot-mediated learning activities for children between the ages of 3-7 years. The duration of the program was 3 months and it involved 21 kindergarten teachers and 4 university trainers (experts of math didactics, educational psychology, classroom inquiry and educational technology). The program consisted of four contact days with additional collaborative and individual work between the contact days. The focus of each contact day was chosen to support co-creation of LDs to integrate math and other disciplines by using educational robotics platforms available in participant kindergartens. An online learning community was used for the purposes of facilitating communication, distributing learning materials, submitting individual tasks, and sharing co-created LDs. During the co-creation activities the participants shared their existing knowledge and understanding about the new method to other team members, later to the members of other groups, and to the colleagues of their schools by presenting their LDs. After piloting the LDs in their own practice, each team member was expected to present an analysis of the implementation experience to their peers and researchers. After the final feedback, the teachers could voluntarily share their LDs publicly in e-Koolikott online repository. During the implementation phase, the participants were asked to pilot the co-created LDs with their students, to monitor and reflect the process, and to share their reflections in online community.

In the Early Childhood case we noticed that the adoption rates of the new teaching practices by the teachers who took part in the program were relatively high. Despite of that, the participants did not form a learning community for developing the innovated method beyond the end of the program. The university hosted community founding meeting six months later was participated by only a few members of the original program. We assume that for better sustainability it is necessary to provide the program participants with continuation activities. For example, the teachers could be invited to take part in programs like Digimath where teachers with some previous experience could co-create learning designs for teachers on a national level.

Sustaining (Phase 3)

The final phase of the EDUlab process can best be described as a phase of establishing an active teacher-researcher learning and teaching community that continues to further develop the proposed method, and to carry the study beyond its official boundaries. This phase is supported by the virtual community platform from the previous phase, and gets continuous support from the EDUlabs facilitator for managing and sustaining the community. The community will also be devoted to continuously growing and renewing itself, for example by a) creating local labs at schools, offering training related to innovated method, support and mentoring; b) building a network of teacher trainers and mentors, able to conduct further training (following the guidelines of the TIL method) and to provide local support for teachers; c) recruiting more method-interested teachers to involve them in training and community activities; d) organizing events and becoming an active participant in making education policy; e) providing facilities for teacher training students to have hands-on training about the innovated method.

This phase is illustrated by Robomath (robot-supported math learning) case. The duration of this program was one school year and each participating class (in about 15% of Estonian schools) had up to 15 math lessons supported by educational robots. The teachers (n=137) were provided with initial training in their locality, and ready-made learning designs before the start of the program. During the program the leading researcher supported participants with weekly newsletters and encouraged them to share and discuss their experience in a web-based virtual community. For collecting data about the experience of teachers and students we used qualitative interviews and surveys with teachers, and pre- and posttests with students.

In Robomath case, the robot-supported math lessons influenced positively student learning motivation and engagement (see also Leoste & Heidmets, 2019). However, math teachers needed the help of educational technologists in order to successfully adopt this new technology and accompanying teaching practices.

From Robomath case we discovered that having ready-made learning designs could compromise the adoption of the innovated method by teachers or could lower the chance of method survival after the project ends – despite of having scaffolding through digital learning community or direct support from researcher. In addition, the lack of direct meetings would hinder the development of sustainable learning community. At the moment Robomath case has an on-going continuation study where teachers from 8% of Estonian school are taking part of voluntary monthly co-creation meetings that follow TIL format and are supported by university. The goal of this continuation study is to examine the feasibility of TIL model for creating regional learning communities for further development of innovated method.

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DISCUSSION AND CONCLUSION

This paper described four cases of implementing education innovation in Estonian schools. Each of these cases illustrated one of the phases of the EDUlab model. Taken together, the cases illustrate how the creation of meaningful learning designs and practices that have the potential to enter and be sustained in real-classroom settings are systematically supported through the EDUlab model.

The cases indicated that co-creation practices in a school-university partnership, and scaffolding teachers in design, implementation and inquiry processes will more likely lead to adoption of innovation by teachers. Teachers need methodological and technological support to better understand the value of novel technologies. This support can be provided by the university researchers, but also by the school specialist (e.g. educational technologist) or by more experienced colleagues and peers. Such systematic scaffolding and guidance is embedded in the EDUlab model described in this paper. The model supports and encourages social practices in teacher professional development. These social practices help to build ownership in teachers about new teaching and learning methods which we see as a critical for the wider adoption of innovation in schools. In our future research, we will further improve the ways of helping teachers to re-use the knowledge created by other teachers, and to formalize and standardize the new educational practices for wider adoption in the school system.

Our research results can be used for developing novel formats of teacher training models (mainly in-service training) to enhance the current training formats, and to make them more sustainable and evidence-based. Also, our research contributes to the field of teacher professional development by providing possibilities for analyzing teachers' professional practices in social settings by using KAM. That approach would facilitate discovering the social practices that need better scaffolding, and designing teacher professional development activities that would lead to better adoption of educational innovations.

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DESIGNING EDUCATIONAL TEXTS FOR INTRODUCTORY NATURE SCIENCE COURSE

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ABSTRACT

In this paper, we present basic principles to design educational texts within the Developmental Instruction framework. First, texts should support students' actions planned by curriculum designers. We focus on an introductory science course - it exploits the text-lab-model triad for each learning cycle. Every text provides basic clues to build or differentiate a model of interest, then students test it by hands-on experiments and revise or refine the model accordingly. After that, the students compare the model features with the description in the text. The second principle implies that the texts should provide a cultural context from which an early form of the model has stemmed. Implementation of these principles yields texts that (1) pose problems and describe ancient technologies to answer them; (2) leaves some gaps for students to be bridged, provide hints and clues for modelling of the process of interest - they are found if the students search for them. A model that students build, test and revise is used to explain the process and no other ready-made explanations are given.

We assume that such learning supports the development of students reading comprehension. To verify it, we have started a 3-year macro-cycle of teaching our science course to 3rd-graders within the educational design research approach. In this paper, we discuss students' reading comprehension levels in our experimental class compared to the control group.



INTRODUCTION

The role of texts in education cannot be overestimated – texts pervade the educational process. They can be analysed in different contexts (Bazerman, 2006), among which the most important is students' interaction with texts.

It is not only words that "count" as texts, but also graphs, tables, and illustrations. In addition to textbooks scientific text sources include journal articles, popular magazines addressing science topics, reference materials, and Web content (NRC, 2014).

It is a tendency among modern teachers to consider texts somewhat "peripheral" to teaching (Peacock & Gates, 2000). That may happen, for example, when the texts copy what the teacher is going to say or vice versa. If this is the case, then texts indeed are excessive, and "good" teachers should try to devise their own materials aimed and adapted to their students and textbooks serve only as a guide for the teacher. Nevertheless, studies show that most often beginning teachers are not competent enough to develop their own curriculum and they should be taught to rely on the textbooks (Ball & Feiman-Nemser, 1988). Our question is: "How to design good texts – texts that introduce students to Nature Sciences in particular, texts, that do not need revision or adaptation, but are a powerful tool to organize learning?"

A number of studies show, that design of texts can be varied to improve learning. For example, a conceptual change text design (Mikkilä-Erdmann, 2002; Wang & Andre, 1991) points out the differences between possible misconceptions and the science knowledge to be learned – and it proved to be effective. Similar to refutational texts, that 1) acknowledge reader's alternative conceptions (misconceptions), 2) refute them, and 3) introduce *scientific* concepts and ideas as possible alternatives (Broughton, Sinatra, & Reynolds, 2010; Hynd & Alvermann, 1986; Mason, Gava, & Boldrin, 2008).

These two ideas for text design mainly concern nature sciences because of abundance of concepts that contradict common knowledge. They both assume, that confronting everyday invalid comprehension with scientific concepts is a powerful source for conceptual change. The significance of this idea for text design cannot be overestimated.

Another idea for text-designers is on text-comprehension through appropriate content schemas (Armbruster, 1986). According to this theory, readers understand texts through construction of appropriate content and textual schemas (concerning both: what text is about and the discourse itself). This idea implies that text-designers are to construct texts with schemas in mind, as they are to support a special kind of the reader's work.

We have also found a most interesting argument (McNamara et al.,1996), that a poorly written text may force the compensatory processing to infer unstated relations in the text. Indeed, merely dropping out words that indicate some logical connections ("therefore", "when") resulted in the attempts to bridge the gap by reconstructing the necessary background. These findings contradict the most common view, that "good texts are always better", as they show, that coherent texts supported all readers in solving superficial tasks, but high-knowledge readers benefitted more from a minimally coherent text if the tasks demanded deeper comprehension. The authors conclude, that texts should be adjusted to the reader's level, thus they will always be challenging enough to stimulate active reconstruction of missing connections and yet not too difficult to break down comprehension. We share the same idea that texts are to challenge readers. It is also evident, that according to this theory, educators should also design texts with the reader's activity in mind.

Texts are a significant part of educational environments. Designing texts thus is a responsible work. In this article we will ponder over the main principles of educational texts' design that stem from the Developmental Instruction Theory (by Davydov).

THEORETICAL BACKGROUND

In Davydov's theory the content of what students learn determines the results they achieve (Davydov, 2008). Working within this framework (also rooted in the Activity Approach (Leontiev, 1978)), our mission as psychologists is to construct special work that students are to do in order to get the concepts planned. The method of content's design in Developmental Instruction Theory is called logical-genetical analysis. That is because the most essential thing is to reconstruct the situation of the concepts' origin in the history of human culture thus students can follow it in their own Activity.

We have devised the module "NartURE" to introduce students of age 9-12 to Nature Sciences (Vysotskaya et al., 2017), and we have chosen the reconstruction of ancient technologies as the general context for this curriculum.

The idea of concept acquisition within this particular module is as follows:

- 1) students learn about some technology, that people used to make something they needed for their purposes;
- 2) students try to reconstruct the technology: its procedure and reasons behind the "how" and "why" of the technology;
- 3) students test some of their ideas in hands-on experiments (if available) or find other proofs for their ideas in their life experience (or other sources).

Thus, they receive their future concept from their own activity. This is the special type of activity – learning activity that develops, when a student shifts from solving



a particular problem (reconstruction of some part of the technology) to considering the reasons behind it and modelling basic relations in this domain.

To support this kind of work curriculum designers have to plan and design 1) students actions that will develop into mental actions; 2) models that will become students thinking instruments and 3) materials to support these actions. The latter include hands-on experiments and texts (also illustrations, quotes, terminology, etc.).

In fact, students move within three components of the educational environment: text, model and lab. First, students learn the main features of an ancient technology from a specially designed text; then, they plan and carry out simple lab experiments to test how the technology works, and finally, students construct a model that helps to control the process of interest. As they build the model, they repeatedly refer to the text to look at it through their model and to search more attentively for the pros or cons to the model they constructed or the hypothesis they are planning to test in a lab. Then again they return to their lab and model to adjust them to the new aspects they uncovered upon re-reading the text.

The texts hence have to support this kind of work, which means they are to:

- 1) pose a problem that students would not think of, based on their own experience
- 2) describe a technology but leave gaps, that challenge students to reconstruct missing information
- 3) contain hints, that will be needed to construct models meant for the corresponding domain, but will be noticed only as students will look for them on purpose

This way, texts are not to contain direct explanations, definitions or any other information that will spare students some mental effort.

We also follow here the Theory of Step-by-step Formation of Mental Actions (Galperin, 1989). One of the main consequences of this theory was the idea of an ideal type of learning, which implied, that students are constructing the ways of solving the tasks themselves, relying on basic principles. Students do not receive these principles ready-made, but extract as the reflection of their activity organised as reconstruction of some meaningful human work in the context of the cultural context of concept origin. Galperin listed 3 types of problem variations meant to prompt students so they will repeatedly consider the very foundations of their actions (Galperin, 2002). They are: a) subject variation –it suggests considering the basic relations from different angles; b) logic variation – problems with extra (needless) information or/and some part of information missing; c) psychological variation – confronting visual representations and text (the way it "seems" and the way it "is").

In fact, the features of the texts, we have outlined above, make the text a problem with all three types of variations.



The new way of teaching, we want to provide, deserves the new kind of educational texts. Below we would like to provide an example of the way, a text, designed by these principles, could support working within this new context.

CHAR-COAL BURNING - AN EXAMPLE OF WORKING WITH A TEXT

Students read the text about charring (see Appendix 1). In Russian the word, which means "making coal", goes in word-by-word translation like "coal-burning". This mismatch between the words' meaning and appearance is the starting point for the discussion.

To answer the first question (What is the difference between charring and burning coal?) students refer to the text again, because their immediate answer, that "coalburning" means burning coal makes no sense with the technology they just read about. After they look through the text, they focus on the quote of some ancient author of the XVIII century. In the class the teacher also uses a special reading technique: reading from the last word. First, students read the last word and explain it, than they read two last words (the word before the last and the last one) and explain, what does the other word mean and how does it fit in the sentence. And so on. The reading itself is much slower, but this way students manage to keep track of the sense of the sentence.

According to the principles we outlined, texts are part of text-lab-model triad in the "NartURE" curriculum. A special model – the technological chart – was designed to help students think about the core of the technology. It is constructed from the final product in the end of the chart towards the raw natural materials in the beginning. Students tend to name ash as the final product of charring, but that does not make sense, as ash is not so valuable to burn wood or coal for it (as it can be received as a by-product) and it sure does not need the complicated technology described in the text.

While students ask themselves about the product, they can refer to the technological chart model and can use it as a tool for thinking it this direction (Fig.1). The answer they find after some time is: the result of charcoal-burning is coal and it is needed to make the hottest fire. Ashes will result from burning coal in the forge

As students try to complete the technological chart the next question arises: what are the conditions of making and burning coal? This question is put in the following way in the tasks:

A modern way is to make ["burn" in Russian terminology] coal in furnaces. But people also heat furnaces with coal! What should be the difference between the furnace that makes coal and the furnace that burns it?

Sometimes on the spot, where a fire was burnt, one can collect some coal. The other time there is only ash left. How should you build fire so



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there would be lots of coal remaining? And how should you build fire so that only ash is left?

The question is comprehensible and yet hard: in both procedures you use fire. How does fire "know" when to make coal and when to make ash?

Students experience difficulties, as they try to put the operation "burry a pile under turf" in the right place. They have to coordinate this operation with the results (coal) and materials (they often say, that it is also coal, that is to be buried under turf). The text is constructed thus, they have to search carefully for the answer – the information is not transparent, rather hidden. The clues can be found only, if student's reading is "goal-oriented" and he anticipates, what he will find.

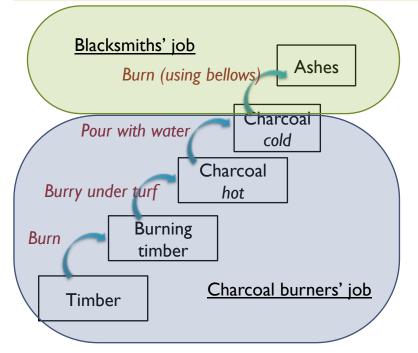


Figure 1. The technological chart of the coal-making process

For example, when students are trying to find, what exactly is buried under turf, they come upon this sentence:

Timber was piled around the fire, it was set on fire and burned until it reached the edge. Then outside timber was moved away and <u>the burning one was buried</u> under turf.

We have underlined the part, where students would hope to find the answer, but the key word is replaced (on purpose by the text designers) by the word "one" which addresses students to the first part of the sentence – and they have to search further. At last they find, that it is burning timber that people buried under turf.



Students also experience difficulties with conditions needed to *burn* coal. It is said directly in the text, that coal is hard to burn. With this direct indication the text designers state the problem, which in other case would skip students' attention. But the answer is disguised: the text, that follows, tells the reader, that "in glass-melting and metal-smelting furnaces bright and hot fire was maintained with bellows that were bloated and squeezed to pump the air". It is not said directly, that it is coal that was burnt this way. Students than have to refer to the very beginning of the text to find, that "you cannot make glass or lime, sucelt metals from ore with a regular fire. The heat from burning wood is too cold for it. Burning coal is hotter, than wood". And that proves, that glass-melting and metal-smelting furnaces burnt coal using bellows, which in its turn adds "lots of air" to the chart (see Fig.2).

Thus, the text is specially designed to be part of the text-model-lab triad. It describes scarcely the ancient technology for making coal out of wood, but leaves important details not transparent. It also clearly states facts, that will pose more restrictions on students and suggests questions, that challenge students to fill in the gaps in technology description (see Appendix 1, questions 2 and 3), or challenges their common knowledge and sense (see Appendix 1, question 1).

The text on charring also supports students' work with the particle model, which is the most important model for Chemistry (Vysotskaya, Khrebtova & Rekhtman, 2018). It models substances through small "particles" and serves students as a powerful tool to think about processes, which we observe on the macro-level, through changes of substances on the micro-level.

To support this kind of work the texts should contain clues for students about the characteristics of products and materials. In cases when technology description is not enough to reconstruct the process of interest on a micro-level, the texts should also provide some ideas on the transformation of substances.

In the fragment on charring there are these lines on the essence of "coal-burning":

"It is known, that even the most dry timber does not produce strong melting heat because of the moisture contained in it, and you cannot use it in most smithery. Hence you have to get water parts out of wood. This kind of work is called coalburning, the resulting combustible substance is called charcoal".

The key words here are "water parts", as the main idea of coal-making is not to get rid of water substance (as the words about "the most dry timber" point to the reader, that the water substance was already driven away), but to burn out the parts of timber particles, that have the potential to turn into water - thus, only pure fuel (coal substance) will remain for future use.



The particle model, also drawn from the final products backwards will look as on the Fig.2.

The detailed analysis of working with particle model is out of scope of this paper – more information can be found in Vysotskaya, Khrebtova & Rekhtman (2018) or Vysotskaya et al (2017). Particle model leads way to the introductory Chemistry curriculum based on cycles of substance transformations. The round arrow on Fig.2 "locks" the cycle of carbon, as carbon dioxide is consumed by trees to make timber again.

The picture of a "charcoal-burner" (Appendix 1) plays an important role also and is part of the text with the same functions as the latter. It may seem that it is a simple illustration, but it also is a clue and a problem at the same time. As students move on with the particle model, they come to the point, where they have to decide on the products that timber is transformed into, besides coal. Though it may seem on the first glance, that the smoke, surrounding piles, is the usual smoke, which is mainly "ex"-carbon transformed into gas that "prevents burning", it is not. If it was going out like it is shown on the picture, than there will be no coal left. The gas that surrounds the pile is mainly water that timber partly turns into.

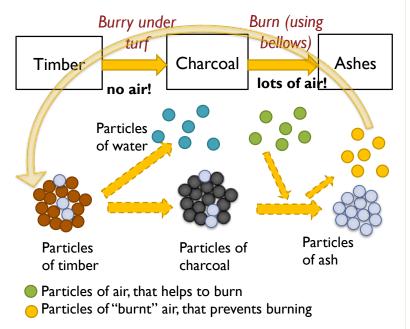


Figure 2. The particle model of coal-making process



METHOD

As we implement Davydov's approach deeply rooted in the Russian psychology heritage, we use the method of "genetic experiment" (Vygotsky, 1934/1986). The modern methodology of the Educational Design Research (e.g. Cobb et al. 2003; Akker et al., 2006) resembles the method of Vygotsky in its' major steps: 1) to set a hypothesis of the way a concept can be obtained by students, 2) to carry out the teaching experiment using the materials specially designed for this purpose, 3) to compare the results achieved with those we anticipated.

In 2017 we have started a new cycle of "NartURE" curriculum planned for 3 years. It was the first time, we tried it on the primary school students: 3rd graders (8-9 years old). We find it important to start that early as we want to prepare students for secondary education thus they will have the questions for the answers they will get there.

Participants

We have started a three-year long module of "NartURE" with one experimental class $(3^{rd} \text{ grade till } 5^{th} \text{ grade})$ of 17 students in 2017. In the 5th grade we had already 26 students, among which 14 students have studied since the beginning of the experiment and 12 joined in the 4th grade. As our control group we used three other classes of the same age in the same urban school, which followed the regular state curriculum on introduction to Nature Sciences. The experimental class was not chosen in any way – except for the consent of their parents to have a different curriculum in Nature Sciences.

The module was held 2 hours a week -68 hours during the school year -204 hours in total. The cycle is in process and will end in May, 2020.

Assessment

We have used the written test "Calendar", which assesses three levels of text comprehension (Ulanovskaya, 2014). The general idea of this diagnostic tool is to test, whether the students learned to use texts as a mean for their learning.

Each student receives the text "Calendar" (the text is split in 5 parts) and 15 questions about it: 6 questions with a choice of one or two correct answers among 4-5 alternatives and 9 open-ended questions. Experts then assess the answers for the latter according to special codes. Each question appeals to one of the three levels of text-comprehension, based on three reader's activities:

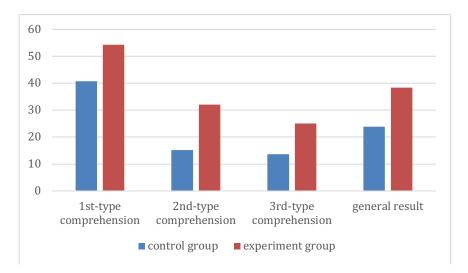


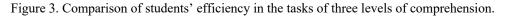
- 1) reconstructive comprehension the reader's ability to reconstruct the events, described in the text. Mainly it deals with "What? Where? When?" questions.
- 2) reflective comprehension the reader's ability to reconstruct the author's logic. It deals with implicit information and answers questions like "Why? For what reason? What would be the consequences?"
- 3) creative comprehension the reader's ability to transfer the text's ideas to other contexts and answer questions such as "What if...?"

We also collected materials for qualitative analyses: videotaped classroom discussions, collected all written works (more than 3 works a year) and scanned students' notes.

RESULTS AND DISCUSSION

The comparison of students' efficiency in the control and experiment classes is presented on Fig.3. All differences are significant (p<0.05 for the 1^{st} type comprehension and p<0.01 for all the rest).





The qualitative analysis shows, that:

1) In the beginning of the experimental teaching students could hardly read the texts. Students had enormous difficulties with grammar constructions. Most of them could not get the meaning after reading the sentence once; many lessons were spent working over a sentence or two, reading them from the last word. In the 5th grade (3rd year of the experiment cycle) students read



fluently and mostly can figure out the meanings of new words from the context.

- 2) Students of the 5th grade refer to the texts repeatedly, and successfully find the clues, whereas at the beginning they were not looking in the text after reading it once unless the teacher directly asked to do it.
- 3) The engagement stayed high throughout the cycle. The teacher needs to moderate the discussion rather than stimulate students.
- 4) Students were working within the text-lab-model triad as planned.

Both: the "Calendar" test and the observation confirm significant gains in terms of text comprehension.

CONCLUSION

Design of educational texts may improve learning (in terms of text comprehension). Within the Developmental Instruction Approach the principles of text-design will be as follows: 1) texts are to support the actions of students planned, 2) texts are to support the cultural context chosen. Within the Nature Science curriculum we devised texts that were to support working within text-lab-model triad in the context of testing ancient technologies by a) posing problems and describing ancient technologies to answer them and b) leaving some gaps for students to be bridged, providing hints and clues for modeling the process of interest.

Our 3-year teaching experiment is not finished yet and we plan to make a thorough assessment in the end of the school year in terms of nature science literacy. We also plan to follow the students, as they will proceed to learning Physics, Chemistry, Biology and Geography to trace benefits in terms of reader's literacy.

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APPENDIX 1

The hottest fire



fire is enough to cook. But you cannot make glass or lime, sucelt metals from ore with a regular fire. The heat from burning wood is too cold for it. Burning coal is hotter, than wood. For this reason people gathered charcoal or made it on purpose. A document from the XVIII century

goes: "It is known, that even the most dry timber does not produce strong melting heat because of the moisture contained in it, and you cannot use it in most smithery. Hence you have to get water parts out of wood. This kind of work is called charring¹, the resulting combustible substance is called charcoal".

Charcoal burners, like blacksmiths, were mysterious and romantic characters of old stories and fairytales.

The simplest way of coal-making was in a pile. Timber was piled around the fire, it was set on fire and burned until it reached the edge. Then outside timber was moved away and the burning one was buried under turf. The pile was left until it ceased to smoke. Then people dug it up and poured water on the red-hot coal left.

After the timber has turned into coal a fire may easily run out. Both: lighting the coal and keeping it burning is rather difficult.

In glass-melting and metal-smelting furnaces bright and hot fire was maintained with bellows that were bloated and squeezed to pump the air.

* Further information cannot be translated in English: In Russian the bellows are called "fur", as they were made of animal's skin. There is also a connection with the word, meaning "bags": bellows, fur (skin) and a bag – all have same roots and the basic part of the word is the same.

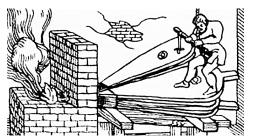
¹ In Russian the word goes like "coal-burning"



- 1. What is the difference between charring¹ and burning coal?
- 2. Why did they pour water on the red-hot coal found in the fire pit?
- 3. Why were they to cover piles (pits) while charring?
- 4.



«Charcoal burning» - Charring



Bellows



ENHANCING ARTISTIC EXTRA CURRICULAR ACTIVITIES TO STRUGGLE AGAINST EARLY SCHOOL LEAVING (ESL)- THE EXAMPLE OF AN EDUCATION TO OPERA (EducOpera project)

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ABSTRACT

The EducOpera project (www.educopera.eu) is a European project, Erasmus + programme, gathering partners with different profiles (Universities, Research Centers, VET organization and an Opera house in France)in five countries-France (leader), Denmark, Italy, Slovenia and Spain. The aim of this two year project is to struggle against Early School Leaving (ESL) through the acquisition of skills & competences by the means of an education to Opera. Three main pedagogical actions are suggested through an education to Opera: listening, acting/playing and singing, plus all the other skills in order to manage an Opera (or similar) show. In complement to a formal education (an education to Opera delivered at school), it may take the form of an extra-curricular activity offered outside school (non-formal and informal learning). Different kinds of competences may be acquired: artistic ones (singing, acting, and playing an instrument), pedagogical ones (history, literature, or sciences...), technical ones (in electricity, make up, dressing, building a stage...), or managerial ones (fund raising, managing of human resources ...). Therefore, it plays a specific role in transversal pedagogical strategies and multidisciplinary learning. The main audience of the EducOpera project includes different profiles of educators- teachers at school (in different matters: language, music, sport...), educators outside school (in associations, music house, conservatories, opera house...), heads of secondary school willing to enhance creative extra-curricular activities together with organizations in their neighborhood as a non-formal and informal learning is more and more taken into account in an inclusive approach of education.



A RESEARCH & PRACTICE-BASED RESEARCH FOCUSED ON AN EDUCATION TO OPERA

At school, education to music is part of a compulsory education. Musical education tackles some main objectives: listening; playing and/or composing; building a musical and artistic education. In complement to a formal education, many extra-curricular activities are offered such as choirs (inside or outside schools) with an annual concert to show the work done among an audience. An education to music combines different kinds of knowledge - history, literature, or sciences. It plays a specific role in transversal pedagogical strategies and multidisciplinary learning (such as history of arts). Many opportunities are offered to youngsters outside school to play the music: in association or conservatories.

An education to opera allows an opening of youngsters to artistic culture. This pedagogical approach is a main asset for enhancing creativity and a harmonious personal development. Opera involves various disciplines such as music, drawing, sports, and dance. An education to Opera may reveal hidden talents, enhances a collective and team spirit, and improves culture and knowledge. It allows acquiring various competences- mastering one's body, concentrating and breathing. It stimulates memory, combines written and oral expression in mother tongue or a foreign language, enriches a personality, and is a main asset for empowerment.

In a praxis based approach, David J. Elliot, rhetorician in education and musician, suggests that an education to music would be more pragmatic than aesthetic. Antti Juvonen states that « *in the heart of pedagogy is the musical experience. Pupils are asked to play the instruments and to sing in order to better understand the music not as an abstraction, but through practice and sensations it reveals. Acting for feeling and understanding before learning a theoretical knowledge, this is the methodological principle*». Learning music enhances a cognitive, emotional, physical and social development of youngsters; it is a main source of creativity. Musical education and more generally artistic education are most necessary for children to become adults open on the world, with relevant knowledge and critical thinking for sharing values with the future generations (Kubik, 2016).

We intent to explain in our article the pedagogical strategy suggested by the EducOpera for students to acquire competences outside school to be taken into account by their educators in their evaluation. This European project implemented in five countries has designed a tool, a mentoring and a guidance for educators to



struggle against Early School Leaving by bridging the gap between formal, nonformal and informal learning thanks to an education to Opera.

A TOOL & MENTORING FOR EDUCATORS TO IDENTIFY AND VALUE THE COMPETENCES ACQUIRED BY STUDENTS THANKS TO AN EDUCATION TO OPERA

The EducOpera is an Erasmus+ project with the defined goal of combatting Early School Leaving (ESL) through the acquisition of skills and competences that come through Education to Opera. Opera is defined as an art that combines "a musical play in which most of the words are sung, or plays and music of this type" (Cambridge Dictionary, 2018). In the EducOpera project, if two of the three elements characterizing an opera (singing/dancing/acting) are present, the activity was suitable - music being compulsory in all cases. The EducOpera perspective not only promotes artistic competences but has a broader approach, including other competences such as managerial, pedagogical, and technical skills.

A first concept of Education to Opera is based on it being part of a compulsory discipline learnt at school – musical education – but one that also promotes Key competences - "literacy competence", "multilingual competence", "personal, social, and learning-to-learn competence", and/or "cultural awareness and expression". In addition, many of the tasks in the program require technical skills that are linked to "mathematical competence and basic competences in science and technology" as well as the managerial competences needed to raise financing and enhance the sustainability of an opera house.

A second concept of the EducOpera strategy is that it is offered outside school as an extracurricular activity. The importance of such activities available to pupils during their free time (and in which they voluntarily engage) is a main characteristic of the project. The involvement in an activity outside of school encourages pupils who might be resistant to traditional learning to become open to other pedagogical approaches and, through them, to acquire knowledge and knowhow and learn how to behave in an informal context. The idea is to combine as simply as possible formal learning delivered at school by teachers with non-formal and informal learning delivered outside of school by educators.

The EducOpera portfolio was designed to equip all educators - teachers at schools and professionals outside of school (in associations or local authorities) with the tools to build a bridge between learning "at school" and learning "outside of school". The portfolio should help them identify and assess the skills and competences already acquired and/or to be developed by young people through an Education to Opera and to support their work with young people facing difficulties at school, including those who have already left school. It combines components of



formal, informal, and non-formal learning. First educators are asked to list the relevant skills and competences acquired by their pupils during an Education to Opera, and particularly to make connections with the eight key competences (EC, 2006). Educators are then invited to combine formal learning (required at school) with non-formal and informal learning (acquired outside school) with reference to the European guidelines (CEDEFOP, 2009).

The suggested mentoring is meant to support any educator (teacher at school and any professional working with youngsters outside school). Extra-curricular activities have a positive impact on the youngsters' behaviour, learning performance, conclusion of schooling and self-esteem and they encourage confidence that youngsters will become successful adults and will be able to take on important social roles (Massoni, 2011). One of the key elements for a positive effect of extra-curricular activities on youngsters is a voluntary choice. Thus, the choice itself and the consequent involvement in the activity bring the first responsibility of the youngster to attend the chosen activity. This is later upgraded with the responsibility of performing the tasks in the framework of the activity and the responsibility towards the mentor, teacher and other participants. The involvement of a youngster in an activity in which he or she feels comfortable and is successful in it also influences the youngster's self-image, self-respect and pride and, consequently, his or her behaviour as well. Being successful in extracurricular activities thus especially contributes to behavioural changes in problematic youngsters.

A third concept of the EducOpera project is an emphasis on competences required at school which have been included in the European Key Competences Framework (as agreed to by all the Ministers of Education from EU member countries). The competence approach has been at the forefront of the European Commission's incentives and numerous projects include it in order to empower vulnerable groups, such as the elderly, early school leavers, youngsters in diversity contexts The evaluation of competences thus obtained is "a key element in national lifelong learning strategies". The emphasis is also on the competences being systematically and correctly recorded, evaluated and then considered in the school system or later in the access to the labour market. Many competences acquired by youngsters outside of the school environment are today still left unrecorded, without selfreflection or evaluation. Nowadays, this can be changed because there are many tools that provide assistance in evaluation either in the form of a portfolio or other, also digital ways of recording competences (i.e. Youthpass).

At last, the ideal to build a bridge for formal, non-formal and informal education in most European countries is not yet functional and although many educational institutions and European policies support such approaches, many of us are discovering that new ideas are extremely difficult to implement in the existing formal education systems.



Learning outcomes (LO)

At the end of the pedagogical sessions the learners (students) have been involved in an extracurricular activity meant to bridge the gap between formal learning and non-formal/informal learning (LO1). The struggle against Early School Leaving is one of the main research areas of the Lab of Experimental Pedagogy of the University of Perugia (Department of Philosophy, Social Sciences and Education). For several years, the group has been using empirical experimental approaches, including the active teaching of competences, in an effort to prevent school dispersion. The group has also engaged in studies focused on how this kind of teaching could affect the learning outcomes of pupils and have an impact on psychological and cognitive dimensions (Batini, Bartolucci and De Carlo 2017, 2018).

Our starting point was that the aim of the EducOpera Project was to support schools in combatting the phenomenon of Early School Leaving as well as to promote social inclusion and pupils' acquisition of new skills and competences through educational activities related to music and opera offered outside of school. The University of Perugia, using a model implemented by the Lab of the Experimental Pedagogy, organized an experimental program related to the project in the framework of Alternative Educational and Training Systems. They have been formalized in Italy under Law 107 promulgated July 13, 2015 for the school year 2015/2016. The intention of the law was to provide a structure for programs implemented in the final three-years of high school that would have a duration of at least 200 hours with the purpose to "increase job opportunities and guidance skills".

Such a program for secondary school pupils was proposed in the form of the EducOpera project through a dedicated national internet portal that defined artistic and musical activities and the acquisition of new skills and competences as its main objective. Since there is no opera company in Perugia, we involved several associations working in the fields of music, theatre, and performing arts education. Activities provided by the participating associations were proposed to third and fourth-year pupils in the framework of Alternative Educational and Training Systems with the support of four teachers from the three schools. The main added point was to promote awareness among pupils about how art and music could boost learning outcomes. The first outcome was to build awareness among pupils about competencies, and how they could apply them in order to fulfill their needs in order to point out the gaining of competencies outside schools and how to value them in the curricular activities. We then implemented a path in order to fill the gap from awareness of pupils and the need to certificate competencies in a national formal level. The second outcome (LO2) was meant to elaborate, and then describe, in a formal way, all the work carried out inside the art and music associations in which they carried out the experience. Students were now made able to reflect on the

experience, and think about how to relate them in the school system. The third outcome (LO3) was reached by the exchange between students and teachers, followed by the university research team, of what the students wrote and documented within the project. Although it could seem a reflective practice on what was implemented so far, we provided also a way of thinking about how to build future plans on how to improve other actions that would lead to an improvement of other levels of competencies, and not only in the immediate level, but in a Lifelong Learning path. The last point was focused on the effective overall outcome they will benefit from (LO5) : « all the activities we carried out....were useful in order to re-evaluate our life at school....but more on what we will be achieving in our professional life".

TESTING & PILOTING THE EDUCOPERA- FEEDBACK IN FRANCE & ITALY

The EducOpera approach was tested in the five countries. We have detailed the one conducted in France and Italy.

Testing in France

The implementation of the EducOpera project took place from 2017 to 2019. The work with the pupils was organized in a close partnership between the Opéra de Massy in charge of gathering professionals with all types of profiles-artists, technicians, pedagogues; the College Blaise Pascal – its head of school and a teacher in French language; and the Institute for Research and Information on Volunteering (IRIV) in charge of supporting the pedagogical tasks among youngsters and the educators involved.

The first year, a demanding planning with weekly sessions was suggested but it didn't work. So the second year was organized differently. The first meeting with the pupils took place in September to define shared rules (attendance, signatures and active participation...), including topics to be covered, profiles of professionals to be involved, and the schedule of the monthly sessions. The pupils had to attend the sessions regularly, at least three to five sessions for the year. Another requirement was to show an interest in the topic of opera. The reward was an evaluation, signed both by the teacher, and the head of the school.

The profiles of the professionals involved were various. A first professional was in charge of pedagogy among a wide audience (thanks to a network of schools, social centres, and the Massy City Hall). A second professional, a make-up artist, combined both technical and artistic skills. A third professional, a theatre director presented a special show she had created. A fourth professional, a comedian played a trust game to prepare the pupils both physically and mentally. A fifth professional, a musician and percussionist gave a lecture to the pupils about his role in the orchestra and the different music instruments played. A sixth professional, an electrician at the theatre, explained how to use different kinds of



lights in a play or an opera. A seventh professional, a conductor combined music (piano) and song (a chorus in two groups, one with boys, the second with girls). An eighth professional, a dancer and choreographer, created choreography for the pupils combining a song by Michael Jackson referring to elements of opera. A ninth session was dedicated to a visit at the Paris Opera Garnier after the youngsters asked for it. A final session, associating the College Blaise Pascal and iriv was dedicated to the evaluation of the pupils.

In complement, a series of pedagogical sessions were conducted among professionals interested in the EducOpera approach or directly involved in the project. These sessions were first meant to gather the feedback from the educators, asking them to identify the weak and strong points of the programme. A second goal was to emphasize the potential benefits of an Education to Opera as an extracurricular activity that might reduce Early School Leaving (ESL) using the competence approach. A couple of sessions were focused on the explanation of the four-step approach suggested by the portfolio with a focus on the eight key competences defined in the European framework. Another main point of the sessions among the professionals was to remind of the importance to combine informal and non-formal learning methods in extracurricular activities in complement to the formal learning proposed at school. A focus was also made on the mentoring / tutoring and a presentation of the evaluation process generated by the Strengths and Difficulties Questionnaire (SDQ). The last sessions tackled the sustainability of the process. A clear connection was made between the experience acquired by pupils during the project and competences required at school: on the one hand, hard skills such as literacy competence (KC1), cultural expression, and awareness competence (KC8), and, on the other hand, soft skills such as regular attendance to the monthly sessions, pupils learning to introduce themselves to adults they didn't know, asking relevant questions about their professions, and actively and positively participating in the programme.

On the basis of the SWOT (Strengths Weakness Opportunities Threats) Analysis conducted after the end of the testing, the key aspects of the EducOpera project were the following. Firstly the holistic approach was a main asset with a pedagogical process including the acquisition of competences that are linked to professionals working at the opera house, and the informal/non-formal learning approach of an extracurricular after-school activity that necessitates the voluntary involvement of pupils in the learning process. A second important benefit was the close mutual relationship built between the French partners - Opéra de Massy , College Blaise Pascal and iriv. In order to implement a sustainable future for the EducOpera, the same kind of partnership has to be built. A third point is the successful programme implemented the second year with monthly sessions. The group was composed of pupils with diverse backgrounds, different levels at school (good, average, or critical), and a balance between boys and girls. The participants had varying knowledge of opera. The shared rules with the pupils have had an



impact on their involvement. As a result, the second year, the rate of dropping was very low and the students suggested a visit to the Opera House Garnier in Paris.

The EducOpera project combined a theoretical and practical approach. On the one hand, the "detour strategy" has been a successful and innovative pedagogical approach implemented in the past years and promoted by educators who work with Early School Leavers. The idea is to find alternative ways for pupils, especially those who resist the methods of the traditional educational system, to acquire competences in diverse learning environments. On the other hand, the practical implementation of the two-year project emphasized the necessity to carefully select youngsters, to offer a regular but not too demanding schedule as this is an extracurricular activity, and to actively involve them in all activities. An active support has to be provided to teachers and professionals working in the field of opera. They must be convinced by the competence approach, with a relevant pedagogy & tool such as the EducOpera portfolio & tutoring for educators together with an evaluation focused on competences rather than grades

Testing in Italy

The University of Perugia, using a model implemented by the Lab of the Experimental Pedagogy, organized an experimental program related to the project in the framework of Alternative Educational and Training Systems. Alternative Education and Training Systems were formalized in Italy under Law 107 promulgated July 13, 2015 for the school year 2015/2016. The intention of the law was to provide a structure for programs implemented in the final three-years of high school that would have a duration of at least 200 hours the purpose of which was to "increase job opportunities and guidance skills".

Such a program for secondary school pupils was proposed in the form of the EducOpera project through a dedicated national internet portal that defined artistic and musical activities and the acquisition of new skills and competences as its main objective. Since there is no opera company in Perugia, we involved several associations working in the fields of music, theatre, and performing arts education, and selected four of them to participate in the project. Activities provided by the participating associations were proposed to third and fourth-year pupils in the framework of Alternative Educational and Training Systems with the support of four teachers from the three schools. Once the associations were chosen, the pupils entered a preliminary phase of training at the University of Perugia and undertook a twenty-hour introductory training course at the individual associations. Both pupils and teachers were informed about the EducOpera project, its goals and purposes, as well as the role and the activities of the associations involved with the aim of prepared them for the activities in which they would later be participating. The meetings focused on competencies both at the European level (key competencies) and at a national level (sixteen basic competencies). They also tackled opportunities for work programs with the associations that would make use



of the acquired competences and on the certification of the acquired competencies at school.

At the end of the initial activities within the associations (totaling some sixty hours), the final phase (another twenty hours) was used for evaluation and the enhancement of what was achieved. The pupils, along with the Italian team and the educators/teachers of the school, also worked on balancing the skills achieved during the experience by using the VAEB (Valuing a voluntary experience, iriv & alii, 2006) tool. In parallel, we implemented various sessions with teachers outside and inside schools. Feedback was collected from the participants. Teachers and other stakeholders expressed interest in better understanding the eight key competencies. They also focused on the four transversal skills, considering "learning-to-learn" and "social and civic competences" to be the most significant and the "closest" to the activities carried out by the associations. Several participants found it useful to "fix" in a certain way the eight competencies by making a precise diagram which could be used in order to spread the knowledge among operators and teachers thus preventing the risk that they would not recognize and value them as much as they actually deserve because of a lack of familiarity.

During the second year of the project, mentoring for educators – both school teachers and professionals outside school – was provided during a series of seminars. The aim was to help these actors to implement the EducOpera project using the output of the research and activities that took place during the first year. The seminars had both theoretical and practical content as well as an introductory discussion on school dispersion and Early School Leaving. Those who attended also learned about official strategies to prevent and combat these phenomena and their potential effects and were presented with an analysis of different types of learning (formal, non-formal, and informal).

The seminars included a debate on the Intellectual Outputs of EducOpera in order to gather feedback from the participants. Meanwhile pupils were engaged in the activities of the Alternate Training and Education system, following the same programme that was provided for during the first year of the project. At the end of the experience, an open debate ensued to gather feedback from pupils and other stakeholders such as teachers, volunteers, educators, and professionals. Opinions on the programme were collected during the training sessions intended for both pupils and teachers and through an online questionnaire. This information was used to improve tools created at the European level for the EducOpera project. The main opinion expressed by participants was that an experience such as EducOpera, especially because it is framed in an Alternative Training and Education system, can help pupils to acquire transversal skills and competences that may be valuable in life and at school. Participants were also positive about the tools and methods used in the project by educators, professors, and professionals from the



associations. All of our debates, discussions, questionnaires, and meetings have shown the remarkable potential of the EducOpera project for pupils and the positive impact such experiences can have on their development. Professors, educators, and professionals all believe in the importance of supporting schools in combatting the phenomenon of Early School Leaving, promoting social inclusion, and the pupils' acquisition of new skills and competences through educational activities outside school related to music and opera.

We decided to frame EducOpera activities within the context of the alternative education and training law in Italy, thus creating a replicable model and implementing a path that will continue beyond the scope of the project. We offered students an unusual and different option for an alternative education and training experience that was much appreciated and produced excellent results in terms of satisfaction and personal growth, educational success, and the acquisition of new competences and skills. We also co-administered a test to all participants in order to evaluation changes in psychological dimensions such as perceived self-efficacy. To summarize: the participants improved their scores in dimensions such as "finalization of actions" (i.e. the ability to plan and finalize any kind of working action), "relational fluidity", and "context analysis". The activities are interchangeable and may be revised and adapted according to specific needs and the area of implementation.

LESSONS LEARNT IN TERMS OF LEARNING STRATEGY TO STRUGGLE AGAINST EARLY SCHOOL LEAVING (ESL)

On the basis of the implemented testing thanks to the EducOpera project many lessons can be learnt.

Lessons for the pedagogy to be implemented to struggle against Early School Leaving (ESL)

The first lesson learnt is that an education to Opera is an example of extracurricular activity addressing a wide audience ; firstly educators who would like to include the EducOpera process in their pedagogical approach ; secondly heads of schools (with pupils aged from 13 to 15 years); thirdly representatives of NGOs offering extracurricular activities to youngsters ; fourthly members of local governments offering a support to families whose children might face difficulties at school with the goal of preventing Early School Leaving (ESL).

The second lesson learnt is that the combination of these different types of professionals should enhance a better guidance to identify, evaluate, and also



support educators involved in extracurricular activities with the aim to build a bridge between formal learning (acquired at school) and non-formal and informal learning (acquired outside of school). The more various the profiles and responsibilities the better the impact on the public policy meant to struggle ESL.

The third lesson learnt is the innovative part of the EducOpera project as the tool and method designed includes not only an artistic focus, namely, the learning of singing, acting, and playing music (the three compulsory elements that describe opera), but also many other skills linked to the activities of an opera house such as technical skills (electricity, makeup, costume design, construction of scenery), managerial skills (fundraising, human resources, project management), and pedagogical skills (historical/cultural background). This was certainly one of the most convincing part among participants as the youngsters could discover other professional profiles and therefore opportunities for a professional future.

The fourth lesson learnt is the necessary evaluation of the cognitive impact of an Education to Opera on pupils (the assessment of competences acquired and those required at school, etc.). The tool and method portfolio suggests a four-step approach in how to use Education to Opera to acquire experience relevant to the development of competences required at school and to combat Early School Leaving (ESL). This is most important in order to build a very tangible link between formal learning (competences acquired at school) and informal/non formal learning (competences outside school).

A fifth lesson learnt is the meaningfulness of providing a detailed description of the testing conducted in different countries (opera in France, secondary schools in Italy, local schools in Denmark, association for opera in Slovenia, a variety of schools in Spain) as it has been conducted in different educative systems, with various roles played by extracurricular activities and a discrepancy in the importance or understanding of the competence approach. The profiles of the participants, in particular the professionals working in Opera houses (different background and experiences) or even the teachers (specialising in diverse topics) are useful to implement the EducOpera process.

A sixth lesson learnt is the different understanding and application of the Strength and Difficulties Questionnaire (SDQ) which includes social and emotional dimensions as well as hyperactivity and attention. It has to be carefully explained as some educators may be reluctant to use it, this has been the case in France. The practical exercises along with a survey for both educators and youngsters (in order to evaluate the level of competences acquired) are much more convincing. The most meaningful example has been given by the Slovenian team which succeeded to create and present an Opera show. A seventh lesson learnt is the change in the perception of the Opera, in the first place perceived as elitist, especially by people living in sensitive urban areas. This has been a main positive impact of the EducOpera project. At the end of the two year testing with regular pedagogical sessions, youngsters didn't see themselves as spectators but as potentially actors of the different tasks and activities required by a Opera house. Some of the participants decided to start an artistic activity at the end of the testing, music or dance.

Lessons for the cognitive approach

The potential power of Education to Opera combines musical and verbal narrative elements and encourages the development of a range of emotional and cognitive components through the merging of it various constituent elements. Numerous neural circuits are involved in its narrative decoding (Batini et al. 2016, 2018). The cortical areas involved in the perception of movement are also activated when subjects read or listen to transitory verbs within a narrative itself (Wallentin et al., 2011). This activation is stronger when reading a narrative text than when disjointed sentences are read together (Kurby & Zacks, 2013).

Through the combination of narration and music, the understanding of intentions and emotions, and empathizing with characters, stories contribute to the development of skills for correctly decoding beliefs and intentions in the real world (Kidd & Castano, 2013). Empathizing with a character not only implies understanding the emotional state of another person but also the ability to experience emotions along with the character (Brink et al., 2011). To summarize, Education to Opera, because it combines music and narrative, can act as an amplifier in the following areas: first of all language: there is a strong correlation between language and music. In fact listening to songs and melodies facilitates language learning. Moreover the development of sound coding is enhanced and this helps in the understanding of foreign languages but also memories: music can be used to remember things that have been learned and is therefore a good tool to develop mnemonic skills.

Another really important dimension is creativity because children with musical skills have a greater degree of creativity than children who demonstrate less musical ability. Creativity and music reinforce each other. But we could think about another cognitive level and functions: Spatial intelligence which is the perception of distances and forms in the surrounding environment. Studies have shown that the sense of orientation is closely related to active listening of music. More even important, emotional intelligence which means that music and melodies have always been able to arouse emotions and feelings of the most varied kinds. Depending on the type of music and the particular moment, listeners may be able to refine the perception of their emotional states and decode their feelings.



And we can say more. In most cases, children with the musical skills that come with the study of an instrument have a predisposition to learn and succeed in logic and mathematics. Analytical capacity is developed as the brain interprets the notes as symbols that create the whole that is the melody. And finally, music helps children develop general life skills, the basic emotional, cognitive and relational skills that all people learn over the course of a lifetime. Concentration, perseverance, commitment, dedication, self-control, and assertiveness are all skills that are developed with the study of music, especially the mastery of an instrument. Educational systems should participate not only in the traditional education but should also provide experiences that can mobilize the transversal competences of pupils. In this sense, schools are often not effective, and non-formal or informal learning activities can become essential in the lives of pupils in order to mobilize a series of resources and skills that will serve them not only in the school environment but over the course of their lifetimes. As we have seen, education combined with the effects of learning with music, including its narrative component, has the potential to become a real "gym" for cognitive, emotional, and linguistic skills and in general for what we call "360-degree" cognitive empowerment. Extracurricular, and in particular musical, activities can encourage the maturation of these transversal competences and thus is an approach that brings these competences into the curriculum of pupils to improve both formal learning and the achievement of life skills

CONCLUSION

We believe that the maximum expression of the project has been to provide students with a new way of conceptualizing and using their interests (cultivated outside of school) as important educational elements at school level. Very often these are not recognized, valued and used within the school curriculum. The real innovation brought by the EducOpera project has become a starting point to review what is the relationship between school learning ...and all that is non-formal teaching that takes place continuously and in a very productive way outside of school. Life is not made of rules and formalities. It's made up of learning. Sometimes unconscious, that we have to take seriously in a world that is changing frantically. In this sense EducOpera has tried, and will try, to accompany this change in order to accompany new directions of learning, development and student empowerment.



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TEACHING DIAGRAM KNOWLEDGE THAT IS USEFUL FOR MATH WORD PROBLEM SOLVING

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ABSTRACT

Math word problem solving is considered important for developing real-life skills (e.g., OECD, 2016). In solving such problems, diagram use has been reported to be effective (Hembree, 1992; Uesaka et al., 2007). However, even though teachers demonstrate the use of diagrams, students generally do not use them spontaneously, and when they do use diagrams, they tend to use them ineffectively (Uesaka & Manalo, 2012). In part, this contributes to the prevalence of difficulties in problem solving (e.g., Hegarty et al., 1992; Uesaka et al., 2007). Recently, it has been demonstrated that both diagram knowledge and practice in using them are necessary to promote spontaneous use (Ayabe & Manalo, 2018; Manalo & Uesaka, 2016). The present study investigated the specificity of diagram knowledge necessary to facilitate effective solving of particular kinds of math problems. Forty participants $(15.0 \pm 3.1 \text{ years})$ were provided specific diagram use knowledge (tables or graphs) and then given problems to solve. At pre-test, they seldom used diagrams. After intervention, increases in diagram use ($\eta_G^2 = .36 - .57$) and correct answer rates $(\eta_G^2 = .30 - .52)$ occurred only in the problems that matched the diagram knowledge provided. This result clarifies the need to teach students about using particular types of diagrams for different kinds of problems.



INTRODUCTION

Diagram use has been reported to be particularly effective for solving mathematical problems (Hembree, 1992). Larkin and Simon (1987) suggested theoretically that a "good diagram" could group together all information that needs to be used together (i.e., promoting easy search), enable the use of location (i.e., reducing the need for symbolic labels), and support many perceptual inferences. However, no standard method has been established for teaching students how to construct "good diagrams" in teaching practice. A series of strategic knowledge such as knowing that, knowing how, and knowing when and why is considered to be effective for successful learning strategies use (Paris et al., 1983). However, students tend not to use diagrams spontaneously (Uesaka & Manalo, 2012) – although, when provided knowledge about diagrams (diagram knowledge) and adequate practice in use of diagrams, it has been demonstrated that students increase in spontaneity in diagram use (Ayabe & Manalo, 2018; Manalo & Uesaka, 2016).

One important limitation of most previous research, however, is that increases in correct answer rates in solving word problems had not been reported despite increases in students' spontaneity in using diagrams (e.g., Uesaka & Manalo, 2006, 2008; Uesaka, Manalo, & Ichikawa, 2010). The lack of evidence for improvements in correct answer rates may be possible to explain by using the concept of domain specificity of diagram. Domain specificity is considered to be a property in which a mechanism specializes in a particular type of information processing, while domain generality is a property in which a mechanism can process any type of information (e.g., Fodar, 1983; Japanese Society for Cognitive Psychology, 2013). Thus, diagrams might promote not only various visual inferences by representing shapes, quantities, colours, and movements (domain generality), but also specialized inferences (e.g., number inference in tables, intersection inference in graphs; domain specificity).

Larkin & Simon (1987) also indicated that we can benefit from diagram use when we know the benefits of diagrams that facilitate the required computational processes, and when we can make the required diagrams. Manalo et al. (2019) suggested that for diagrams to be useful, they need to facilitate abstraction, linking of essential components, and clarity. This suggests that the use of diagrams in math word problem solving does not always lead to beneficial effects even if the nature of the diagram matches the inference type. Such use can only be beneficial if the user possesses the domain-specific knowledge to work with it (see Figure 1 and 2).



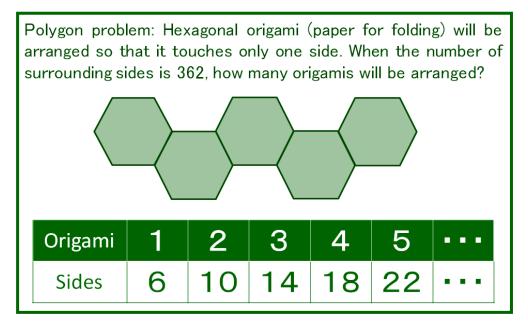


Figure 1. Diagram use example for polygon problem.

The diagram/drawing of hexagonal pieces of paper above might be useful for various inferences because its shape and portrayal of location can be helpful for making visual inferences, but not necessarily for making numerical inferences. In the table just below it, information about the shapes and the location is omitted by abstraction, but the information provided is facilitative of numerical inference because it focuses on the number changes.

The present study was aimed at developing a teaching method to develop students' knowledge about the use of specific types of diagrams in math word problem solving. The research question was whether diagram knowledge (i.e., how to use tables or graphs) would increase diagram use and facilitate effective solving in corresponding kinds of problems (Figure 3).

More specifically, we were interested in finding out if teaching students about the use of tables for solving math word problems that were deemed as likely to benefit from the use of tables, would result in increases in diagram use and correct answer rates only in those kinds of problems – or if diagram use and correct answer rates would also increase in math word problems deemed to require the use of graphs. We asked the same question in the case of teaching students the use of graphs.



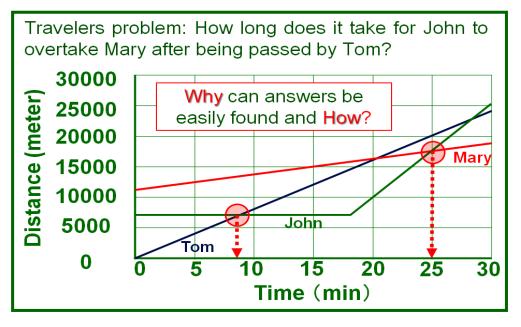


Figure 2. Diagram use example for travelers' problem.

The diagram (graph) above is a virtual plane where distance and time are mixed (it cannot exist in the real space). However, the information provided is facilitative of visual inference of intersections because it focuses on linking distance and time together.

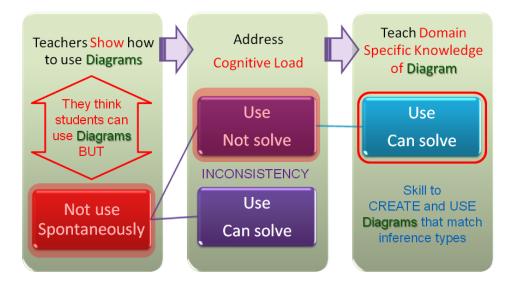


Figure 3. What we addressed in the present study (Research Flow)



METHOD

The research implementation procedure was reviewed and approved by the ethics committee of the university to which the lead researcher belonged. The participants were provided an explanation of the experimental procedures in advance, and they gave their consent to participate by signing an agreement form. The experimental design was a two-factor mixed design of diagram type (table / graph: between participants) x test phase (pre-test / post-test / follow-up: within participants). Forty participants from elementary school level to undergraduate university level (mean age 15.0 ± 3.1 years; 12 women) were recruited. They were divided into two groups matched by age. The table group was instructed only on table knowledge and the graph group only on graph knowledge (Table 1).

Implementation schedule					
Session	Test or Intervention	EEG	Table Group	Graph Group	Day
1	Pre test		Table Problem Graph Problem		1st
2	Intervention		Table Skill	Graph Skill	1st
3	Post test	•	Table Problem Graph Problem		15th
4	Follow up test		Table Problem Graph Problem		29th

Table 1Implementation schedule

The experiment consisted of four sessions: the pre-test, teaching of diagram knowledge (tables or graphs), the post-test (after 2 weeks), and the follow-up test (after 4 weeks). Only the third session was conducted in the laboratory to measure brain activity (EEG) of the participants as they attempted to solve the problems given; the other sessions were carried out in usual classrooms.

In all test sessions, the table and graph problems were randomly provided. These problems were all math word problems (Table 2). The diagrams and answers produced in the test sheets were scored using appropriate rubrics (see Tables 3 and 4).



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Table 2 **Problem used**

	Table problem	Graph problem
	Isomorphic Polygon Problems	Isomorphic Travel problems
Session 1 Pre-test	There are several pieces of origami paper (paper for folding) of a regular octagon with one side measuring two centimeters. You will arrange these pieces one by one in order. One side of the newly placed origami piece can be arranged so that it touches only one side of the origami piece already arranged. There is no need to consider whether the subsequent origami piece touches another side of the newly placed origami piece. If you arrange twenty origami pieces, what will the length around the figure be?	A yellow, a red, and a green train will run from station A to station D. Station B is at 7200 meters and station C is at 12600 meters from station A. Each train runs at speeds of 1200 meters/min, 2000 meters/min and 600 meters/min respectively. The yellow and the green train will start at the same time, and the red train will leave just 13 minutes after they leave. How long does it take for the red train to overtake the green one, after being passed by the yellow one?
Session 2 Post-test	There are several blocks of a regular hexagon with one side measuring two centimeters. You will arrange these blocks one by one in order. One side of the newly placed block can be arranged so that it touches only one side of the block already arranged. There is no need to consider whether the subsequent block touches another side of the newly placed block. If you arrange thirty blocks, what will the length around the figure be?	Tom, John, and Mary are heading to the amusement park. The station is at 7200 meters and a bus stop at 11000 meters away from Tom's house. Tom will go by car from his house at 800 meters/min, John will go by train from the station at 1500 meters/min, and Mary goes by bus from the bus stop at 250 meters/min. The car and the bus will leave at the same time, and the train will leave just 18 minutes after. How long does it take for John to overtake Mary, after being passed by Tom?
Session 4 Follow-up test	There are several tiles of a regular pentagon with one side measuring two centimeters. You will arrange these tiles one by one in order. One side of the newly placed tile can be arranged so that it touches only one side of the tile already arranged. There is no need to consider whether the subsequent tile touches another side of the newly placed tile. If you arrange forty tiles, what will the length around the figure be?	Bob, Mike, and Jane are heading to the baseball stadium. A bus stop is at 640 meters and Jane's house at 2240 meters away from Bob's house. Bob will go by bike from his house at 160 meters/min, Mike will go by bus from the bus stop at 320 meters/min, and Jane will walk from her house at 80 meters/min. Bob and Jane will leave their houses at the same time, and Mike will leave just 17 minutes after. How long does it take for Bob to overtake Jane, after been passed by

Jane?



EAPRIL 2019 CONFERENCE PROCEEDINGS

Table 3Rubric for diagram appropriateness (Diagram score)				
	Scr	Criteria for scoring diagram appropriateness		
-	0	no diagram is included		
NOT	1	a diagram is included but it is NOT the one deemed appropriate for the problem, and it does not contain or represent ANY of the important numbers/quantities from the problem		
NOT Appropriate	2	a diagram is included but it is NOT the one deemed appropriate for the problem, and it does NOT contain or represent ALL of the important numbers/quantities from the problem		
	3	a diagram is included but it is NOT the one deemed appropriate for the problem; however, it contains or represents ALL of the important numbers/quantities from the problem		
Appropriate diagram	4	a diagram deemed appropriate for the problem is included, but it does not contain or represent ANY of the important numbers/quantities from the problem		
	5	a diagram deemed appropriate for the problem is included, and it contains or represents some but NOT ALL of the important numbers/quantities from the problem		
	6	a diagram deemed appropriate for the problem is included, and it contains or represents ALL of the important numbers/quantities from the problem		
	7	a diagram deemed appropriate for the problem is included, which contains or represents all of the important numbers/quantities from the problem, AS WELL as ONE of the necessary additional inferences about the solution to the problem		
	8	a diagram deemed appropriate for the problem is included, which contains or represents all of the important numbers/quantities from the problem, AS WELL as BOTH additional necessary inferences about the solution to the problem		

Note. The combinations of numbers of overlapped figures (such as tiles) and corresponding sides were regarded as a table even if not partitioned by ruled lines. Only a diagram with plots/lines in an orthogonal coordinate system was regarded as a graph.



Table 4Rubric for answer completion (Problem score)

	Scr	Criteria for scoring answer completion				
	0	Neither correct answers nor necessary numbers/quantities are included.				
Not	1	ONLY ONE of the necessary numbers/quantities for either answer are included, and no correct answer is included.				
ct	2	BOTH necessary numbers/quantities for either answer are included for either answer, but no correct answer is included.				
Correct	3	Correct answer is included, but NO necessary numbers/quantities are included.				
	4	Correct answer is included, and ONLY ONE of the necessary numbers/quantities is included.				
	5	Correct answer is included, and BOTH necessary numbers/quantities are included.				

Note. Necessary numbers refer to the ones needed to infer the answer, or the ones arithmetically computed by using the information given by the problem for preparing diagram use.

RESULTS

All main effects for both factors (diagram types, phases) were significant in both problem types. Simple main effects of all diagram scores and problem scores where the diagram instruction and the problems matched were significant. This result suggests that diagram instruction is effective for matching kinds of problems ($\eta_G^2 = .30 - .57, p < .001$). When the diagram knowledge and problems did not match, the simple main effects were not significant in the problem score of the table group (p = .400) and in the diagram score of the graph group (p = .130). The correlations between the diagram scores and the problem scores in the follow-up test were high in both the table problem ($r_s = .58, p < .001$) and the graph problem ($r_s = .82, p < .001$). These results showed that diagram use promoted correct answer rates in the matching kinds of problems (Figure 4).



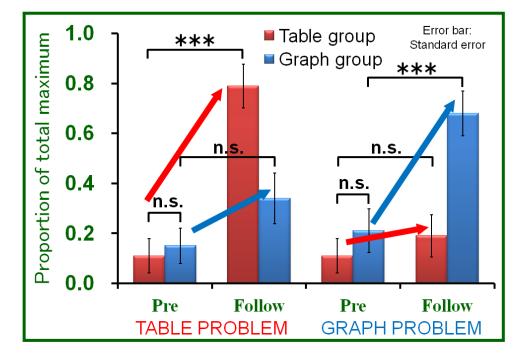


Figure 4. Changes in the problem score before and after intervention.

After the intervention (follow-up test), the problem scores were significantly improved only in the matched condition, but not in the mismatched condition.

IMPLICATION

Even though we have known for a long time that diagram use is effective for math problem solving, students are not usually explicitly taught how to use particular types of diagrams (e.g., how/when to use tables, or graphs, to solve problems). The results of this study indicate that explicit instruction is beneficial: it promotes student spontaneity in using diagrams, and it improves their correct answer rates. However, these results also indicate that knowledge about diagram use is "domain specific" – knowing about the use of a particular type of diagram (e.g., tables) does not enable students to also effectively use another type of diagram (e.g., graphs). Thus, these findings indicate that teachers should explicitly teach students about all the types of diagrams (how, why, when to use them) that are helpful in solving the kinds of math word problems they would be required to solve.



CONCLUSION

In math word problem solving, the results of the present study indicate that specific diagram use instruction enhanced spontaneity of diagram use and facilitated effective solving of particular kinds of problems (those that matched the instruction provided). The results suggest that teachers need to teach students about the use of particular types of diagrams for solving particular kinds of math word problems. Simply demonstrating diagram use (without specific instruction about particular types and uses), or providing instruction only on certain types of diagrams, would not likely enable students to effectively solve the different kinds of problems they are likely to encounter in school education. The results also suggest that the ease/difficulty with which students acquire knowledge and skills in diagram use may vary across types of diagrams (e.g., graphs may be more difficult than tables), and thus instruction provided for them may need to be adjusted accordingly.

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THE DEVELOPMENT OF A PEDAGOGICAL PATH BASED ON THE STEPS OF HISTORICAL-CRITICAL PEDAGOGY

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ABSTRACT

This paper aims to establish a dialogue between Active Methodologies and Historical-Critical Pedagogy in order to support new practices in different learning contexts. In addition, it is analyzed the pedagogical path of RE-MAES course developed based on active learning paradigm. On the one hand, there is the MAES Network formed by teachers from different Brazilian Federal Institutes who offers continuing education courses to teachers based on Finnish principles of education. On the other hand, there is the Historical-Critical Pedagogy as a milestone in Brazilian education still little used at different levels of education. The questions that guided the research were: how did trainers of the RE-MAES course organize pedagogical work from the perspective of active learning? Is it possible to establish a dialogue with Historical-Critical Pedagogy? It deals with a qualitative research of a descriptive-explanatory nature. The instruments for data collection were: the RE-MAES course project, lesson plans and the literature review. The investigation used as a basis studies on Methodologies and Pedagogical Methods for Professional Education. Result indicates the predominance of student-centered methodology and problem-based (ABProb) and project-based (ABProj) learning methods that bring a possible methodological approach along with the steps of Historical-Critical Pedagogy, thus consolidating itself as possibilities for didactic action based on problematizing reality.



INTRODUCTION

Faced with the new configurations of society, the world of work and the way of being of human being, school institutions are, often, challenged that, above all, emerge in the need to redefine their practices. In Brazil, most of the time school and society go at different rates. While global society requires more autonomous, creative and flexible subjects, a large number of Brazilian school institutions remain offering traditional teaching, based on reproductive practices.

The contradiction between social requirements and school reality leads us to believe that formal education has the impasse to evolve to get everyone to learn in a competent way to know, build their life projects and live with others. Therefore, it is essential to review the processes of organizing curricula, methodologies, school times and spaces (Moran, 2015).

Institutional review programs and projects for initial and continuing teacher training are included as a focus of review. According to our perspective, teacher training is an important investment to reframe practices, capable to break the empty of meaning, in addition to provide opportunities for the recognition of instruments to effect an integral formation of the people in their different realities. The teacher training must therefore go through the recognition of his mediating role and promoter of autonomy, as well as it needs to offer practical alternatives that contribute to pedagogical practice, consolidating in a constant reflection-action project.

The challenge of education, therefore, is to insert students in the socio-capitalist machine (since they are part of it), providing a critical formation that leads to overcoming their own condition, making students agents of transformation. Therefore, this article reflects, above all, about the need for more directive and intentional actions managed by teaching activity.

Focusing at methodological aspect, that is, in an attempt to find ways to approach the different themes to be taught, in a way that allows protagonist and reflective learning, it emerges from the internationalization of professional education, the MAES Network, within the scope of extension activities of the Federal Institute of Mato Grosso do Sul - IFMS, *campus* Nova Andradina. Among the activities of the MAES Network, there is the teacher training program RE-MAES Network of Trainers in Active Learning Methodologies for the 21st Century Student, developed in 2018. For development of RE-MAES program, RE-MAES coordinators concentrate efforts for the understanding and proposition of active learning alternatives to outline pedagogical paths that enable the realization of disruptive models of teaching and learning in line with the demands of contemporary society.

This article, therefore, intends to bring the practical path of RE-MAES program in order to discuss whether the methodological steps and the didactic proposals of this



course, based on the learned principles of Finnish training, can also be understood in the light of the principles of Historical Pedagogy-critical.

RESEARCH METHODOLOGY

The research has a qualitative approach as it aims to identify didactic processes not perceived by the trainers. Bortoni-Ricardo (2008) explains that it is up to qualitative research to make visible social structures masked by daily routines in school environments (p. 49). It is interesting to study the teaching and learning method and "check how it manifests itself in the activities, procedures and daily interactions" of the trainers (Ludke & Menga, 2013, p. 13) at school.

The teaching and learning methods used in the process of continuing teacher education are the object of this research. In addition, from the context in which RE-MAES course was developed, we present how the trainers of Re-MAES course organized the pedagogical work and analyze the possibility to establish a dialogue between the methods used with Historical-Critical Pedagogy.

According to the research objectives, this is an exploratory research, which involves bibliographic survey and analysis of material produced by the trainers. We collected data from RE-MAES project and lesson plans, carefully prepared by the trainers during the course, from February to November 2018. After selection and organization of the data that allowed the design of the methods used by the trainers, the description and analysis of the content was carried out in the light of Franco's theoretical and methodological assumptions (2003).

ACTIVE OR EMERGING METHODOLOGIES

To deal with teaching methodologies is to be concerned with the integral education of the student, and not only with the contents, considering that the methodological choices of each teacher, in some way, reveal their training objectives and their professional values. These choices can contribute to reinforce responsible or irresponsible, protagonist or submissive, creative or reproductive, cooperative or competitive education. The choice of methodologies that observe the subjects in a more individualized way and allow them space for reconstruction and reflection is supported by the dialogical perspective about teaching and learning processes, where the educator teach each other, becoming both, subjects of the educational process.

Teaching requires rigor, respect for the student's knowledge, acceptance of diversity and reflection on practice. Aspects that are against the mere transmission of knowledge. It also requires awareness of the unfinished (Freire, 2005) and requires direct action by all involved on the objects of knowledge.



The achievement of this ideal reveals the need for problematizing education, which emerges in formative paths that allow the development of an understanding of the world, recognizing it as equally unfinished, and reflecting on possibilities for intervention and overcoming reality itself. It also implies the reformulation of the process of knowing itself, which in this context suggests problematization as a path to the development of emancipatory learning.

Thus, through active or emerging methodologies, several contemporary attempts to rethink ways of approaching teaching are considered, in order to undertake efforts to achieve problematizing education whose objective is the development of coresponsibility, protagonism and student autonomy. It is based on the studentcentered learning principle, which proposes to transfer to the student the central focus on teaching relationship, breaking with traditional paradigms in which the teacher establishes himself as a central figure, in a relationship of subordination and reproduction.

Student-centered learning or active learning is a term that points to a set of practices that the teacher uses in his praxis, in order to achieve the learning objectives. Such actions intend to establish themselves against the traditional understanding of classes that follow a positivist script of a character that is often "plastered". Actions like these sometimes emerge in a watertight and decontextualized work. In this sense, student should not be merely a "receiver" of information, but must be engaged in a protagonist manner, proposing, analyzing, rethinking and reforming knowledge in his daily life.

In short, the use of active methodologies and methods to promote active learning is established as an alternative for overcoming challenges, solving problems, building new knowledge and developing a more reflective posture of reality, since it requires of the student: analysis, research and decision making to solve different situations. It is closely related to the emerging understandings of training, in a scenario in which the teacher must be clear of his mediating role, whose intentionality in learning situations will emerge in the construction of new knowledge, in a collaborative relationship with the student and the knowledge that he/she has already.

The possibilities of methods and techniques based on active or emerging methodologies are diverse and are based on principles of centrality in the student, application and practice, mediation and personification of teaching. As for the methods, one can list the problematization from the Arco de Maguerez, the Problem-Based Learning, Project and Research-based learning, the steps of Historical-Critical Pedagogy, design thinking among others. Innumerable practices can also be constituted as active learning techniques, observing their conduction and intentionality, such as round tables, debates, seminars, workshops, dramatizations, construction of artifacts, concept maps, generation of ideas (brainstorming), elaboration of questions of research among others (Barbosa & Moura, 2013). It is

important to note that many of these practices share similar steps and activities, with different nomenclatures, when inserted in different learning contexts. It is interesting to analyze the methodologies, methods and active techniques used for RE-MAES program development and the similarities of the methodological approaches with Historical-Critical Pedagogy, despite the different nomenclatures.

METHODOLOGIES, METHODS AND TECHNIQUES IN RE-MAES

In this study, the conceptual reference is the fact that the methodology refers to the science that studies the method in its philosophical and epistemological bases, thus representing a posture, a pedagogical conception. Added to the use of the term "emerging methodologies", which refers to the fundamentals and principles that support active practices.

Otherwise, method refers to a path, a way of organizing steps to achieve some purpose. In educational context, it comprises the rational organization of a pedagogical path, used to reach a teaching objective. The techniques, in turn, are conceived as steps or procedures performed in the context of the method and based (consciously or not) on a given methodological principle.

Among the practices consolidated in RE-MAES course, the use of problem-based (ABProb) and project (ABProj) methods stands out with dialogic techniques capable to promote active learning by participants (both trainers and course participants).

Problem-based teaching and learning method emerged in the 1960s in the context of behavioral psychology and it was widely used in the health field today. It emerged to stimulate the capacity for self-training, from the search for knowledge in an active and autonomous way. It refers to a teaching plan that starts with the identification of a problem and the search for information to support the student to solve it. It is thus a learning opportunity that starts with the objective of solving a given problem situation, and implies collaborative work and the ability to self-organization. According to Souza and Dourado (2015), AbProb has the potential to involve group discussion, promote cooperative research and contribute significantly to confer applicability to the concepts learned.

With principles similar to the Problem learning method, there is the Project-based learning method (AbProj), also used in the formative course of RE-MAES. Barbosa and Moura (2013) argue that both "can generate innovative teaching practices in the context of professional training" (p. 49), not least because they have as main characteristics the student as a center of learning, group work and the teacher as a manager of educational situations (teaching-learning). However, as pointed out by Barbosa and Moura (2013), there are significant differences between the two methods important to remember in order to understand the alternatives for teaching practice brought by RE-MAES course.

Both methods have problems as the guiding principle of pedagogical practice, however, in ABProj, educational action is not always guided by a problem, which may be due to different types of student motivation. Having the problem as a central point in the ABProb method, practical situations are always generators of learning. On the other hand, in ABProj, learning can be encouraged by practical situations, purely theoretical or theoretical-practical studies. At ABProb the teacher guarantees, in a certain way, the centrality of the process, once he defines the problem, at ABProj students are encouraged to make choices, plan, develop and evaluate the process, guaranteeing greater autonomy and their involvement in the educational process.

Having a path defined by the Professor, with a focus on presenting analysis and solving a problem, without the obligation to generate a product, the ABProb method has a duration period just like ABProj. This, in turn, aims at innovation, through the presentation by students of a final product, the result of the study of practical situations anchored in theoretical principles.

RE-MAES STRUCTURE

According to Vieira and Chediak (2018), RE-MAES course took place in two phases: 1) February to June 2018 and 2) August to November 2018. Phase 1 was developed in twenty (20) weeks and phase 2 in eighteen (18) weeks. In total, in phase 1, twenty (20) activities were guided and developed during face-to-face meeting, once a week, on Wednesdays (from 7 pm to 10 pm) and fifteen (15) activities were oriented and developed by the participants in different online environment. In phase 2, there were eighteen (18) face-to-face meetings, two (2) online activities and ten (10) activities developed in the context of the teacher-students.

The activities oriented in phase 1 of the course had the purpose of building projects for continuing education activities for teachers, being the main instrument for assessing learning in this phase of RE-MAES. On the other hand, the implementation of the activities planned by the teacher-students in their contexts of work. The presentation of results were the requirements for completing the second phase of RE-MAES.

The course has the didactic intent of relying on structural curriculum standards for competence and project-based learning. It begins with a diagnostic assessment to understand the reality of teacher-students, forming a learning community in order to make teaching less directive and more dialogical.

The analysis of RE-MAES project and the lesson plans built in the virtual environment *google drive* by the trainers allowed the conclusion of two (02) systematized actions followed during the course, the first one starts from the principles of Problem-based learning method (ABProb) and it evolves to the Project-based learning method (ABProj).



It means that from the first (1st) to the eleventh (11th) face-to-face meeting of RE-MAES phase 1 (February to May 2018), the participants were instigated, through face-to-face and interactions *online*, to take theoretical readings, to reflect based on theoretical principles about the context of each person's performance, to identify and solve problems in the their school routine. During this period, in the light of the literature consulted, there was a predominance of problem learning method (ABProb). The description of activities one (01) and two (02) brings the systematization of the actions organized by the trainers, as in the course's weekly activity plan:

Activity 1

- Reading, discussion and analysis of the textual description of a problem situation commonly perceived in school;
- Registration of at least three (3) and at most five (5) causes and possibilities of solutions to the problem;
- Argumentative presentation of the causes and suggestions for solutions;
- Debate and contributions from other participants.

Example of a situation commonly faced by teachers at Brazilian schools

A Portuguese teacher decided to guide an activity in pairs. To do so, in agreement with the students, he established a deadline for the activity to be done. A pair of students chose to divide the tasks because it was difficult point a meeting and this would speed up the activity. A week before the deadline, in class, the pair met and one student was responsible for the initial part and the other for the final part of the work. On the deadline, one of the students did not do his part and he was not worried with this because he believed he was not harming anyone. The teacher in face of this situation established another date for the students. The student who had done his part argued to the teacher that decided to assess individually each student.

Points to discuss: what is the purpose of group work? When we propose an activity, do we truly believe in its role for student learning? How to evaluate the student who does cooperate with the team?

Activity 2

Hello, dear ones, we propose a challenge for the next week. Our Wednesday meeting will be in Maria José's kitchen. Each group



work will prepare the following dishes: rice with lentils and chicken wrapped in bacon; Roll steak and banana flour; chocolate cake and pastel de Belém. In Maria José's kitchen, groups should prepare these recipes, at 7pm on Wednesday. Remember that we do not have the ingredients.

According to the problem-based learning method, it noticed that activity 1 and 2 present problems that guide studies and reflections based on real contexts of teacherstudents with a tendency to be more contextual than theoretical. In addition, the two situations bring the content to be studied according to the course objectives. The pedagogical proposal for discussion and analysis of the situation is perceived, and there is no plan to be developed in social reality.

On the other hand, after eleven (11) face-to-face meetings and ten (10) online activities that took place in the period from February to May 2018, a different methodological path guide the process of learning, specific characteristics of the project-based learning method (ABProj) emerge. The teacher-students were challenged to present interests, needs or problems from their education real contexts. Besides, the trainers assumed the role of advisor and guide in the decision-making of each teacher-student. This process began in May and ended in November 2018, which results were a teacher training program, its implementation in teacher-student context of work and an event for sharing the experience with the local community.

The process guided by project-based learning (ABProj) method took place in twentyseven (27) face-to-face meetings and ten (10) face-to-face workshops. It is important to clarify that the RE-MAES course promoted team works of at least three (3) and a maximum five (05) teacher-students, identified as Development Groups. Activities 3, 4 and 5 brings examples of ABProj characteristics developed by the trainers:

Activity 3

Now, you will create a concrete representation of everything that is still a little abstract for us all about our teacher training program. Then, decide what your team group will create and bring, next Wednesday, materials for working together.

Activity 4

Hello Teacher, we sent nine (9) scientific texts in your email, please choose one (1) or more for reading and analysis. The paper chosen must be according to the thematic you are interested to study deeper. Put your name in front of the name of the paper you chose, this way everyone will know the text you are reading and analyzing. It is okay to read a text that another colleague will already be reading. If this happens, we suggest that you interact with your colleague and



exchange some ideas. We hope that this exercise help you to find the paths that guide your research. Good reading!

Activity 5

Hello RE-MAES community, we are going well in the process of construction the interventionist action plan and the research plan. Next step, we ask you to check the action and research plan for making sure that they are ready to guide the course with your colleagues at the school you work.

Activity three (3) indicates the demonstration of a project based learning in a situation of interest to the teacher-students, which reveals a less centralized approach of teaching, characteristics of ABProj as it begins with the student interest, need or problem and the teacher acts as a mentor.

Activity four (4) provides a teaching orientation, which students find theoretical support for the situation that generates the intervention project they will build. Activity five (5) indicates the intervention projects for pedagogical practice and research projects as proposals to develop something new and reflect on the action developed.

HISTORICAL-CRITICAL PEDAGOGY: SOME CONSIDERATION

In addition to describing the course experienced, the objective of this paper is to establish a parallel between the principles of ABProb / ABProj and the steps of historical-critical pedagogy in order to reflect on the possible proximity of these methodologies, since both are possibilities for teacher training especially in the context of Professional Teacher Education. These methodologies emerge in different moment of Brazilian history and they bring different concepts, but we believe they have similarities that are important to be highlighted.

Among the various aspects, already registered in this paper, that characterize AbProb and ApProb as emerging methodologies of an active nature, we return to some principles that support the intended analysis, such as: the consideration of the student as a transforming agent, application in the practice of the learned, teaching and consideration of problematized reality. Therefore, it deals with teaching practices that are committed to the development of subjects based on the investigation and articulation of knowledge (Bender, 2014).

For Gasparin (2005) the philosophy that supports the principles of this pedagogy finds support in the Historical-Dialectical Materialism proposed by Marx, which is based on the worldview, praxis, concreteness and dialectical logic. He understands that in order to overcome common sense, theoretical reflection is necessary, aiming



at reaching philosophical consciousness. Therefore, it must start from the knowledge of the empirical reality, study of the theory, abstractions and reach of the concrete reality until reaching the full comprehension of the posed reality.

Saviani (1984) suggests, initially, five steps articulated with each other for the realization of a sequence of teaching work. These steps are further deepened based on the studies by Gasparin (2005) and are named for: 1) Initial Social Practice 2) Questioning 3) Instrumentalization 4) Catharsis and 5) Final Social Practice. Such methodological characteristic that points to structured stages for teaching, in turn, brings to reflection the possibilities of dialogue between historical-critical pedagogy (HCP) with other methods.

In HCP, the main characterist of Initial Social Practice (1) is the contradictory daily relationships, as well as individual and collective relationships. It is consolidated in the prior knowledge of the student and the teacher and encompasses the enunciation of the contents to be studied and their respective objectives in the search to know their knowledge, establishing relationships even before something is taught to them, in an investigative and challenging proposition.

The second step is problematization (2), which occurs in an association of content with the main problems identified in social practice. It starts with a discussion about the problems and their relationship with the contents to be learned. From this discussion, problematizing questions are raised that encompass the scientific, historical, cultural and social spheres, considering from multiple perspectives.

In the next step, Instrumentalization (3), the different dimensions of the content are worked on, based on Instrumentalization. This stage can be defined as the work done by student and teacher, from the presentation of scientific, formal knowledge and other spheres raised in the previous stage, establishing a parallel between knowledge and daily life, causing the appropriation of new content. Therefore, it deals with the appropriation of knowledge constructed socially for the construction of new knowledge.

According to Saviani (1984), this construction will only occur if there is an internalization, that is, the incorporation of knowledge to thought into action, which he named Catharsis (4). Catharsis constitutes the fourth step of Historical-Critical Pedagogy and is characterized by the more elaborate expression of what it was intended to explore, in a relationship between theory and social practice. At this moment, a mental synthesis is carried out that manifests itself from a new posture. The learner is able to explain what has been learned in its different dimensions.

The fifth and final step is the Final Social Practice (5) and consists of assuming a new attitude towards what has been learned (GASPARIN, 2005). Through this



attitude, the student will be able to manifest new attitudes, in a commitment to social exercise and acquired scientific knowledge.

In observance of the steps and references that encompass Historical-Critical Pedagogy, some positions that determine it stand out. The primacy of school knowledge and the need for its appropriation by the learning subjects, learning difficulties as a result of conditions previously established and subject to change and the possibility of developing self-training when practices become the object of reflection and criticism. This method, in short, aims to stimulate the activity, increase the dialogue between the subjects involved and with the culture accumulated historically, with a view to the appropriation and articulation with the students' knowledge, without omitting the logical relation of the constructed knowledge.

The understanding of such positions, which characterize the HCP, and the exploration of the steps proposed as a teaching methodology raise reflections that, safeguarding their epistemological character, instigates the methodological proximity to the problematization. Thus, in order to establish a parallel between the principles of the questioning methods used in RE-MAES (AbProb and AbProj) and the steps of PHC, a comparative reflection is proposed, based on the concepts published by Bender (2014), Barbosa and Moura (2013), Souza and Dourado (2015) and Gasparin (2005):

Despite the different contexts in which the proposals arise, the pedagogical action in both propositions is approached, initially by proposing everyday situations as a starting and ending point, in a bias commitment to reality, and later reflectivetheoretical phases for the appropriation and reframing of socially constructed knowledge.

In the first step of the HCP, called Initial Social Practice, it is possible to establish a relationship with the principle of problematization work proposed in ABProb / ABProj, which implies in the analysis of daily life and delimitation of the problem to be studied.

In the second proposed step, the questioning, proposes the association of the problem with the learning objectives, a situation that converges with the questioning principle (ABProb / ABProj) of linking the learning situations to the knowledge, according to the teaching objectives.

Instrumentalization, in turn, is associated with the investigative principle on which ABProb / ABProj is based, aiming at the theoretical-scientific basis that will bring the initial understanding of the problem and possible reflections for overcoming it, based on socially constructed knowledge.

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In Catharsis, knowledge is incorporated into action, bringing the problematization ideal of associating theory and practice, with a view to concrete action. The Final Social Practice dialogues with the fact that learning necessarily generates a new posture, concept and/or product. Situation similar to the final step (expected result) of ABProb / ABProj.

When registering these assumptions in parallel, it is also noticed that the different registered methods, equally, point to a methodological alternative based on the problematization of reality (either under the theoretical guidelines of HCP or ABProb / ABProj) as an alternative of teaching. They therefore suggest, in the same way, a practice that promotes a critical look at everyday issues, the appropriation and reflection of the knowledge produced by humanity and the identification of possibilities of overcoming associated with a new attitude towards the issues addressed.

In view of the approaches recorded above, based on the theoretical survey carried out, the possibility of rethinking the steps suggested in the HCP is therefore considered as a problematic teaching method that methodologically approaches the principles proposed by ABProb and ABProj and, furthermore, consolidate as important practices for Professional Teacher Education, in a possible dialogue.

CONCLUSIONS

It is noticed that, in recent years, a lot has been produced about active methodologies for teaching practice, at the most different levels of teaching. Learning methods and techniques are developed and adapted to the most diverse contexts, based on studentcentered teaching. However, activities based on active methodologies are personified in different ways, starting from different understandings for planning, application and evaluation in the teaching processes.

Aiming effectiveness of active methodologies in the direction of the intentionality by which they are defined or elected, it will be necessary for participants in the process to assimilate them in order to understand them (Berbel, 2011). Therefore, it is relevant that, in the case of teacher training, the teacher not only replicates, but experiences active learning actions in order to reformulate them according to his pedagogical intention, perceiving them as learning resources that can bring his practice of integral training, contributing to the critical training of the student.

The use of Active Learning methods does not refer to the field of experimentation, but to collective constructions that are guided by clear training objectives; but that, they are subject to the student movement, since its development in all the human spheres is the final objective. In this understanding, RE-MAES course explores, as a didactic basis, teaching actions of an active nature, suggesting alternatives that



commit to praxis based on the observation of reality, identification of problems and the search for solving them, exploring them, theorizing it, elaborating hypotheses and applying them; in order to intervene in the contexts in which they present themselves. From this perspective, it is understood that these teaching methods can collaborate for a more structured and intentional teaching performance.

In short, it is concluded that the pedagogical practices proposed by RE-MAES trainers are committed to the exercise of teaching, promoting replicable approaches between initial training, often restricted to theoretical understandings, and professional practice; consolidating itself as an innovative didactic-pedagogical proposition. His proposal is consolidated in a response to the propaedeutic formations that, as a rule, do not consider the school reality, in a proposal to break with traditional teaching practices.

It is important to emphasize that the perspective of active learning, in this proposal, does not cancel the role of the teacher and the excellence of his specialties; but it instrumentalizes it for the work, allowing the observation, problematization, theorization and intervention in the reality itself, towards an integral formation.

Therefore, it deals with methodological proposals that allow reflection, action and emancipation, when permeated by such objectives. It is understood that teaching strategies, when imbued with this intentionality, can favor the break with mechanized teaching practices, which are often limited to theoretical, decontextualized explanations of action and applicability.

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ENGINEERING EDUCATION AND INDUSTRY: UNIVERSITY INITIATIVES TO ELIMINATE KNOWLEDGE GAP

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ABSTRACT

Nowadays interest in new skills of a future engineer is on the radar of researchers. To meet society's challenges the successful future engineer will need business and management knowledge, leadership, high ethical standards, professionalism, dynamism, agility, resilience, strong analytical skills, practical ingenuity, creativity, good communication skills, flexibility, and the pursuit of lifelong learning. To prepare the engineer for that challenging future, the National Research Tomsk Polytechnic University undertook an in-depth study of how engineering education would have to change and to lower the knowledge gap of students close to the labor market, providing a tremendous diversity of engineering skills. The research revealed some of the obstacles the engineering university had to overcome. The paper suggests the outline of training and development initiatives within the Tomsk Polytechnic educational strategy. As a result of the research, an engineers' competency model was suggested. Developing an engineers' competences model based on the meaningful learning principles was identified as a key priority by the authorities of Tomsk Polytechnic University to help educators, employers, professionals and future engineers understand the knowledge and skills needed to thrive in the workplace. The result of the research professes a new role for the engineers of tomorrow, reflecting a new level of leadership and professionalism.

Keywords: engineering education, university initiative, meaningful learning



INTRODUCTION

The challenges of engineering education currently become more and more crucial. The delayed responses to these challenges are blamed on intensive global changes in science and technology (Levin, M., & Greenwood 2001). Another reason for the tardy responses to the challenges of the external and internal environment is the rigidity of the education system in general, and engineering training, in particular (Daheim 2008). The main problem is the discrepancy between the requirements imposed by stakeholders (representatives of industry and business (prospective employer), government, parents, and students) and the quality of education in the field of engineering and technology. In other words, these are global issues faced by universities and scientific and educational communities today (Chuchalin 2014). The introduction of the competency-based approach into the system of higher engineering education stated in the Federal State Education Standard of Higher Education and professional standards is one of the most important changes in recent years. The initiative implementation aims at meeting the requirement set by the employers to the quality of education and implies a modification of education programme, curricula, and learning technologies. All this is supposed to ensure that students develop the competencies, which will dramatically shorten the period of adaptation at the work place.

Purpose and scope

It becomes obvious that not all learning is the same when we compare two learning types (deep learning that means learning about a subject we are interested in and memorizing some boring things in a literal way). David Ausubel studied the differences between these learning types and developed the theory of meaningful learning (Ausubel 2000). The objective of this paper is to briefly review several developments in the future visioning of engineering education and present a model of future engineer from the point of view of his competences on the bases of meaningful learning. Researchers in the field of higher engineering education are currently rethinking traditional teacher-centred curriculum designs with the aim of embracing new ideologies with a stronger focus on learner-centred learning. According to the learning outcomes of engineering programmes, students should be trained not only within technical spheres, but also acquire knowledge of business communication with resource providers, personnel, and customers, work as a member of project teams, assume responsibility, in other words, they should be able to apply the required strategies and technologies in human resources management. Being one of the oldest engineering higher school in the Asian part of Russia, Tomsk Polytechnic University (TPU) has become an alma mater for generations of graduates. Today TPU is a national research university that places special emphasis on advanced engineering education, creation of resource-efficient technologies, internationalization, and integration of research and academic activities. Thus, the University core competencies lie in the area of engineering and applied sciences. In this paper, we offer a meaningful learning experience carried out in TPU based on



Ausubel's (1968, 1983) and Novak's (1981) meaningful learning principles (Ausubel and Novak, 1983).

Literature review showed that authors determine three different types of meaningful learning (Cadorin *et al*, 2014): 1) 'active building-up process' (Johannsen et al., 2012); 2) meaningful learning as 'change' (Krueger *et al.*, 2011); 3) meaningful learning as 'outcome of experience' (Mayer, 2001, 2002; Marks and McIntosh, 2006). A meaningful learning in TPU is recognized as a primary educational goal associated according to Mayer (Mayer, 2002) with Understand, Apply, Analyze, Evaluate, and Create and chosen as a basis of the engineer's competences model.

21-st engineer's skills

Advanced technologies such as robotics, 3D printing, artificial intelligence and generative design changed our life. The changes are so profound that many people call it a new industrial revolution. Across all industries, building an ecosystem of partners will be necessary to promote value and to keep up with the revolutionary transformation. Most companies already struggle to hire skilled engineers in data science, software, and artificial intelligence. Many predict a polarization of engineering skills, which will be necessary in the future. Currently, our education systems is very good at teaching information, facts, and processes. Too often 'soft-skills' are neglected at universities. It is necessary to note that there's a real education challenge ahead. Thus, challenges will go way beyond digital and communicative skills. The combination of different skills of engineer will cause a massive transformation of the engineering workforce that will have to be carefully handled. Engineering universities have to start on this journey as quickly as possible to secure their competitiveness.

METHODOLOGY

The first part of the paper provides a literature review of the meaningful learning in general and engineering skills in particular. The second part presents a draft of Engineering Competency Model and start-up of its implementation that was carried out in 2018 in TPU.

ENGINEER' COMPETENCES MODEL: IMPLEMENTIG INTO PRACTICE

In 2012 according to Government initiative, the project 5-100 aimed at adapting Russian universities to international standards and their inclusion in the international educational environment, began to be implemented. Russian Ministry of Education and Science has funded a 5-100 project to modernize the educational system of universities via implementing institutional changes and developing digital studies that can support flexible curricula and offer students a possibility to expand



their knowledge and competences through cross-studies from all participating universities. Being the oldest engineering higher school in the Asian part of Russia, Tomsk Polytechnic University has become an alma mater for generations of graduates, brilliant researchers, inspiring political and public figures, gifted teacher, and excellent engineers. Today TPU is a national research university that places special emphasis on advanced engineering education, creation of resource-efficient technologies, internationalization, and integration of research and academic activities. To prepare the engineer for the challenging future, Tomsk Polytechnic University made a global transformation of its structure focused on changing all the educational process. The first step was to organize the following structure:

Core Engineering School the main goal of which is to provide students with basic technical and social-humanitarian competencies also pay close attention to applied skills: teamwork, critical thinking, leadership skills, and ability to solve complex professional problems. The key feature of the School is a complex of basic academic courses for freshmen and sophomore undergraduate students focused on the development of general professional and cultural competencies for future engineers.
 7 Engineering Schools and 2 Research Schools. After the second year, students

Further, the TPU organized a gathering of thought leaders from diverse backgrounds engineers, teaching staff from different technical and humanitarian disciplines, educators, businesspersons, and other leaders - to ask: What will the engineering world be like in 2030? What aspirational role will engineers play in that radically transformed world? The answer professes a new role for the future engineers, reflecting a new level of knowledge, leadership, and professionalism. Future engineers would be entrusted by society to achieve a sustainable world and raise the global quality of life. The second step was to work out the model of a high-tech engineer with critical competences and to develop the educational programmes based on activities achieving meaningful learning. TPU worked with stakeholders across the engineering community, from industry, private practice, and academia, through a two-year-long process of feedback and drafting to discuss how the model could be a useful tool for engineering-related societies and the overall engineering

community in the future (see table 1):



Table 1

Competences							
Personal Effectiveness	Integrity	Interperson al skills	Initiative	Adaptabilit y	Flexibility	Dependability and Reliability	Lifelong learning
Academic Excellence	Reading	Writing	Communicati on	Mathematic s	Science and technology	Critical and Analytical Thinking	Computer Skills
Workplace competences	Teamwork	Planning and Organizing	Scheduling and Coordinating	Problem Solving and Decision Making	Working with Tools and Technologi es	Creative Thinking	Business Fundamentals
Technical Competences	Fundamental s of Engineering	Design	Professional Ethics	Business Legal and Public Policy	Engineering Economics	Sustainability and Environmenta 1 Impact	Safety, Health. Security
Industry competences	Specified by industry sector representatives						

ENGINEER'S COMPETANCES MODEL

Table 1 presents an engineer's competences model according to meaningful learning view. To be a qualified engineer means that engineering students as a future specialists have to memorize many different things from various fields of knowledge and have to link new information to previous knowledge. In this context, professional competence is defined as a dynamic portfolio of conceptual, procedural and factual knowledge, cognitive and practical skills, the application of which, in an appropriate academic context enables efficient action. It means that when the facts are meaningful and made sense to the students, they are able to retain the information a lot better. Not only this, but they could also "transfer" the facts to long-term memory a lot more easily. So, learning is considered meaningful when it is generalizable, functional and durable. The main idea of changing educational process structure was to create an atmosphere in which students can collaborate and develop their future professional skills. In addition, the designers of educational programmes we interested in developing digital skills as a very essential for modern specialist. Online courses provide a modern way of educating professionals with excellent skills in digital work, virtual collaboration and self-management, all of which are needed in all companies. Because of this, different on-line courses that can support flexible curricula and offer students a possibility to expand their knowledge and competences through cross-studies from all 5-100 Universities, were developed.

DISCUSSION AND RESULTS

In this paper, we briefly stated the implementation of the engineers' competences model based on the principles of the meaningful learning in one of the Russian



Engineering Universities. The preliminary research results suggest that university staff should establish better motivational structures within their Schools and Departments and up-to-date motivational mechanisms within educational programmes. To make learning more meaningful it is necessary to teach using the following recommendations:

- to adapt a student-centered approach;
- to link students' classroom activities to real-life experiences;
- to bring the real world to the classroom;
- to teach the same concept, procedure or attitude using various methodologies, in different tasks, subjects, and physical settings;
- to promote self-knowledge, that means to let students realize that above all, learning is a personal process.

In addition, we can say, that within the atmosphere of meaningful learning the use of concept maps, collaborative work, and digital resources help students to build their educational trajectory. They enjoy themselves while learning and become more motivated. All these help students form meaningful learning and the ability to apply learned concepts. As a result of meaningful learning the individual become

- observant;
- constructive;
- reflective;
- cooperative;
- communicative;
- goal directed.

In particular, they must consider that the development of career paths is a very important instrument in motivating to work in the industry.

As for teachers, they also appreciate this new approach as their educational efforts are rewarded and they safe much more energy. The role of teacher changes, he/she is supposed to act as an adviser – a person who helps learners to build their educational trajectory and to get a new instrument for their life-long learning. A knowledge ecosystem model is essential and useful, that can be designed in the form of offering on-line courses (MOOCs, LMS-Moodle, mobile devices and etc.), organizing school events, and integrating the use of social media.

CONCLUSION

In modern conditions, only those universities, which are ready to introduce more effective and innovative tools of strategic management can, survive and effectively operate in the market of higher professional education. The engineer' competences model provides specific guidance to teaching staff on the core competencies and skills necessary to enter into the engineering profession, as well as to maintain proficiency during one's career. The preliminary research shows that studying



according this Model sustains students' self-regulative learning skills in terms of motivation regulation. In addition, students' study engagement, well-being and academic performance are related to better motivation regulation, but do not differ between students' studying either in traditional or online degree programmes. Communication and collaboration skills, digital work skills, and self-regulative learning skills are seen critical for many of today's workplaces, especially in global work environments. Our students rate all this skills very high, as most of them see this as value and very essential to their profile in the job market. The experience of TPU in implementing the engineer's competences model into curricular was approved by the experts of the strategic partners (potential employers), who are closely involved in its design. The main conclusion that can be drawn based on the analysis of the implementation of the engineer's competences model is that the efficiency of introducing it into TPU Curricular is due to the fact that it enables university managers to visualize the development strategy of the university. We suggest that the proposed model may become important for industry-university relation development and improvement and can be adjusted and adapted to any engineering university.

In this 21-st century it must be pointed out that the Ausubel's original theory (Ausubel, 2000) should be updated to respond to the new world changes and new requirements to modern professionals. According to Marco Antonio Moreira "...the human knowledge is constructed and nowadays such construction happens in large scale and changes quickly" (Moreira, 2011). To learn meaningfully means to allow the learner to deal with new knowledge and new changes of the contemporary world.

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