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PREFACE

EAPRIL is …

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

- Promotion and development of learning and instruction practice within Europe, by means of practice-based research.
- To promote the development and distribution of knowledge and methods for practice-based research and the distribution of research results on learning and instruction in specific contexts.
- To promote the exchange of information on learning and instruction practice, obtained by means of practice-based research, among the members of the association and among other associations, by means of an international network for exchange of knowledge and experience in relation to learning and instruction practice.
- To establish an international network and communication forum for practitioners working in the field of learning and instruction in education and corporate contexts and develop knowledge on this issue by means of practically-oriented research methods.
- To encourage collaboration and exchange of expertise between educational practitioners, trainers, policy makers and academic researchers with the intent to support and improve the practice of learning and instruction in education and professional contexts.
- By the aforementioned goals the professional development and 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 2023 Conference as well as some afterglow moments of the 2022 Conference can be found on our conference website http://www.eapril.org.

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OBESE CURRICULUM: THE MAIN PITFALL IN MOVING LEARNING INTO REAL WORLD PRACTICE

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ABSTRACT

The competency-based curriculum approach has received increasing attention in various disciplines in recent decades and it has become a dominant approach in many countries. We aimed to explore the lived experiences of medical professors and students about the movement from a discipline-based to competency-based curriculum. A qualitative method was used to through selecting participants via a purposeful sampling strategy. The study was conducted at a Medical School in Iran. The results of the research showed that, the development of competencies in the students has been abandoned and this is due to focus on the cognitive domain, isolated and appended curriculum, H-shaped curriculum. An Obese curriculum is introduced to describe such conditions.

Introduction

In many countries, discussions on contemporary higher education led to curricular reforms. A competency-based curriculum has become a necessity rather than an option, and many universities have already gone through the process of changing to a competency-based curriculum or are in the process of making the switch(Frank et al., 2017; Hsu et al., 2022). Medical disciplines have been strongly impacted by this change (Carraccio & Englander, 2013; Ten Cate, 2017), and the development and widespread adoption of competency frameworks, such as Can MEDS(Frank et al., 2015) or Good medical practice(Cumming & Noble, 2010) are good examples.
Learners develop professional competencies when working on meaningful learning assignments.
One reason for the widespread acceptance of this approach is in its merits(van der Vleuten, 2015). Competency-based curricula offer structural, content, and process advantages. Benefits include a focus on learners' outcomes and progress, formative and observation-based assessment, support for flexible learning, and increase in transparency and responsiveness to all stakeholders with a set of shared expectations and common language for learning (Hawkins et al., 2015).Competency development relies on experience and coping with real-world tasks (Vandewaetere et al., 2015). However, many universities still offer a discipline-based curriculum that is similar to the curriculum that Flexner considered more than a hundred years ago. For them, the realization of a competency-based curriculum is not an easy task and has all the features of complex change (Englander et al., 2017). Accordingly, it is necessary to examine the challenges of transitioning from a discipline-based to a competency-based curriculum.
Most education and training lack instructional design approaches; this has led to the implementation of innovations that certainly aim to better prepare trainees to perform tasks related to their work, but the results of the implementation have been far from the desired success (Dolmans et al., 2013). This is because the focus of the education has been on part tasks or separate topics. Simply put, topic integration for students has been ignored. In doing so, often a series of topics or tasks are taught, then students are requested to complete a broader task or problem as the final experience by applying those skills or knowledge related to the components or topics, but students do not succeed in integrating what they have learned with the real world (van Merriënboer & Kester, 2014).
Traditional objectives-driven instructional design models were increasingly criticized because learners often experienced their educational or training program as a disconnected set of topics and courses, with implicit relationships between them and unclear relevance to their future profession. This complaint prompted a new interest in instructional design for integrative goals(Gagné & Merrill, 1990), for example, when complex skills or professional competencies are taught. The traditional atomistic approach, where complex contents and tasks are reduced into simpler elements up to a level where the single elements can be transferred to learners through presentation and/or practice, was replaced by a holistic approach,

where complex contents and tasks are taught from simple-to-complex wholes in such a way that relationships between elements are retained.
For real-life tasks, there are many interactions between different aspects of task performance and their related goals. Integrated goals consider the ability to effectively perform each aspect of a complex task separately and also to coordinate these different aspects while performing real-life tasks (van Merriënboer & Kester, 2014).
The most well-known task-centered learning models are cognitive apprenticeship (Collins, 1991) and elaboration theory (Reigeluth, 1999), and First Principles of Instruction (Merrill, 2012), and the four-component instructional design (4C/ID) model (van Merrienboer & Kirschner, 2017).

Task-centered learning environments provide a good alternative to learning professional competencies in clinical practice(Francom, 2016; van Merrië nboer & Kirschner, 2017).
Iran is one country that revised the curriculum of its medical schools in 2016, marked by a shift in focus from ‘quantity’ to ‘quality’ (Curriculum Committee of MD School, 2017). This quality shift was supported by a description of the competencies medical students need to acquire. The revised curriculum was implemented in 2017 with a specific focus on seven outcomes such as clinical skills and communication skills. (Curriculum Committee of MD School, 2015).

Methods

This qualitative study was undertaken, using in-depth, semi-structured interviews with the six medical educators and seven student of the general medicine program at the Medical School of Mashhad University of Medical Sciences, Mashad, Iran. We used a phenomenology research method for this study.
This study was conducted at a Medical School in Iran. In 2015, Iran's Ministry of Health and Medical Education (MHME) announced that the institutions of higher education must ensure that all graduates of the medical programs can demonstrate professional commitment, decision-making, and problem solving (clinical skills), as well as communication skills, sensitivity to caring for patients, self-regulated skills for individual development or continuous learning, and the ability to improve community health. Recently, with an emphasis on expanding the role of family doctors, the re-design of the programs to prepare medical doctors has become more critical in the medical education system in Iran. To meet the new educational aims, a new curriculum was developed in 2017 by introducing the core competencies. Mashhad University of Medical Sciences is one of the best universities in Iran which has 25 clinical and 19 basic departments. The research was conducted on the medical school curriculum revised in 2017-2018.
To identify and select the participants, a purposeful sampling strategy was used. Given the goals of the current research and the revised curriculum characteristics,

the interview statements were developed. Then, we conducted a pilot study on three participants to examine the content validity. The participants were informed about the interviews and the reasons and interests of the researcher of the study. Then, they were invited for the individual interviews. All interview were conducted by first author who is a professional expert at curriculum studies. Moreover, no relationship was established between the interviewer and the participants prior to the study.

The interviews with the students and professors of the basic sciences were conducted in the department of medical education at Mashhad University of Medical Sciences and the interviews with the clinical professors were conducted in Imam Reza hospital. All interviews were conducted using the face-to-face method and no one else was present besides the participants and researcher during the interviews. Each interview lasted for 45 to 60 minutes. Notes were taken by the researcher and all interviews were recorded and transcribed verbatim. None of the interviews were repeated. The transcripts were returned to the participants for the comments and corrections. All data were kept confidential and were only accessible to the investigators. The participants signed the informed consent forms. All professors and students who were invited agreed to participate (participation rate of 100%). After each individual interview, we checked whether new information had emerged. Interviewing continued until saturation was reached.

Three successive phases were used to analyze the interviews based on the Miles and Huberman's theory (2003) about qualitative data analysis. In other words, data reduction by coding, data structuring by categorization, and data interpretation by discussion. MK imported all interview transcripts into the MAXQDA software package and coded all items. The codes were used as the first coding dictionary. MK revised the coding dictionary by removing the code duplicates and discussing the codes. MK and JvM structured the codes and discussed their structures to identify the dimensions. During the analysis process, sub-themes were created and/or reduced by merging them, thus allowing the analysis to reach internal homogeneity and external heterogeneity. The questioning and challenging of the emerging themes continued in an iterative process via the thematic analytical model by going back and forth between the researchers' assumptions, ideas, questions and explanations and, then, a validation of these themes through comparing them with the interview texts. The analysis was continuously discussed and re-evaluated by authors(MK and JvM) to enhance the reliability of the analysis through the exploration of different aspects, the contradictory information, and the interpretations. The participants were not asked to provide feedback on the findings. The data interpretation via discussion was the connecting activity throughout the whole analysis process and during the decision-making process about the relevant quotes.

Results

In this section, we will describe the professors and students' experiences.

Focuses on Cognitive Learning

The medical professor believed that the value of the contents is not well appreciated by the students because they have not been given the opportunities to put what they have learned into practice immediately.

> *"In different courses, we try to use the main up-to-date resources that are comprehensive and contain a lot of content, in teaching. It is very difficult to present all these materials during the semester sessions and, therefore, there is no opportunity for other learning activities."*

Appended Curriculum

From the students' point of view, basic courses seem unnecessary because they have no specific connection with the clinic. Student F stated:

> *"Basic science courses, anyone we ask says, are not important courses; they are useless because they have a series of lessons that have very little to do with the clinic in terms of content, and those parts that are related to the clinic, students do not understand the connection."*

Isolated Curriculum

Students believed the curriculum prevents learning to diagnose and treat diseases in connection with the real clinical environment. Student D described her experience as:

> *"The physiopathology course is an intensive and difficult course in which a lot of things are told to students in a short time. Professors do not guide us how to link our knowledge to clinical skills to have effective outcomes to use in our workplace."*

Accordingly, Professor B stated:

> *" The students study complex contents in their theoretical courses, but they do not have enough opportunities to acquire the needed competencies in their workplace."*

H-Shaped Curriculum

Students expect the knowledge they have gained over the years will act as a bridge helping them to transfer from university to the real therapeutic (medical) environment; however, they feel that the bridge is broken. For example, student G stated:

> *"We expected all the different courses we took in college to prepare us for real-life issues in the workplace, but our experience does not show that at all."*

Discussion

This study focused on analyzing the lived experiences of general medical students and professors about a curriculum that is in a process of change, from discipline-based to competency-based. The findings of this study are significant and show that experiences of our participants reflect the challenges of designing a learning environment that helps students develop medical competencies. Understanding the unique environment of clinical education and how it affects learning and performance brings greater clarity to the students' lived experiences of the medical curriculum. These finding and inclusion of trainees in these research can drive conversations on future curriculum change. The remainder of the takeaways are interesting and beneficial for the field.

The students' lived experiences of taking basic courses show that they consider these courses as being unnecessary because, in their perception, they have nothing to do with the clinic. This experience can be a natural result of a discipline-oriented curriculum that focuses more on academic disciplines than anything else (Ornstein & Hunkins, 2018).

In addition, students stated that taking basic science courses in the classroom without being associated with the clinical setting reduced their motivation. One of the disadvantages of the disciplinary approach is the separation of the curriculum into pre-clinical and clinical sections, which makes the student in the first academic years have no experience of being in the environment and seeing real patients, and this deeply frustrates students(Papa & Harasym, 1999; Sivapragasam, 2016). In addition, the results of research show that a lack of integration of anatomy courses with the clinic prevents near and far transfer of learning(Cheung et al., 2021). All physicians need knowledge of the basic sciences, although this level of need varies between different specialties. Balancing clinical and basic sciences and, especially, fully integrating them in a way that best serves the competency development of medical students is an issue that needs to be the focus of many future innovations (Bandiera et al., 2013; Irby et al., 2010).

The obese curriculum and can be good concepts to describe these experiences of students because, on the one hand, the curriculum is full of courses that have no clear relationship with medical competencies and, on the other hand, in this type of curriculum, the quantity of knowledge taught in each lesson is emphasized. Developing professional competencies requires a lean curriculum; a curriculum that is outcome-oriented and the mission of each course in the curriculum is to help students develop specific and core competencies. At the level of courses, the role of each learning activity, students' assignments, and assessment methods should be aligned with the expected outcomes of the course, which is to educate and assess competencies.

In the obese curriculum, theoretical courses are considered separately from practical courses, and each course is considered completely separate from the other courses, which we call an isolated curriculum, which leads to the formation of an H-shaped curriculum(Wijnen-Meijer et al., 2009). Nonetheless, the lean curriculum is

interdisciplinary and integrated and has a Z-shaped structure(Wijnen-Meijer et al., 2015). These features cause some imbalances in content, learning experiences, teaching methods, and assessment in the obese curriculum, which we call appended curriculum, while the lean curriculum will be a balanced one. Table 1 compares the obese and lean curriculum.

Table 1. *The obese and lean curriculums' characteristics*

	Obese Curriculum	**Lean curriculum**
Outcomes	Knowledge, skills, and attitudes in different compartments	Competencies
Organization of contents	Atomistic	Holistic
Main Approach	Discipline-based	Task-centered
Vertical organization	H Shape	Z shape
Continuity	Linear	Spiral
Learning environment	Classroom and practicals	Simulation and real-life learning environment
A beginning Starting point for design?	Subject matter that might - eventually – help to perform real-life tasks	Real-life tasks that require particular subject matter
Learning	Retention	Transfer
Teaching	Individual Professors	Teaching team
Curriculum development	Faculty	Co-creation by a multidisciplinary team
Integration	Isolated	Integrated
Coherency	Appended	Balanced
Accountability	Social	Organizational

REFERENCES

Bandiera, G., Boucher, A., Neville, A., Kuper, A., & Hodges, B. (2013). Integration and timing of basic and clinical sciences education. *Medical Teacher*, *35*(5), 381–387. https://doi.org/10.3109/0142159X.2013.769674

Carraccio, C. L., & Englander, R. (2013). From flexner to competencies: Reflections on a decade and the journey ahead. *Academic Medicine*, *88*(8), 1067–1073. https://doi.org/10.1097/ACM.0b013e318299396f

Cheung, C. C., Bridges, S. M., & Tipoe, G. L. (2021). Why is Anatomy Difficult to Learn? The Implications for Undergraduate Medical Curricula. *Anatomical Sciences Education*, *12*, 1–12. https://doi.org/10.1002/ase.2071

Collins, A. (1991). Cognitive Apprenticeship: Making Things Visible. *American Educator: The Professional Journal of the American Federation of Teachers*, *15*(3).

Cumming, A. D., & Noble, S. I. R. (2010). Good medical practice. *Davidson's Principles and Practice of Medicine*, 1–16. https://doi.org/10.1016/b978-0-7020-3085-7.00001-8

Dolmans, D. H. J. M., Wolfhagen, I. H. A. P., & Van Merriënboer, J. J. G. (2013). Twelve tips for implementing whole-task curricula: How to make it work. *Medical Teacher*, *35*(10), 801–805.

Englander, R., Frank, J. R., Carraccio, C., Sherbino, J., Ross, S., & Snell, L. (2017). Toward a shared language for competency-based medical education. *Medical Teacher*, *39*(6), 582–587. https://doi.org/10.1080/0142159X.2017.1315066

Francom, G. M. (2016). Principles for task-centered instruction. In *Instructional-Design Theories and Models, Volume IV* (pp. 81–108). Routledge.

Francom, G. M., & Gardner, J. (2014). What is task-centered learning? *TechTrends*, *58*(5), 27–35.

Frank, J. R., Snell, L., Englander, R., & Holmboe, E. S. (2017). Implementing competency-based medical education: Moving forward. *Medical Teacher*, *39*(6), 568–573. https://doi.org/10.1080/0142159X.2017.1315069

Frank, J., Snell, L., Sherbino, J., & Editors. (2015). CanMEDS 2015 - Leader. *CanMEDS Physician Competency Framework*, 1–17. http://www.royalcollege.ca/portal/page/portal/rc/common/documents/canmeds/framework/canmeds2015_framework_series_IV_e.pdf

Gagné, R. M., & Merrill, M. D. (1990). Integrative goals for instructional design. *Educational Technology Research and Development*, *38*(1), 23–30.

Hawkins, R. E., Welcher, C. M., Holmboe, E. S., Kirk, L. M., Norcini, J. J., Simons, K. B., & Skochelak, S. E. (2015). Implementation of competency-based medical education: Are we addressing the concerns and challenges? *Medical Education*, *49*(11), 1086–1102. https://doi.org/10.1111/medu.12831

Hsu, T., Angelis, F. De, Al-asaaed, S., Basi, S. K., Tomiak, A., Grenier, D., Hammad, N., Henning, J., Berry, S., & Song, X. (2022). *competency-based medical education training program*.

Irby, D. M., Cooke, M., & O'Brien, B. C. (2010). Calls for reform of medical education by the Carnegie Foundation for the Advancement of Teaching: 1910 and 2010. *Academic Medicine*, *85*(2), 220–227.

Merrill, M. D. (2012). *First principles of instruction*. John Wiley & Sons.

Olle, T. C. (2017). Competency-Based Postgraduate Medical Education: Past, Present and Future. *GMS Journal for Medical Education*, *34*(5), Doc69.

http://www.ncbi.nlm.nih.gov/pubmed/29226237%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC5704607

Ornstein, A. C., & Hunkins, F. P. (2018). Curriculum: Foundation, Principles and Issues, Seventh Edition. In *Pearson Education*.

Papa, F. J., & Harasym, P. H. (1999). Medical curriculum reform in North America, 1765 to the present: A cognitive science perspective. *Academic Medicine*, *74*(2), 154–164. https://doi.org/10.1097/00001888-199902000-00015

Reigeluth, C. M. (1999). The elaboration theory: Guidance for scope and sequence decisions. *Instructional-Design Theories and Models*, *2*, 425–453.

Sivapragasam, M. (2016). Basic science in integrated curricula: A medical student experience. *Perspectives on Medical Education*, *5*(4), 257–258. https://doi.org/10.1007/s40037-016-0290-4

van der Vleuten, C. P. M. (2015). Competency-based education is beneficial for professional development. *Perspectives on Medical Education*, *4*(6), 323–325. https://doi.org/10.1007/s40037-015-0232-6

Van Merriënboer, J. J. G. (1997). *Training complex cognitive skills: A four-component instructional design model for technical training*. Educational Technology.

van Merriënboer, J. J. G., & Kester, L. (2014). The Four-Component Instructional Design Model: Multimedia Principles in Environments for Complex Learning. In R. E. Mayer (Ed.), *The Cambridge Handbook of Multimedia Learning* (2nd ed., pp. 104–148). Cambridge University Press. https://doi.org/DOI: 10.1017/CBO9781139547369.007

van Merrië nboer, J. J. G., & Kirschner, P. A. 2017. (2017). *Ten steps to complex learning : a systematic approach to four-component instructional design* (2017) 3 edition (October 23 (ed.)). Routledge.

Vandewaetere, M., Manhaeve, D., Aertgeerts, B., Clarebout, G., Van Merriënboer, J. J. G., & Roex, A. (2015). 4C/ID in medical education: How to design an educational program based on whole-task learning: AMEE Guide No. 93. *Medical Teacher*, *37*(1), 4–20. https://doi.org/10.3109/0142159X.2014.928407

Wijnen-Meijer, M., Ten Cate, O. T. J., Rademakers, J. J. D. J. M., Van Der Schaaf, M., & Borleffs, J. C. C. (2009). The influence of a vertically integrated curriculum on the transition to postgraduate training. *Medical Teacher*, *31*(11). https://doi.org/10.3109/01421590902842417

Wijnen-Meijer, M., Ten Cate, O., Van Der Schaaf, M., Burgers, C., Borleffs, J., & Harendza, S. (2015). Vertically integrated medical education and the readiness for practice of graduates. *BMC Medical Education*, *15*(1), 1–9. https://doi.org/10.1186/s12909-015-0514-z

PROFESSIONALIZING PRIMARY SCHOOL MATHEMATICS TEACHER EDUCATORS

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ABSTRACT

Mathematics teacher educators in primary teacher education need expert knowledge and skills in teaching in primary school, in subject matter and research. Most starting mathematics teacher educators possess only part of this knowledge and skills. A professional development trajectory for this group is developed and tested, where a design based research is used to evaluate the design. This paper describes the professional development trajectory and it's design. We conclude that the professional development design should focus on mathematical knowledge for teaching, should refer to both teacher education and primary education, should offer opportunities for cooperative learning, and need to use practice based research as a developmental tool.

INTRODUCTION

Mathematics teacher educators in primary teacher education need high level mathematical content knowledge, deep theoretical knowledge on mathematics teaching in primary education, knowledge and skills in supporting student teachers in teacher education, and knowledge of teaching practice in primary education (Goffree & Dolk, 1995). Only few starting mathematics teacher educators combine all these competences.

In the Netherlands, starting mathematics teacher educators have diverse backgrounds and differently developed competencies. There is no professional standard or certification to become a mathematics teacher educator. Almost all starting mathematics teacher educators feel that they have to develop extra skills and knowledge. But what skills and knowledge those are varies depending on the educator in question.

Of course, new employees are rarely fully prepared for their new job or task. However, we notice that the support from colleagues for starting mathematics teacher educators on the job is mostly of practical nature. They get information on many relevant aspects of teacher education, such as the institute's curriculum, the digital system, the assessment processes and many more, but not on domain specific knowledge and skills that are necessary for providing high quality mathematics teacher education. From talks with starting colleagues at conferences and other gatherings a clear need came to the fore for more profound, theoretical, and specific professionalization trajectory. That is why we decided to develop and perform a professional development trajectory for starting mathematics teacher educators.

In this paper we consider the design of the professional development trajectory as design research (Bakker, 2018). We will sketch the process leading to formulating design principles. From these design principles we developed a design used in the trajectory. Then we elaborate on experiences in the professional development trajectory by providing an example from a morning session. This brings us to a critical analysis of the design and ideas for further development.

We thus answer the following research question:

What are characteristics of a professional development trajectory for starting mathematics teacher educators?

METHOD

Participants

Mathematics teacher educators were approached through advertisements in professional journals, on websites, and by notices at conferences. On the institutional level all Dutch teacher education institutes were approached.

The first cohort of 14 teacher educators commenced the professional development trajectory in 2020. In 2021, in the second cohort 13 teacher educators participated and in 2022, in the third cohort, 20 teacher educators. With these three cohorts teacher educators from 17 different teacher education institutes from all over the Netherlands participated. Several participants had to travel over two hours to get to the course location.

Participants' background, knowledge, and educational experience differed significantly. Some just started as teacher educators, whereas others had one or several years' experience as mathematics teacher educator. There were participants with experience as primary school teacher or math specialist in primary education, others had been mathematics teachers at secondary school. Some participants have a PhD in mathematics education, with extensive research experience and some teaching experience at university. Several participants had been educational advisor or textbook writer and developer for mathematics education. As a consequence there are large differences between participants in terms of subject matter knowledge, pedagogical content knowledge, teaching experience in primary education or teacher education, and experience in doing research.

Towards design principles for the professional development trajectory

We developed a professional development trajectory taking into account the diverse population of relatively new mathematics teacher educators and the diverse skills and knowledge set they are supposed to develop. The skills and knowledge set consists of at least high level mathematical content knowledge (Oonk, Van Zanten,

& Keijzer, 2007), mathematical knowledge for teaching (Hill, Ball, & Schilling, 2008), deep theoretical knowledge on mathematics teaching in primary education, knowledge and skills about supporting student teachers in teacher education (Oonk, 2009), and knowledge of teaching practice in primary education. To develop this, we estimated that educators would need support over an extensive period of time, we would have to know their starting level on the different aspects very well and taking good account of the different starting levels between them in order to optimally cater the sessions to their needs, and we would have to link the activities in the trajectory to primary school practice, teacher education practice, and insights from mathematics education literature. In several design sessions we devised relevant topics to include in the trajectory and the design principles we would abide by in designing the meetings in the trajectory and the activities therein. Finally, we characterized the professional development trajectory by the following features.

The trajectory:

1. has mathematical knowledge for teaching as a content and pedagogical framework,
2. consists of activities that are embedded in both mathematics teacher education practice and primary education practice,
3. offers opportunities for cooperative learning, and
4. uses practice based research as a developmental tool.

The design team consisted of five experienced mathematics teacher educators who work at three different teacher education institutes in the Netherlands. Their expertise is in practice-oriented research, curriculum development and professional development related to primary mathematics education and teacher education.

General characteristics of the professional development trajectory

The professional development trajectory takes two years, with five meetings of six hours during a year. For each of these ten meetings the participants prepare specific tasks both individually and in small teams. These tasks generally involve some reading of literature and practical assignments in their teacher education, activities which they develop, carry out, and evaluate. The second year in the trajectory focuses on practice base research with associated assignments. Estimated time need for preparatory work for each meeting amounts to a maximum of 10 hours. The study

load thus amounts to 160 hours over the two year period. Participants are facilitated by their institutions to be able to make this time investment.

Design team members also taught the course. Generally two course leaders are responsible for a meeting day, but the other course leaders strive to be actively present in these meetings as well. Thus ensuring the continuous exchange between experts through co-teaching and further development of the trajectory.

Using the design principles to develop the professional development trajectory

1. The professional development trajectory has mathematical knowledge for teaching as a content and pedagogical framework

The professional development trajectory is called 'verdiepingscursus' in Dutch, which means 'deepening course'. This implies that our participants are provided with more than practical lesson ideas and teacher educator skills, they are challenged to really develop their mathematical knowledge for teaching, both in subject matter knowledge as pedagogical content knowledge (Ball, Thames, & Phelps, 2008). The starting point and thus the steepness and length of their needed learning curve differs between the participants. We strive to challenge each participant on their own level (or slightly above) to make the connection between their mathematics teacher education practice and their mathematical knowledge for teaching through studying, reflecting, experimenting, and analyzing, thus allowing for growth in both domains. In the meetings we included several aspects of mathematical knowledge for teaching, sometimes focusing more on primary mathematics education, on mathematics teacher education, on (specialized) content knowledge, or on a combination of these. The meetings always are focused on one or two themes, to which the preparatory work is connected. The main themes of the meetings are:

1. The infrastructure of mathematics education in the Netherlands and abroad. In this we look into the extant journals, professional and scientific, conferences, associations, research institutes, funding agencies and much more.
2. The goals of primary mathematics education and the extent to which these are reached in the Netherlands and abroad.
3. The vision on primary mathematics education and mathematics teacher education, connected to the used textbooks.

4. Teaching and learning trajectories for primary mathematics education and mathematics teacher education.
5. Analyzing primary school students' and preservice teachers' solution strategies to be able to connect to their ways and levels of thinking.
6. Differentiation: from dealing with differences to using differences between students in primary education and teacher education
7. Developing a mathematical attitude of primary school students, preservice teachers, and mathematics teacher educators.
8. Developing higher-order thinking skills, like problem solving, and the skills teachers need to develop these in primary school and teacher education.
9. Developing mathematical literacy (functional numeracy) in primary school students and preservice teachers.
10. Developing design research skills to perform practice-oriented research in primary mathematics teacher education.

2. The professional development trajectory consists of activities that are embedded in both mathematics teacher education practice and primary education practice

Participants in the professional development trajectory are expected to develop on three important aspects. Firstly, they develop their own mathematical knowledge for teaching. They are challenged to apply this knowledge in their own teacher education practice. For example by discussing the goals and didactics of mathematics teacher education with their colleagues. Secondly, participants also implement new teacher education activities with their preservice teachers. When discussing, designing, experimenting, and evaluating this mathematical knowledge for teaching in teacher education practice the question comes to the fore how preservice teachers can apply this knowledge in their practice schools while teaching mathematics. The three levels in the professional development trajectory refer to activities in which the teacher educator, their students, or primary school students are exchanging and continually developing together.

3. The professional development trajectory offers opportunities for cooperative learning

The professional development trajectory offers a wide variety of learning activities where knowledge and experience of the leading teacher educators and practical and scientific sources play an important role. Equally important are the experiences, knowledge, and competences of the participants. The course, purposefully, offers many tasks and activities that are aimed at exchanging and evaluating experiences,

and offer opportunities to learn from and with peers. Such activities are for example activities in which participants, individually or in small peer groups, interview their colleagues in mathematics teacher education, have their student-teachers solve non-routine mathematical problems, look for mathematics in the world and in media, analyze textbooks and syllabi used in their institution, evaluate assessments and student work, design lesson activities and trial these in teacher education, investigate the vision of their teacher education institute on mathematics education, illustrate the teaching and learning trajectories used by their teacher education institutes, read literature of their choosing as well as provided literature, and answer their own research questions in that way, and share their findings in the meetings with other teacher educators. Plenary and small-group discussions are connected with theory, or form the basis for a new assignment. This learning with and from each other is intertwined with instructions or reflections from the course leaders. By this approach to learning we strive to have the participants prepared for and involved in an existing professional network or as developed within the trajectory, whereon they can still rely after the completion of the professional development trajectory. To facilitate these connections between the participants during the meetings there is always space built-in for informal exchanges in the form of lunches or walking tours.

4. The course uses practice based research as a developmental tool

Depth and progress in the learning process of the participants is aimed at by using an inquiry-based approach into questions or problems from their own teacher education practice. Participants select and study literature, design possible solutions, and trial these in their own institution, all the while gathering data to analyze and evaluate their designed intervention (Bakker, 2018). Such inquiries allow both for solutions to local problems from practice and the development of participants' mathematical knowledge for teaching. In the first year of the professional development trajectory relatively small and well-defined inquiry activities are undertaken. In the second year, participants perform a research project during the entire year, in which they focus on investigating and designing an educational intervention in their own teacher education institute. The participants are grouped thematically and can thus divide the work and perform several cycles in their design research with different student groups and context. In addition to the thematic focus of the meetings of the trajectory, about half of the time in the meetings in the second year is dedicated to this research project.

EXAMPLE MORNING SESSION: MATHEMATICAL ATTITUDE

To illustrate our approach, we will now describe some activities performed during a morning session in year 1. During this session, the central theme is the development of a mathematical attitude. Participants realize and experience that this ongoing development takes place among themselves, student teachers, and primary school students, and they will investigate how to encourage this.

In preparation for the meeting, the students have read Oonk and De Goeij's (2006) article on a mathematical attitude and prepare questions of the most appropriate way to work on the development of a mathematical attitude in primary school, and whether this follows or precedes basic skill development. One of the authors, Erica de Goeij, is present and lectures about the different aspects of a mathematical attitude. In addition to affective aspects, such as self-confidence and pleasure in mathematics, she also distinguishes reflective, inquisitive, critical, and communicative aspects of the mathematical attitude. This means that people with a mathematical attitude recognize mathematics in the world around them and explore how they can use mathematics to solve problems in everyday life. Verbalizing different approaches to solving problems and sharing and evaluating them with peers plays an important role in developing a mathematical attitude. Following the lecture, participants were given a meaningful task to solve: 'How many kilometres of toilet paper has been bought in the Netherlands last year?' Solving such a task requires knowledge of real-world measurements and quantities, and higher-order mathematical skills, such as critical and logical thinking and problem-solving skills. Participants first work on the question individually, then they discuss their problem approaches in small groups, and finally they have a plenary discussion and reflection.

One participant tries to work out the circumference of a toilet roll using the constant π (≈ 3.14). She estimates the number of layers of paper and in this way approximates the length of toilet paper on one roll. While discussing this with some other participants, she discovered that this could not be correct, since not every layer on the roll has the same length. Others estimate the length of a sheet of toilet paper and the number of sheets used in the Netherlands over the past year. Estimates of the length of a sheet of toilet paper range from 10 to 15 centimetres. One participant found on the internet that 12 cm is the exact length of one sheet. A deviation of 2 or 3 cm seems not much, but on a number of about 62 billion sheets, it causes a big difference. It makes participants critically reflect on estimates and their impact.

Some participants do not use separate sheets in their problem approaches, but use the length of a roll of toilet paper. One participant knows that her living room measures 14 metres. She estimates that she can cover that distance about twice with a roll of toilet paper and derives that a roll of toilet paper has a length of about 30 metres. Most participants note their thoughts quite extensively and can explain their approach well. During the small-group discussions, quite a few calculation errors and diverse estimations come to light. One of the participants estimated the population of the Netherlands to be 15 million, while it is actually about 18 million at the moment (see Figure 1).

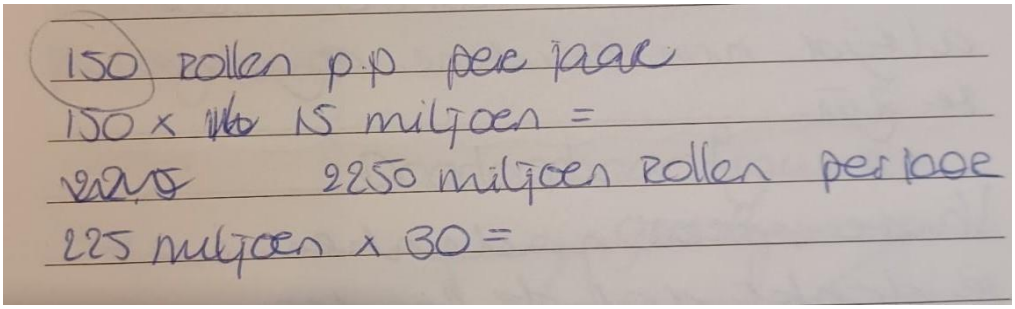

Figure 1: This participant estimates that one person uses 150 rolls of toilet paper a year and that there are 30 metres of paper on a roll. Multiplying the use per person by only 15 million inhabitants is too few and, she makes an error of a factor 10 in her calculation.

Another participant discovers that she should have multiplied her answer by the number of inhabitants. Yet another participant realises he should have multiplied the number of kilometres per day by 365 to arrive at the yearly use (see Figure 2). Things also went wrong occasionally when converting centimetres to kilometres. It becomes clear that some teacher educators struggle with such rich meaningful problems whereas others can solve these problems easily.

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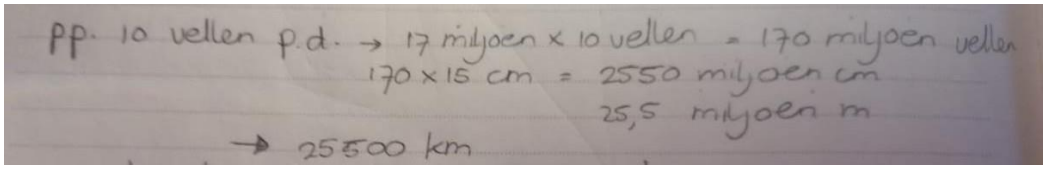

Figure 2: This participant estimates that 17 million people use 170 million sheets of toilet paper a day. She estimates the length of a sheet of toilet paper to be 15 cm. She forgets to multiply the distance found per day by the number of days per year.

During the plenary discussion, we noticed some participants being more eager to explain their own problem approach than questioning fellow participants. Trying to connect with the thinking and reasoning of the other problem solver is crucial in any learning process and should play a part at every level of education in order to achieve optimal development of mathematical thinking. Participants recognize this and agreed with the importance of this feature of teacher behavior. To make the participants more aware of the process of developing a mathematical attitude, we provide them with a list of characteristics of a mathematical attitude with the request to tick the characteristics that played a role during their individual work on the problem, and which were addressed during the small-group and plenary discussions. The participants believed that while working individually on the task, recognizing and applying mathematics in situations and being focused on appropriate numbers and on accuracy and completeness, were mostly present. While working together on the problem, being focused on alternative problem approaches, using mathematical language in collaboration with others, and being critical of the use of mathematics were more evident.

Participants also discovered how important the choice of an appropriate problem is in developing a mathematical attitude. The problem about the toilet paper was intriguing, required knowledge of the world, and appealed to higher-order thinking skills, but some participants considered the problem not urgent enough. They considered that it would be more valuable to use problems that you actually encounter in everyday life, for example, predicting the hight of your energy bill and how one's behaviour may affect that amount to be paid.

In the second part of the morning, participants analyse the work of primary school students who worked on the same toilet paper problem. The students' problem approaches also show many differences, especially in the ways they note their thinking. Participants experienced that it places high demands on the teacher to understand how students reason in rich meaningful problems, and especially to then conduct a classroom discussion in which students are learning from and with each other and thus developing their mathematical attitude. You need a lot of mathematical and didactic skills and knowledge as a teacher. Getting students to give respectful feedback on each other's work requires a safe classroom climate in which students are used to listening to and respecting each other. This, then, also requires strong pedagogical skills.

Finally, several participants decide to apply the toilet paper problem, the primary school student materials and the article, to a lesson on mathematical attitude in their

own teacher education program as well. The several aspects of the activities made them think about the development of mathematical attitude, and they hope to trigger this thinking process in their own student teachers as well. Perhaps this will subsequently encourage their student teachers to experiment with the problem in primary school practice.

Reflection on the morning session

In the description of this example, the four design criteria are clearly recognizable. The content theme is mathematical attitude, the participants can grow in their mathematical knowledge for teaching by reading the article and by the input of guest speaker De Goeij. They also further construct their own knowledge by sharing and reflecting on experiences during the meeting. The three levels - teacher educators, preservice teachers, and primary school students - are continuously interchanging or simultaneously in the spotlight. While working on the toilet paper problem, participants become aware of characteristics of mathematical attitude needed for educators. They are challenged to think about the required teacher skills to develop a mathematical attitude. What should their students teachers know and be able to do? Finally, they analysed the work of primary school students and how primary school students can develop their mathematical attitude. Learning from and with each other takes place during small group work and plenary discussion. Thus, participants work collectively on their own mathematics skills and their views on the aims of mathematics education. The fourth design principle - practice-based research as a developmental tool - comes into play at the many moments during the meeting when participants are invited, individually or together, to systematically explore, describe and evaluate their own and the primary school's practice, using the knowledge and experiences gained before and during the meeting. That this encouragement to research-based thinking about their own teacher education and the primary education effectively inspired the participants is evidenced by the fact that during the practice-oriented research in the second year of the course several participants chose to do a practical research project concerning the development of their students' mathematical attitude.

CONCLUSION AND DISCUSSION

What did we learn from these experiences - in a (more) broad sense?

Looking back at the professional development trajectory, we can conclude that the trajectory, as described in the design principles, has clearly contributed to the further professionalization of the participants. Concretely, the trajectory provided them with a more profound knowledge of the domain, by inspiring them with theorical insights and use these to investigate practical situations. Also by discussing with their teacher education colleagues and trying to get a grasp of their vision on mathematics education, and by doing practice-oriented research into a particular subject. Additionally the exchanges between teacher educators have clearly contributed to a broader perspective on education, educational settings, and the content. The mathematics teacher educators in the professional development trajectory became a professional learning community and formed a network, on which they can continue to rely after finishing the trajectory. Finally they have been learning from the diverse contexts of teacher education institutes in their practice-oriented research project in the second year.

As such we can conclude that the knowledge gains we aimed for and that we strived to obtain using the design criteria were indeed achieved. The participants also provided their feedback on this to us:

"I found it especially interesting to read articles from different mathematics education journals and discuss these with the peer group" (cf. design principle 1)

"Already in the first meeting it became clear that everyone's background and level was taken into account. Differentiation. I really appreciated that."

"I really found it of added value to exchange ideas and especially experiences. As I work in a small institute these exchanges with mathematics teacher educators are rare." (cf. design principle 3)

Notwithstanding the second quote, a challenge for the trajectory remains to really cater to the needs of all participants. Different participants gave different feedback on the different themes dealt with in the trajectory. As described above, due to the differences in previous experiences and knowledge the participants' needs differed greatly. Although we strived to incorporate different foci and levels in each meeting, participants did sometimes feel that things went too slowly, or too quickly. All in all it is clear that participants and the course leaders were positive about the content of the professional development trajectory and the development of the participants' mathematical knowledge for teaching therein. The designed professional development trajectory with a content-specific focus clearly contributes to the professionalization of new mathematics teacher educators.

REFERENCES

Bakker, A. (2018). *Design Research in Education. A Practical Guide for Early Career Researchers.* Leiden: Taylor & Francis Ltd.

Ball, D., Thames, M., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education, 59*, 389-407.

Goffree, F., & Dolk, M. (Eds.). (1995). *Proeve van een nationaal programma rekenen-wiskunde & didactiek op de pabo [Standards for primary mathematics teacher education]*. Enschede/Utrecht: Instituut voor Leerplanontwikkeling / NVORWO.

Hill, H., Ball, D., & Schilling, S. (2008). Unpacking pedagogical content knowledge: Conceptualizing and measuring teachers' topic-specific knowledge of students. *Journal for Research in Mathematics Education, 39*, 372–400.

Oonk, W. (2009). *Theory-enriched practical knowledge in mathematics teacher education.* Leiden: Universiteit Leiden.

Oonk, W., & De Goeij, E. (2006). Wiskundige attitudevorming. *Reken-wiskundeonderwijs: onderzoek, ontwikkeling, praktijk, 25*(4), 37-39.

Oonk, W., Van Zanten, M. A., & Keijzer, R. (2007). Gecijferdheid, vier eeuwen ontwikkeling [Four centuries in development: mathematical literacy]. *Reken-wiskundeonderwijs: onderzoek, ontwikkeling, praktijk, 26*(3), 3-18.

CONSTRUCTING A TEST INSTRUMENT (SOWIS-L) FOR MEASURING THE PROFESSIONAL KNOWLEDGE OF TRAINEE TEACHERS IN THE SUBJECT OF SOCIAL SCIENCES

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ABSTRACT

This paper presents the development and validation of a standardised test instrument for measuring the content knowledge (ck) and the pedagogical content knowledge (pck) of trainee teachers in the subject of social sciences according to the theoretical model of Shulman (1986) and Baumert & Kunter (2011). The resulting instrument, SoWis-L (Sozialwissenschaftliches Wissen - Lehrkräfte [The professional knowledge of social sciences teachers]) investigates declarative and conceptual knowledge in the areas politics, economics, sociology and didactics. The 46-item instrument was developed and validated using a sample of 374 social sciences trainee teachers. Research questions specifically explored the reliability and criterion validity of the instrument. Item response theory analyses showed good item fit and acceptable reliability. A structural equation model resulted in a good fit of the model with three correlated latent factors, i.e. with pedagogical content knowledge and two areas of content knowledge, namely political and economic knowledge. Criterion validity of the SoWis-L instrument was indicated by a comparison of the test results of trainee teachers preparing to teach in the academic secondary school track versus those preparing to teach in the vocational track, by a comparison of the test results of trainee teachers enrolled in their bachelor's versus their master's degree, and by significant correlations with the grades that trainee teachers achieved in their own final school examinations (Abitur, i.e. university entrance qualification).

THEORETICAL BACKGROUND

The theoretical foundation of our work is based on the generic model of the professional competence of teachers according to Baumert & Kunter (2006). The three-way division of professional knowledge into the areas of *content knowledge (ck)*, *pedagogical content knowledge (pck)*, and *pedagogical knowledge (pk)* goes back to the work of Shulman (1986, 1987) and has become widely accepted in research on the teaching profession. Two of these three types of knowledge, namely *ck* and *pck*, must be designed in a domain-specific manner. Such knowledge can be differentiated into different levels ranging from subject-related general knowledge to school-level knowledge and academic, university-level knowledge (Baumert & Kunter, 2011). Among other aspects, *pedagogical content knowledge* includes elements of knowledge about making content understandable (see Krauss et al., 2008, p. 227). In accordance with Park & Oliver (2008), *pck* can be divided into knowledge about the curriculum, strategies for instruction and teaching, subject-related diagnostics, teaching-learning research, and student cognition. In contrast to pedagogical knowledge, which is not subject specific, pedagogical content knowledge focuses on relevant and concrete subject-related content, in this case relating to social sciences.

Conceptualising Professional Knowledge for Teacher Training in Social Sciences

For *pedagogical content knowledge*, the present work adopted the generic classification of knowledge according to Park & Oliver (2008) to design corresponding *pck* items. In the area of content knowledge, the SoWis-L test instrument explores professional knowledge taught at university at a deepened level of understanding of the learning content that is relevant in a school setting (Blömeke & Zlatkin-Troitschanskaia, 2013; Krauss et al., 2008). Core content areas of university-based teacher education in the subject of social sciences are taken into consideration in accordance with the common content requirements of the German federal states for university-based teacher education in social sciences as set out by the Standing Conference of the Ministers of Education and Cultural Affairs (*Kultusministerkonferenz* [KMK], 2008, pp. 58–60) and in accordance with the recommendation of relevant professional associations in Germany. Moreover, according to cognitive psychology, knowledge can be categorised based on cognitive requirements (Anderson, Krathwohl & Bloom, 2001). For the SoWis-L test instrument, we adopted the distinction between declarative knowledge that can be recalled and procedural knowledge that is applied (Großschedl et al., 2015; Kauertz et al., 2010). Several challenges arise when conceptualising subject-specific

knowledge in the field of social sciences; some of these are addressed in the next section.

Modelling and Measuring the Professional Knowledge of Trainee Teachers in the Subject of Social Sciences

This section provides an overview of the current practices for modelling and measuring the professional knowledge of trainee teachers in the subject of social sciences. In so doing, specific challenges relating to designing a test instrument in this subject must be considered. These challenges go beyond generic problems with measuring competence in higher education, such as the significant institutional and curricular heterogeneity of the German higher education system or the absence of a nationwide core curriculum (Blömeke & Zlatkin-Troischanskaia, 2015, p. 9). Both across and within the various federal states of Germany, the subjects of politics and social sciences are configured differently and/or integrated into different subjects[1] at school depending on the school track (vocational versus academic) and phase (lower versus upper years in secondary education). There are no binding standards for political and social sciences education at school. The core content elements of university-based teacher education in social sciences are determined only by the common content requirements of the German federal states as set out by the KMK (2008, pp. 58–60). These provide the framework for the design of the SoWis-L knowledge test.

So far, knowledge in Social Sciences is conceptualized from the perspective of individual disciplines. First, we offer a brief overview of existing tests on political and economic knowledge[2]. In Germany, **political knowledge** is measured regularly in tests that survey general knowledge (ALLBUS, 2018). Individual subscales are available in the differential knowledge test (Fürntratt & Jäger, 1996), the Bochum knowledge test (Hossiep & Schulte, 2007), the Hohenheim inventory of political knowledge (Trepte et al., 2017), and through the Organisation for Economic Co-operation and Development's Programme for International Student Assessment (PISA; see Trepte & Verbeet, 2010). Subjective and objective political knowledge is regularly the focus of specific research in the fields of sociopsychology, media psychology, sociology, and political science. Such research is frequently combined with research on political interest, use of media or information, or participation (e.g. Westle & Tausendpfund, 2019). Landwehr (2017, pp. 129ff.) offers an overview of international and national empirical research on political knowledge.

[1] For an overview of school subjects under whose umbrella politics and social sciences are taught, see: http://library.fes.de/pdf-files/studienfoerderung/14009/polbild_als_unterrichtsfach_gesamt.pdf

[2] A knowledge test that measures sociological knowledge does not exist at this time.

In the field of economics, tests are used to measure **economic knowledge**. The economics education test (*wirtschaftskundlicher Bildungstest* [WBT]) developed by Beck et al. in 1998 adapted the test of economic literacy (TEL) for Germany. Wuttke & Beck (2002) used the WBT to measure the entry requirements for students of economics. Förster et al. (2012) and Zlatkin-Troitschanskaia et al. (2017, 2019) developed and extensively validated a theory-based model of economic competence by adapting into German the fourth version of the American test of understanding college economics (TUCE4-G) and the fourth version of the test of economic literacy (TEL4-G).

As illustrated above, existing test instruments focus either on citizens' general political knowledge, teachers' political or subject-didactic professional knowledge (e.g. Weißeno, et al., 2013; Weschenfelder, 2014), or economic knowledge (e.g. Beck et al., 1998; Förster et al., 2012, Zlatkin-Troitschanskaia et al., 2019). It is therefore not possible to make empirical statements about the professional knowledge of social sciences teachers based on the model of professional competence developed by Baumert & Kunter (2006), which is not subject specific. A subject-specific adaptation of Baumert & Kunter's model was first presented for the subject domain of politics by Weschenfelder (2014) in the research project on the professional competence of politics teachers, *Professionelle Kompetenz von Politiklehrkräften* ([PKP]; Weißeno et al., 2013). A test instrument which considers all three areas of *content knowledge* and *pedagogical content knowledge* equally in terms of both declarative and conceptual knowledge does not yet exist in the field of teacher training in social sciences. For this reason, we have developed a new test instrument that addresses these desiderata.

RESEARCH AIMS AND QUESTIONS

The aim of this study was to develop and validate a standardised test instrument for measuring the professional knowledge of trainee teachers in the subject of social sciences. The starting point was preparatory work (see Manzel & Gronostay, 2018) completed within the project *PROVIEL* [Professionalization for Diversity] funded by the German Federal Ministry of Education and Research at the University of Duisburg-Essen (fund number FKZ 01JA1910[3]). The test instrument was designed to provide valid and reliable measurements of *ck* and *pck* in the three knowledge areas of politics, economics, and sociology. Additionally, it was designed be time-efficient to use. Such a test instrument makes it possible to research the interdependencies between the different areas of professional knowledge as well as relationships between professional knowledge and other dimensions of professional

[3] Original work: Gronostay, Manzel & Zischke, paper accepted in 2022, to be published in *Diagnostica* - Journal of Psychological Diagnostics and Differential Psychology in Spring 2023

competence (such as subject-specific beliefs and values, and motivational orientations) of social sciences teachers.

This paper focuses on four research questions regarding the reliability and validity of the developed test instrument.

Question one (Q_1) investigates whether professional knowledge of the subject of social sciences can be measured reliably along the dimensions of *ck* and *pck* using the developed test items.

Question two (Q_2) examines how the structure of professional knowledge presents itself empirically. Based on the preceding theoretical discussion, we will expect to see evidence of a distinction between *ck* and *pck* and of a distinction between the three subject knowledge areas.

Question three (Q_3) focuses on known-group validity (criterion validity). Is there evidence of the expected differences between groups in terms of study progress and teacher training programme? The assumption is that due to a greater level of study progress, students enrolled in the master's phase of their teacher training degree will show higher test results than students enrolled in the bachelor's phase.[4] Additionally, trainee teachers preparing to teach in the academic secondary school track should show better test results than those preparing to teach in the vocational school track. A comparison of trainee teachers' test results with those of practicing teachers should provide indications of the sensitivity of the SoWis-L test instrument in terms of differences in expertise.

Finally, **question four** (Q_4) relates to validation using external criteria. The grade achieved by trainee teachers in their final school examinations (university entrance qualification) is considered a predictor of achievement in higher education studies and should therefore show a significant negative correlation with SoWis-L test results (higher test results achieved correlate with a lower, i.e. better, grade in the final school examinations; note that final school examinations in Germany are graded, and the final mark is averaged, from 1, which is best, to 4, which is the lowest possible pass mark). Another external criterion is self-reported university examination grades; these should also show a significant negative correlation with performance in the SoWis-L test.

[4] Note that teacher training programmes in North Rhine-Westphalia consist of two university-based phases: a three-year bachelor's degree followed by a two-year master's degree. Students have to complete both degrees as well as a one-year preparatory service period to qualify fully as a teacher.

INSTRUMENTS AND METHODS

Construction of the Test Instrument

The construction of the SoWis-L test instrument was based on the generic model of teachers' professional competence developed by Baumert & Kunter (2006) as well as its more concrete application in the domain-specific model of the professional competence of politics teachers (PKP model, see Weißeno et al., 2013; Weschenfelder, 2014). To ensure curricular validity, the development of test items was based on the common content requirements of the German federal states for university-based teacher education in social sciences as set out by the KMK (2008, pp. 58–60). Further guidance was taken from existing test instruments as well as from the recommendations of relevant professional associations.

In order to ensure the time-efficient administration of the SoWis-L, it was designed to be completed within a maximum of 60 minutes and to cover all four knowledge areas, whereby each area is comprised of three equal parts of application and comprehension tasks (dimension: cognitive processes). The test items were developed systematically based on the matrix shown in Figure 1.

Specifically, we developed items along the following dimensions: knowledge area (politics, economics, sociology, and didactics); category (with three to four subcategories depending on the knowledge area); and cognitive processes (with the two subcategories of memory and recall, and comprehension and application respectively; see Großschedl et al., 2015; Kauertz et al., 2010).

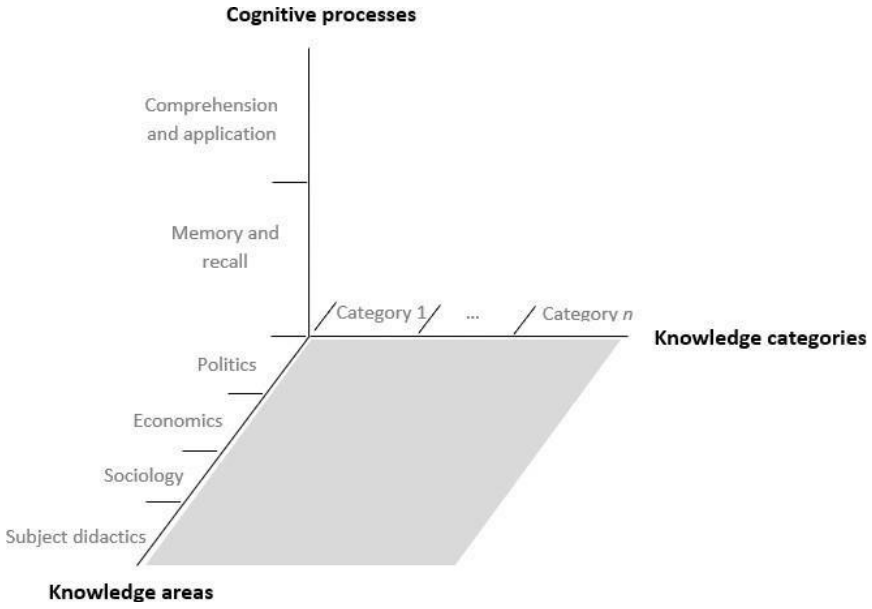

Figure 1: Item Construction Matrix (cf. Gronostay, Manzel & Zischke, 2023)

In total, 134 items offering a single-answer format with four answer choices were constructed along this matrix. In order to test the item pool, a pilot study was conducted involving 229 social sciences trainee teachers at the University of Duisburg-Essen. The following criteria were used for item selection: classic item difficulty ($.10 \leq P_i \leq .90$); item discrimination ($\geq .30$); weighted infit mean square ($.80 \leq$ wMNSQ ≤ 1.20 and $-1.96 \leq t\text{-value} \leq 1.96$) calculated using ConQuest generalised item response modelling software and a graphical inspection of the item characteristic curves. The items were reviewed by experts to ensure not only the content accuracy of the items but also their categorisation in terms of cognitive processes and content areas.

Sample

The main study was based on survey data from $N = 374$ trainee teachers in the subject of social sciences at the University of Duisburg-Essen. The average age of respondents was between 19 and 40 years ($M = 24.79$, $SD = 3.09$); 58% of respondents were female, 34% had an academic background, and 23% reported a native language other than German. More than three-quarters of respondents (76%) were enrolled in the teacher training programme for the academic secondary school track; the rest were enrolled in the teacher training programme for the vocational secondary school track. Exactly 50% of respondents were studying for their master's degree; the other half was studying for their bachelor's degree.

Survey

The paper-pencil survey was conducted between 2018 and 2020 at the beginning of each semester in the same subject-didactic course in the bachelor's phase (semester 5/6) and in the master's phase of the teacher training programme in social sciences; this is a mandatory course in both study phases. Participants generated an ID code for themselves, which was recorded to avoid including individual participants twice in the sample for this study. All surveys were administered by trained test supervisors. The design of the test booklet controlled for order effects but not carryover effects. All versions of the test booklet included a comparable number of items from all knowledge areas as well as anchor items. A spiralled distribution technique (for a detailed description, see Frey et al., 2009, p. 45) was used to ensure an even and random distribution of the different versions of the test booklet among participants. Participation in the survey was voluntary. In order to increase trainee teachers' motivation to participate, students were offered the opportunity of receiving individual feedback on their results via their ID code.

RESULTS

Item Response Theory (IRT) Scaling Results

Item difficulty, item discrimination values, and expected a posteriori (EAP) and plausible values (PV) reliability were estimated based on IRT using ConQuest software. Items were IRT-scaled for the overall test and separately in the three content knowledge areas (politics, economics, sociology) and *pck* (subject didactics). With regard to Q_1, it can be stated that the sociology scale has insufficient reliability and therefore is excluded from further analyses. The scale of economics, politics and subject didactics result in satisfactory reliability values and are correspondingly subject of further analysis.

Table 1: Scaling Parameters of the SoWis-L Knowledge Test

Knowledge area	*n*	Number of items	EAP/PV	Variance	wMNSQ	ID (*M*)
Politics	371	16	.66	.99	.87–1.10	.32
Economics	370	15	.66	1.06	.92–1.12	.31
Sociology	374	17	.47	.38	.95–1.08	.19
Didactics/*pck*	366	15	.60	.88	.90–1.08	.30

Note: EAP/PV = Expected A-Posteriori / Plausible Value Reliability; wMNSQ = Weighted Mean Square, ID (*M*) = mean value of item discrimination.

Structural Analyses

In order to test the structure of professional knowledge of the social sciences (Q_2), structural equation models (Kline, 2015) were calculated using the weighted least squares mean and variance adjusted (WLSMV) estimator in Mplus 8 software (Muthén & Muthén, 1998–2017), and three models were tested. Compared to the general factor model M1, the two-factor model M2 (differention *ck – pck*) showed a statistically significant model improvement ($\Delta\ \chi2 = 46.43$, $df = 2$, $p < .001$). The three-factor model M3 (differention between subject areas) yielded a significant model improvement compared to both the general factor model M1 ($\Delta\ \chi2 = 93.38$, $df = 5$, $p < .001$) and the two-factor model M2 ($\Delta\ \chi2 = 46.95$, $df = 3$, $p < .001$). EAP reliability values were in a satisfactory range with values of ≥ .70. Overall, the results strongly supported using three-factor scaling. Root mean square error of approximation (RMSEA) and confirmatory fit index (CFI) were used to assess model fit. RMSEA values less than .05 and CFI values greater than .95 indicate a good model fit, and RMSEA values less than .08 and CFI values greater than .90 indicate an acceptable model fit (Hu & Bentler, 1999; Xia & Yang, 2018).

Q_3 focuses on validating the test instrument using the known-group method. Analysis looked at the levels of increase in knowledge between the bachelor's and master's phases (in a cross-section) as well as differences in knowledge between school tracks. Results showed that students training to teach in the academic school track on average performed better in the knowledge test in all knowledge areas than those training to teach in the vocational track. This applied to the knowledge area of politics ($t_{347} = 4.42$, $p < .001$, $d = .57$), economics ($t_{347} = 3.68$, $p < .001$, $d = .48$), and *pck* ($t_{347} = 1.69$, $p = .046$, $d = .22$). These results are strongly in line with expected results. Similarly, test performance in politics improved between bachelor's and master's phases. There is a medium significant effect for students training to teach in the vocational secondary school track ($t_{74} = 2.22$, $p = .015$, $d = .52$), and a small significant effect for students training to teach in the academic track ($t_{266} = 1.82$, $p = .035$, $d = .22$). It is only in economics that no difference can be observed in test performance between students enrolled in their bachelor's degree and those enrolled in their master's degree. Overall, these results support the assumed group differences (criterion validity). Additionally, a contrast sample of twelve teachers in active service achieved a significantly higher test performance in politics ($t_{383} = 5.37$, $p < .001$, $d = 1.575$), economics ($t_{13,11} = 9.82$, $p < .001$, $d = 1.442$), and *pck* ($t_{380} = 6.59$, $p < .001$, $d = 1.932$), which can be interpreted as an indication that the test instrument is sensitive to difference in expertise.

Q_4 looks at correlations between test performance in the SoWis-L test instrument with external criteria, in this case the self-reported average university examination grades by knowledge area, and the grade achieved in final school examinations. In all three knowledge areas, test performance in the SoWis-L knowledge test was

significantly negatively correlated with the grade achieved in final school examinations. The correlation was strongest in economic knowledge (r = -.27, p < .001) and weakest in the area of *pck* (r = -.16, p = .004). This means that the better the grade achieved in final school examinations, the better the corresponding SoWis-L test result. This result is consistent with the hypothesis.

DISCUSSION AND CONCLUSIONS

This paper describes the construction and validation of a test instrument for measuring the professional knowledge of trainee teachers in social sciences. The SoWis-L test instrument was administered to 374 trainee teachers in social sciences at the University of Duisburg-Essen and was subsequently evaluated for its psychometric quality and validity. The results show that the SoWis-L test instrument can reliably measure content knowledge and pedagogical content knowledge in subject-specific dimensions, and that the test is both valid and efficient to administer. The test instrument better reflects the integrated nature of the subject of social sciences than alternative instruments (Weschenfelder, 2014). The test instrument is innovative in that it allows for separate modelling of the knowledge in politics and economics as well as *pck*; this means that research questions regarding the professional knowledge of teachers can be investigated with a greater degree of differentiation than was previously possible. The known-groups validation method largely produced results in line with expectations. Students enrolled in their master's degree performed better in the political knowledge tests and in *pck*. Contrary to expectations, the same was not true for economics. Since cross-sectional data was used, the possibility cannot be ruled out that underlying performance differences between the cohorts exist which may have confounded the comparison between bachelor's and master's students. Nonetheless, some research gaps remain, and some limitations of the test instrument must be noted. However, it was not possible to develop a reliable scale for knowledge in sociology. The items constructed for this scale should be tested on a larger or additional sample for the purposes of further validation and, if necessary, should be revised for future use. And as the core content of the respective teaching degrees was determined based on an extensive review of curricular documents, the test instrument should be suitable for use at other universities. However, ultimately this can only be verified by empirical research.

REFERENCES

Anderson, L.W., Krathwohl, D. R., & Bloom, B.S. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives. Longman.

Baumert, J. & Kunter, M. (2006). Stichwort: Professionelle Kompetenz von Lehrkräften [Keyword: Professional competence of teachers]. Zeitschrift für Erziehungswissenschaft, 9(4), 469–520.

Baumert, J. & Kunter, M. (2011). Das Kompetenzmodell von COACTIV [The COACTIV competence model]. In M. Kunter, J. Baumert, W. Blum, U. Klusmann, S. Krauss, & M. Neubrand (Eds.), Professionelle Kompetenz von Lehrkräften. Ergebnisse des Forschungsprogramms COACTIV (pp. 29–53). Waxmann.

Beck, K., Krumm, V., & Dubs, R. (1998). Wirtschaftskundlicher Bildungs-Test (WBT) [Economics education test]. Hogrefe.

Blömeke, S. & Zlatkin-Troitschanskaia, O. (2013). Kompetenzmodellierung und Kompetenzerfassung im Hochschulsektor: Ziele, theoretischer Rahmen, Design und Herausforderungen des BMBF-Forschungsprogramms KoKoHs (KoKoHs Working Papers, 1) [Modelling and measuring competence in the higher education sector]. Humboldt-Universität/Johannes Gutenberg-Universität.

Blömeke, S. & Zlatkin-Troitschanskaia, O. (2015). Kompetenzen von Studierenden [Competences of university students]. Einleitung. Zeitschrift für Pädagogik, 61. Beiheft, 7–10

Förster, M., Happ, R., & Zlatkin-Troitschanskaia, O. (2012). Valide Erfassung des volkswirtschaftlichen Fachwissens von Studierenden der Wirtschaftswissenschaften und der Wirtschaftspädagogik – Eine Untersuchung der diagnostischen Eignung des Wirtschaftskundlichen Bildungstests (WBT) [Valid measurements of the economics knowledge of students of econonics and economics education]. bwp@ Berufs- und Wirtschaftspädagogik—online, 22, 1–21.

Frey, A., Hartig, J. & Rupp, A. A. (2009). An NCME instructional module on booklet designs in large-scale assessments of student achievement: Theory and practice. Educational Measurement: Issues and Practice, 28(3), 39–53. https://doi.org/10.1111/j.1745-3992.2009.00154.x

Fü rntratt, E. & Jäger, A. O. (1996). Differentieller Wissenstest [Differential knowledge test]. Hogrefe.

Gronostay, D., Manzel, S. & Zischke, F.E. (in print). Konstruktion eines Testinstruments zur Erhebung des Professionswissens von Lehramtsstudierenden im Fach Sozialwissenschaften (SoWis-L). *Diagnostica. Zeitschrift für Psychologische Diagnostik und Differentielle Psychologie.*

Großschedl, J., Neubrand, C., Kirchner, A., Oppermann, L., Basel, N., & Gantner, S. (2015). Entwicklung und Validierung eines Testinstruments zur Erfassung des evolutionsbezogenen Professionswissens von Lehramtsstudierenden

(ProWiE) [Developing and validating a test instrument for measuring trainee teachers' professional knowledge about evolution]. Zeitschrift für Didaktik der Naturwissenschaften, 21(1), 173–185. https://doi.org/10.1007/s40573-015-0036-6

Hossiep, R. & Schulte, M. (2007). BOWIT—Bochumer Wissenstest [The Bochum knowledge test]. Hogrefe.

Hu, L. & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal, 6(1), 1–55.

Kauertz, A., Fischer, H. E., Mayer, J., Sumfleth, E., & Walpuski, M. (2010). Standardbezogenen Kompetenzmodellierung in den Naturwissenschaften der Sekundarstufe I [Standard-focused competence modelling in the natural sciences at lower secondary school level]. Zeitschrift für Didaktik der Naturwissenschaften, 16, 135–153.

Kline, R. B. (2015). Principles and practice of structural equation modeling (4th ed.). The Guilford Press.

Krauss, S., Neubrand, M., Blum, W., Baumert, J., Brunner, M., Kunter, M., et al. (2008). Die Untersuchung des professionellen Wissens deutscher Mathematik-Lehrerinnen und -Lehrer im Rahmen der COACTIV-Studie [Measuring the professional knowledge of German mathematics teachers in the context of the COACTIV study]. Journal für Mathematik-Didaktik, 29(3/4), 223–258.

Kultusministerkonferenz (2008). Ländergemeinsame inhaltliche Anforderungen für die Fachwissenschaften und Fachdidaktiken in der Lehrerinnen- und Lehrerbildung. Beschluss der Kultusministerkonferenz vom 16.10.2008 i. d. F. vom 10.09.2015 [Common content requirements of the German federal states for subject sciences and subject didactics in teacher education]. http://www.kmk.org/fileadmin/Dateien/veroeffentlichungen_beschluesse/2008/2008_10_16-Fachprofile-Lehrerbildung.pdf

Landwehr, B. (2017). Partizipation, Wissen und Motivation im Politikunterricht. Eine Interventionsstudie [Participation, knowledge, and motivation in policits lessons. An intervention study]. Springer. https://doi.org/10.1007/978-3-658-16507-9.

Manzel, S. & Gronostay, D. (2018). Weiblich, Realschule, pädagogisches Interesse – männlich, Gymnasium, höheres Fachinteresse? Einflussfaktoren auf das Professionswissen bei angehenden Politik-Lehrkräften. In S. Manzel & M. Oberle (Hrsg.), *Kompetenzorientierung. Potenziale zur Professionalisierung der Politischen Bildung* (S. 73–84). Springer VS.

Muthén, L. K. & Muthén, B. (1998–2017). Mplus (Version 8). Muthén & Muthén.

Park, S. & Oliver, J. S. (2008). Revisiting the conceptualisation of pedagogical content knowledge (PCK). PCK as a conceptual tool to understand teachers as professionals. Research in Science Education, 38(3), 261–284.

Shulman, L. S. (1986). Those who understand. Knowledge growth in teaching. Educational Researcher, 15(2), 4–14.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. Harvard Educational Review, 57(1), 1–22.

Trepte, S., Loy, L. S., Schmitt, J. B., & Otto, S. (2017). Hohenheimer Inventar zum Politikwissen (HIP): Konstruktion und Skalierung [The Hohenheim inventory of political knowlege: Design and scaling]. Diagnostica. https://doi.org/10.1026/0012-1924/a000180.

Trepte, S. & Verbeet, M. (2010). Allgemeinbildung in Deutschland [General education in Germany]. VS Verlag fü r Sozialwissenschaften.

Weißeno, G., Weschenfelder, E., & Oberle, M. (2013). Empirische Ergebnisse zur professionellen Kompetenz von Politiklehrer/-innen [Emprical results regarding the professional competence of politics teachers]. In K. P. Hufer & D. Richter (Eds.), Politische Bildung als Profession. Verständnisse und Forschungen (pp. 187–202). Bundeszentrale für politische Bildung.

Weschenfelder, E. (2014). Professionelle Kompetenz von Politiklehrkräften. Eine Studie zu Wissen und Überzeugungen [The professional competence of politics teachers: A study of knowledge and beliefs]. Springer VS. https://doi.org/10.1007/978-3-658-04193-9.

Westle, B. & Tausendpfund, M. (Eds.). (2019). Politisches Wissen. Relevanz, Messung und Befunde [Political knowledge: Relevance, measurements, and results]. Springer VS. https://doi.org/10.1007/978-3-658-23787-5

Wuttke, E. & Beck, K. (2002). Eingangsbedingungen von Studienanfä ngern—Die Prognostische Validität wirtschaftskundlichen Wissens fü r das Vordiplom bei Studierenden der Wirtschaftswissenschaften [Entry requirements for new students—The prognostic validity of economic knowledge for the preliminary diploma of economics students]. Arbeitspapiere WP 41. Universität Mainz. https://download.uni-mainz.de/fb03-wipaed/ArbeitspapiereWP/gr_Nr.41.pdf

Xia, Y. & Yang, Y. (2018). RMSEA, CFI, and TLI in structural equation modeling with ordered categorical data: The story they tell depends on the estimation methods. Behavior Research Methods, 51, 409–428.

Zlatkin-Troitschanskaia, O., Jitomirski, J., Happ, R., Molerov, D., Schlax, J., Kü hling-Thees, C., Fö rster, M., & Brü ckner, S. (2019). Validating a test for measuring knowledge and understanding of economics among university students. Zeitschrift fü r Pä dagogische Psychologie, 33(2), 119–133.

Zlatkin-Troitschanskaia, O., Pant, H. A., Toepper, M., Lautenbach, C., & Molerov, D. (2017). Valid competency assessment in higher education—Framework, results, and further perspectives of the German research program KoKoHs. AERA Open, 3(1), 1–22. https://doi.org/10.1177/2332858416686739

USERS' CONCEPTIONS OF THE OPEN ACCESS JOURNAL IN THE SECTOR OF THE FINNISH UNIVERSITY OF APPLIED SCIENCES

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ABSTRACT

The purpose of this case study was to find out the readers´ opinions of the Finnish Journal of Universities of Applied Sciences (UAS Journal) quality. The research questions were formulated as follows: (1) what are the readability and usability of the UAS Journal from the reader's point of view, and (2) what kind of development initiatives do they express? The data was gathered by using a web-based questionnaire, and there were 100 respondents. In addition, with the qualitative data, the Net Promoter Score (NPS) was used to rate the likelihood of recommending the journal to a colleague educator. In general, the journal was seen as a familiar suitable-for-all professional, non-scholar journal, suitable for the whole UAS "family". The respondents were very pleased, and every third would recommend it (NPS 14). Indeed, the Finnish UAS Journal supports the dialogue between UASs and wider society and affects a high-impact 'hat trick' through cooperation, dialogue, and the articles published. This national professional open access semi-academic journal has a justified place to maintain and develop the professional expertise of the higher education learning and knowledge production ecosystem, and to improve educational practice.

Keywords: Higher education, publication, reader's opinion, dissemination, research, development, innovation

INTRODUCTION

> *Homo sapiens is a storytelling animal that thinks in stories rather than in numbers or graphs, and believes that the universe itself works like a story, replete with heroes and villains, conflicts and resolutions, climaxes and happy endings. When we look for the meaning of life, we want a story that will explain what reality is all about and what my particular role is in the cosmic drama. This role makes me a part of something bigger than myself, and gives meaning to all my experiences and choices.*
>
> Yuval Noah Harari (2018)

In recent decades, the open access publication activity as one task of the universities of applied sciences (UAS) in Finland has gained momentum. However, only a half of Finnish peer-reviewed publication channels are open access and just a small group of them meet the focal initiative for Open Access publishing (Plan S) requirements (Linna, Holopainen, Ikonen & Ylönen, 2020). In addition, a user-driven approach to studying non-peer reviewed professional journals in the Finnish higher education context has received minor attention. In this case study, we focus on the results of the Journal of Finnish Universities of Applied Sciences user survey in 2020. In addition, feedback from the editors of four theme issues 2022 was used.

Traditionally, the main roles of academic journals have been stated to be editorial, quality control of content and form, confirming recognition of work, marketing, raising awareness, and delivering/ disseminating. In addition, there are also hidden or non-obvious roles such as subject defining, directly/indirectly, community defining, and archiving (Smith, 1999). The purpose of this present case study was to find out the users´ opinions of the Finnish UAS Journal`s quality, such as, readers, article authors and editors. The research questions were formulated as follows:

1. what are the readability and usability of the UAS Journal from the reader's point of view, and

2. what kind of development initiatives do they express?

This practice-based research is based on the results of earlier studies (Väänänen & Friman, 2018; Väänänen, Friman, Kantola & Lamberg, 2019), where the need of the users' conceptions in developing the UAS Journal was recognized and belongs to the

person- and process-related “spheres of knowledge in higher education” (Teichler, 1996).

JOURNAL OF FINNISH UNIVERSITIES OF APPLIED SCIENCES – THE OPEN ACCESS PUBLICATION FOR APPLIED PRACTICE BASED RDI

The purpose of the UAS Journal is to maintain and develop the professional expertise of the professional learning ecosystems, increasing national social capital and to offer a “window” to the operations and results of UASs. Its activities are based on well-grounded interaction and the strong connections that staff at universities of applied sciences have with a broad range of stakeholders in the private sector, their practical experiences as professionals, and their expertise in RDI activities. An online journal can be compared to a campfire, around which we digitally gather four or five times a year to share stories. The story is a cultural tool specializing in the structuring and directing of human life, which has evolved from the outside into an internal story (Hakanurmi & Kantola, 2020). Sharing good practices and thus achieving more than just a local impact of the research activities, as well as finding colleagues to collaborate with both nationally and internationally, are outcomes of such gatherings (Väänänen, Friman, Kantola & Lamberg, 2019). Of the articles published in the Finnish UAS Journal during 2017, the majority (87%) were authored by staff or students of Finnish UASs. Articles authored by employees of traditional universities constituted 5%, while 8% of contributions came from other organisations (Väänänen, Friman, Kantola & Lamberg, 2019). Among Finnish UASs the hidden target, more or less, is strengthening networking and increasing productive collaboration. Each year, the UAS Journal publishes around 75 articles, with contributions from nearly two hundred authors and more than ten theme editors. The idea of co-authoring has been one aim in the UAS Journal´s developing work and it has succeeded well. The editorial process has two phases. In the first phase, the authors send an abstract of the proposed article, and in the second phase the full text. Typically, about one-third of the abstracts will be accepted. The articles have been typically in Finnish including a summary in English, but every issue has had one or two articles in the opposite format. The journal`s web pages are visited annually over one hundred thousand times and the amount has increased year by year during the last ten years telling the story about the digital development of the Finnish society.

The societal impact of the UAS Journal has been realised by following the three routes to impact defined by the Academy of Finland (Huutoniemi, Törnroos, & Mälkki, 2016): proficient people, cooperation and interaction, and transfer of research results (Väänänen, Friman, Kantola & Lamberg, 2019). The themes of the issues and the number of their articles, and the annual number of the website visitors

and visits in the period 2020–2023 are shown in Table 1, and the annual operation plan 2022 in Figure 2. The numbers or the articles do not include editorials.

Table 1: The themes of the issues, and the number of the articles, annual website visitors and visits of the UAS Journal in the period 2020 – 2022.

Year/ Issue	**2020**	**2021**	**2022**
#1	Current topics (22)	Current topics (20)	Current topics (15)
#2	Promoting ecological sustainability (24)	Open RDI activities and open education in UASs (12)	Sustainability (12)
#3	Promoting social sustainability (20)	Responsibility (14)	Ethical Sustainability Competences and Actions in HE and Business Context (15)
#4	Using data from work-related studies (19)	Sustainable development and responsibility (17)	Internationality at UASs today and tomorrow (15)
Visitors	36,799	32,910	29,306
Visits	92,369	111,742	103,064

The annual plan is an essential part of the UAS Journal´s quality system. The core of the annual operational plan is the publishing dates of the issues and the yearly meetings (two) of the editorial board. Not only does the visual year calendar have its functions in the publishing process but it is also a tool for briefing the guest editors and board members to the UAS Journal wholeness.

The weekly visitors of the UAS Journal website in the period 2021–2022 are quarterly peaked based on the publication week of the issue (Figure 1) in March, April, September and December.

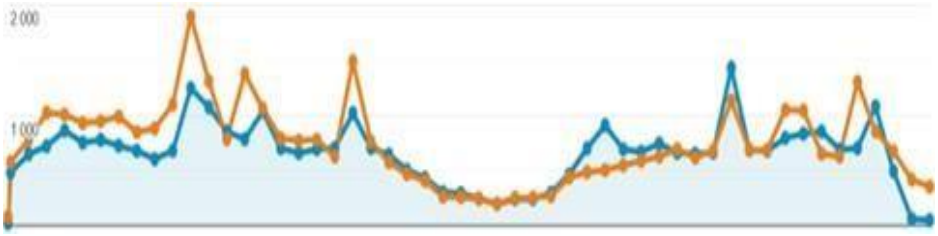

Figure 1: Weekly visits to the Finnish Journal of Universities of Applied Sciences website in the period 2021 (red) – 2022 (blue). (https://analytics.google.com)

Figure 2: The annual 2022 circular operation plan of the Journal of Finnish Universities of Applied Sciences.

METHODS

In November 2020, the data was gathered during three weeks via a web-based questionnaire to the subscribers of the UAS Journal's newsletter (N = 856). A reminder message was sent once. In addition to the background variables (age, gender, occupational position), the questionnaire included both qualitative and quantitative questions of the user's satisfaction, development initiatives and opinions of the Journal. The Net Promoter Score (Reichheld, 2003) was used to rate the likelihood that they would recommend the journal to a colleague. The subscribers were asked to express what quality words they would use to describe the Journal, and which animal and car brand the Journal is characteristic of. The results are visually presented by the online word cloud generator WordArt.com that gives a greater ranking to words that have appeared more frequently. In addition, the feedback from the 2022 theme issue editors (n=11) were requested by e-mail.

RESULTS

There were 100 respondents (age 52 ± 9 years), and the response rate was 13%. The Journal was portrayed as timely, diverse, and competent by them. In general, the UAS Journal was seen as a familiar suitable-for-all professional, non-scholar journal, suitable for the whole Finnish UAS sciences "family". The respondents were very pleased (7.6 ± 2.0 on a scale from 0 to 10) with the Journal, and every third (32%) would recommend it to their friend or colleague (Net Promoter Score 14).

> *"The UAS Journal provides a versatile coverage of the phenomena of the Finnish UASs` operating environment, from pedagogy to RDI activities.*" (Reader)

The UAS Journal was seen as an easy and practical publication platform, especially for RDI activities that are not always an acceptable topic for scientifically refereed journals. Moreover, the UAS Journal provides information on current topics and can be used in education. The online Journal is fast in spreading UAS activities and work-related information in a popularized form. It helps in perceiving what others in the field do and gives a wide-perspective view on higher education. In addition, it offers a diverse setting from pedagogy to RDI activities in the higher education environment. New networks have also been found because of the journal. Nevertheless, one critical respondent wrote that although the journal is not interesting in terms of content, and the themes are too far-fetched and disconnected from everyday life, it is well delivered. More issues per year, non-stop appearance and non-limited thematic issues were in a wish list. In addition, including the per review articles and the utilization of the social media were proposed for the journal.

The respondents were also asked to describe the UAS Journal using metaphors and similes. The most mentioned adjectives were "actual", "many-sided", "professional", "high-quality", "approachable" and "easy to use". The total number of mentioned adjectives was 193, and the eight most frequently mentioned (52% of all) adjectives, are listed in Table 2.

Adjective	Frequency	Frequency (%)
Current	21	11
Versatile	17	9
Professional	15	8
Interesting	10	5
High quality	10	5
Appropriate	10	5
Modern	10	5
Usual	8	4

Table 2: The eight most frequently mentioned adjectives about the Journal of Finnish Universities of Applied Sciences.

As an animal, the Finnish Journal of UASs was described as a dog and a Finnish Universal (Finnhorse). Such similes could represent loyalty and fidelity but also hard work in all circumstances, similar to the national cold-blooded horse breed. Further, this animal's distinguishing features are dry and strongly muscled, with strong bones and good hooves. Most often, it has a chestnut colour. In addition, this "chameleon-like" colorfulness was mentioned which probably means the diverse, variable and inspiring content of the journal. To the question about comparing the UAS Journal to a car, the active and reliable every day, stylish, smart and safe, renewed look, modern, user-friendly, safe and enjoyable experience car brands, such as the Toyota Corona, were the most mentioned. The visual word cloud representation by WordArt.com of the car brands (n=20) is presented Figure 3.

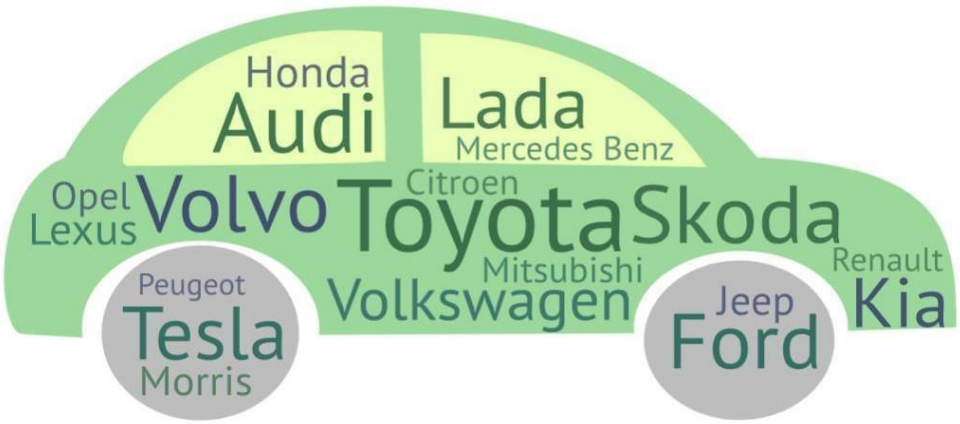

Figure 3: Metaphors about the Journal of Finnish Universities of Applied Sciences as a car brand where greater ranking is given to those that appeared more frequently.

The feedback from the theme editors was positive, though they quite often jump right into the delivery process, and at first, they were not quite sure what they are getting involved with. Based on the responses, when the editors receive the texts and start editing, the process has been smooth, quick and interesting. The opportunity to discuss both the texts and other matters with the editor group was mentioned to be meaningful. Although the co-operation platform (Teams) has worked well in structuring joint progress and informing about the steps of the editing process, meetings in person and / or online were desired.

The online view of the theme issue of the journal is such that all articles are not visible at once, and some of the articles were mentioned to be "buried" in the queue.

"Thank you for the opportunity to participate. I hope I can cooperate with you in the future."

"The whole turned out to be successful and comfortably offered different perspectives"

(Theme editors)

DISCUSSION

The freedom of research stands for openness, exchange, excellence, internationalism, diversity, equality, integrity, curiosity, responsibility and reflexivity, and entails the right to share, disseminate and publish the results openly (The Bonn Declaration on Freedom of Scientific Research, 2020). The possibilities of the research type of knowledge production, creation and dissemination are raising the importance of the need to create new models, patterns and activities (Bettencourt & Kaur, 2011). Open access publishing platforms for practice-based research such as the Journal of Finnish Universities of Applied Sciences is one way, among others, to increase the social impact of higher educations' operations, where the distinction between 'in-science' and 'out-of-science' in not necessary or even possible to distinguish.

The results of the reader survey included a wish for further themes and topics such as changes in work, digitalization, continuous learning, and teachership. Moreover, the regional impact of UASs, internationalization, artificial intelligence, neuromarketing, practice-based research methods, knowledge-based management, competence development, and quality in general, were among desired themes. UASs play a key role in Finland's learning ecosystems, where new practical knowledge

and expertise for the benefit of the whole of society in cooperation with businesses and industry, government, and the third sector are produced. To disseminate this, an important channel for ensuring effectiveness and usability is constituted by the open access UAS Journal. This publication includes multi-channeled and broad-based activities, high-quality issues, and a large expert and developer network. The UAS Journal promotes and inspires different actors to put their open, multidisciplinary RDI activities and expertise on display and build networks both nationally and internationally. The adjectives and metaphors expressed safety, trustworthiness and loyalty, and the spirit of the conceptions was very positive and concrete without condemnatory views.

The main conclusions for the educational practice based on the results of this survey are as follows. The journal, like the Finnish UAS Journal, supports the dialogue between UASs and wider society and affects a high impact 'hat trick' through cooperation, dialogue, and the articles published. This national professional open access semi-academic journal has a justified place to maintain and develop the professional expertise of the higher education learning and knowledge production ecosystem, and to improve its educational life-long practice.

Although there is continuous volume and issues throughout the year to made articles available as soon as they areready to publish without unnecessary delays, the theme issues of the UAS Journal 2023 (Current topics, Leadership & management, administration, and quality in UASs, Digitalization & Pedagogy, and RDI activities) will be published quarterly.

In recent years, higher education institutes, both universities and UASs have strongly emphasized the seventeen global goals of sustainable development (United Nations, 2020) for instance by publishing their programmes of sustainability and responsibility (Arene, 2020). The UAS Journal´s themes have reflected the goals as Table 1 shows, and the UAS Journal itself respects the goals by a transparent, equal and fair publishing policy which means, in practice, systematic self-evaluation, and open calls both for guest editors and papers. The editorial board takes responsibility of taking care of the participation of all UASs by reminding and encouraging colleagues to contribute to the UAS Journal. Creating and maintaining a strong, goal-oriented UAS sector is UAS Journal`s internal passion.

As we presented the results of this study in an international conference (EAPRIL, November 2022), the interest of the audience was pointed specifically to two topics: the funding of the UAS Journal and the co-operation of all Finnish UASs in it. UAS journal is funded collaboratively by all Finnish UAS's, and it is also run in co-operation. In the editorial board of the journal there is a variety of gender, age, different disciplines, and positions. Most of the board members work for different Finnish UASs, but there is also a member from the Rectors' Conference of Finnish Universities of Applied Sciences Arene and a member acting as the European

Parliament member. In addition, there has been a member from the National Union of Students in Finnish Universities of Applied Sciences.

At the beginning of the article a campfire metaphor was described. Campfire catches the spirit of the journal not only in sharing, reading and consuming stories, but also actively producing and writing them: UAS journal brings together versatile researchers, teachers, stakeholders, students, professionals, and writers that would not necessarily author an article to an academic journal. Out of OECD countries 25–64-year-old people, an average of 1% holds a doctoral degree (OECD 2021, 48). This means a narrow percentage of the population participates in the knowledge production through writing (research) articles. Participation in research and public discussion is structurally easier for highly educated people. UAS journal is widening the spectrum of people who contribute to semi-academic writing and public discussion e.g., as a co-author of an article. This is also a societal and ethical question and a question of sustainable development that is in line with principles of Arene and tasks of UASs. UAS journal offers a wide perspective of writers to publish their development and practical research initiatives and innovative ideas and strengthens participation and inclusion to knowledge production. It offers respectable opportunities also for students to publish and gain competence in semi-academic writing and publishing processes that is a key competence in the working life. The tasks of UASs include aims to change the world for a better place and act openly and responsibly (Arene). UAS journal is working as a tool for these tasks too. Attitudes and principles of open access publishing have changed tremendously during the resent years. The open research culture has been at the core of UAS journal since it was established in 2011.

UAS journal was published by Arene more ten years. It will be fascinating to see what the following years will be and how the journal will be developed. Hopefully, the profile of the UAS Journal will be clear in the following years, and the journal works even more valuable as a tool and platform to participate in the “third task” of higher education.

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REFERENCES

Arene. (2020). Sustainable, responsible and carbon-neutral Universities of Applied Sciences. https://www.arene.fi/wp-content/uploads/Raportit/2020/Sustainable%2C%20responsible%20and%20carbon-neutral%20universities%20of%20applied%20sciences.pdf?_t=1606145574

Arene. N.d. Arene. https://www.arene.fi/arene/ accessed 24.1.2023

Bettencourt, L. M. A., & Kaur, J. (2011). Evolution and structure of sustainability science. *Proc. Natl. Acad. Sci.* U.S.A 108:49, 19540-19545.

Bonn Declaration on Freedom of Scientific Research. (2020). https://www.bmbf.de/files/10_2_2_Bonn_Declaration_en_final.pdf.

Hakanurmi, S. & Kantola, M. (2020). Kerro ja ohjaa digitaalisia tarinoita. [Tell and guide digital stories]. The learning materials of Turku University Applied Sciences 132. ISBN 978-952-216-755-2 (bdf), ISSN 1796-9972 (electronic). https://julkaisut.turkuamk.fi/isbn9789522167552.pdf

Harari, Y.N. 2018. 21 Lessons for the 21st Century? Random House.

Huutoniemi, K., Törnroos, J., & Mälkki, A. (Eds.) (2017). State of Scientific Research in Finland 2016. Special Theme: Broader Impact of Research in Society. Academy of Finland. Retrieved from http://www.aka.fi/globalassets/30tiedepoliittinen-toiminta/tieteentila/aka_tieteen_tila_2016_eng_150317.pdf

Linna, A.-K., Holopainen, M., Ikonen, A., & Ylönen, I. (2020). Kotimaiset tieteelliset julkaisusarjat ja avoimuus. [Finnish scientific publication series and openness]. *Informaatiotutkimus*, 39:4, 4–32. https://doi.org/10.23978/inf.98656

OECD (2021), *Education at a Glance 2021: OECD Indicators*, OECD Publishing, Paris, https://doi.org/10.1787/b35a14e5-en.

Reichheld, F. F. (2003). "One Number You Need to Grow". *Harvard Business Review* 81:46–54, 124.

Smith, J. W. T. (1999). The deconstructed journal – a new model for academic publishing. *Learned Publishing* 12:2, 79–91.

Teichler, U. (1996). Comparative higher education studies: Potentials and limits. *Higher Education*, 32:4, 431–465.

Väänänen, I. & Friman M. (2018). Effectiveness of publishing [Julkaisutoiminnan vaikuttavuus]. *Journal of Professional and Vocational Education* 20:3, 35-43. https://journal.fi/akakk/article/view/84631/43657

Väänänen, I., Friman, M., Kantola, M. & Lamberg, J. (2019). International sharing in European higher education — case co-publishing. *EAPRIL 2018 Conference Proceedings*. 135-150. https://www.eapril.org/sites/default/files/2019-03/Proceedings%202018%20publication.pdf

YEARLY TRENDS IN STUDENT MOTIVATION TO LEARN AT AN ONLINE UNIVERSITY AND COMPARISON BY ACADEMIC YEAR

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ABSTRACT

Online learners must complete the distance learning course independently from start to finish, at their own pace. As a result, some learners easily feel lonely and some stop learning altogether due to the lack of motivation. This paper compares the results of a survey conducted in 2022 among enrolled students at the Tokyo Online University regarding their motivation to learn with those of a 2021 survey to analyze whether there have been changes in students' motivations. In addition, the 2022 survey included an analysis of the difference between first- and fourth-year students. Differences were analyzed using the Mann–Whitney U-test. There were 94 students who participated in the 2021 survey and 90 in the 2022 survey. The analysis of the 2021 survey revealed that online university students were more autonomous and self-directed and less communicative than general school students. This trend continued in 2022, with the lowest scores for "making friends" and the highest scores for "autonomous learning" related to students' motivation to learn. Finally, compared with first-year students, the fourth-year counterparts were less concerned with the learning progress dashboard provided by the university's Learning Management System and were more motivated to learn about their current work.

INTRODUCTION

Online learning was already used in various forms before the COVID-19 outbreak, but after the pandemic many educational institutions and companies were forced to use it as a mode of learning. Although the pandemic is not yet over, the opportunities for online learning have not diminished after the pandemic, and its use is likely to increase in the future (Pokhrel & Chhetri, 2021).

Other studies have reported that the rapid spread of online learning has forced both students and teachers to use it in a confusing way. The online learning environment, which was only been partially used before the pandemic, is now used 100% at all levels of education after the pandemic. This means that a number of difficulties need to be overcome in order to achieve learning outcomes (Li, D., 2022).

The issues of student autonomy, motivation to learn, and active digital pedagogy are key factors ensuring students' success in online learning. In addition, some recommendations have been made, including good communication, providing information about certain changes, involving students in decisions related to the changes made, adapting teaching content and pedagogical methods to the way of learning online, taking care of social presence through synchronous forms, limiting the tools used, and providing support in the field of technologies used to enable full participation in online learning (Díaz-Noguera et al., 2022).

Research has been conducted regarding students' motivation to learn at the online university, and the results show that students at the online university are more autonomous and motivated to learn than students at other commuter universities. Details on the results for the 2021 survey have already been reported (Kato, 2021). Related to this, the current paper compares and analyses the results of two surveys conducted in 2021 and 2022 on the learning motivations of the online university students in order to clarify the current situation and changes in this area. This paper also analyses the learning processes of online university students and examines the optimal learning intervention methods that can be applied to increase and maintain their learning motivation.

LITERATURE REVIEW

Even before the COVID-19 pandemic, the high dropout rate in MOOCs was already a serious problem, and the situation remained the same after the pandemic. Although various interventions have been attempted to help students, no drastic solution has yet been found. Previous research has recommended that student dropout interventions are categorized according to specific stakeholders, such as institution/faculty-, teacher-, and student-focused (Greenland & Moore, 2022). Faculty-focused interventions include identifying at-risk students by assessing enrolment data, analyzing learning management systems (LMS), and providing follow-up support. Meanwhile, teacher-focused interventions include improving existing program, pedagogy and technology designs and facilitating academic social interactions . Finally, student-focused interventions recommended self-improvement in terms of study skills and time management to enable students to achieve better balance in their study, work, and life (Greenland & Moore, 2022).

In a survey of UK higher education institutions, the impact of on-demand online learning via LMSs and other means on student engagement in learning was almost equally positive and negative at 41% and 43%, respectively. Furthermore, 55% and 30% of students had negative and positive views, respectively, of one-way, simultaneous, interactive online learning via videoconferencing systems. In terms of learning outcomes, 54% of students said that the move to online (on-demand and simultaneous interactive) teaching and learning had an impact on their learning outcomes, of whom 38% and 16% reported positive and negative impacts, respectively. In particular, for working students, the positive impact of online learning was seen as significant, as it reduced the time spent traveling to and from school (QAA, 2022).

At the same time, the high dropout rate in online learning has been one of the biggest problems for online universities. Therefore, reducing this dropout rate is a key challenge for such institutions. In online learning, about 60% of students drop out, but most of those who continue to the final exams become successful. This means that in many cases, students do not continue to finish their courses and opt to drop out instead (Simpson, 2006). As study also revealed that between 45% and 85% of students drop out, and that the completion rate of open universities in the UK is just

22%–a very low figure compared to traditional commuter universities (Xavier & Meneses, 2020). Another study examined on-demand online courses at Japanese universities and found that 40% of students dropped out of e-learning courses. Furthermore, the typical dropouts had a rushed or intensive learning style, while those who studied regularly and consistently had a lower dropout rate. It was also found that students who dropped out earlier performed worse on quizzes (Nodera & Nakamura, 2016).

Self-determination theory classifies four types of extrinsic motivation: external regulation, introjected regulation, identifying regulation, and integrated regulation. "External regulation" refers to the motivation to conform to external control (e.g., to receive rewards or avoid punishment), while "introjected regulation" is the extrinsic motivation to internalize external control and comply with self-regulation in order to maintain self-esteem or to respond to the fear of public self-esteem damage. "Identifying regulation" is a motivation to value external control, actively internalize it, and act on it selectively and with personal involvement. Finally, "integrated regulation" refers to the motivation to not only recognize the value of external control, but to integrate it organically with other aspects of the self and then act on it. Among them, integrated regulation is the most autonomous form of extrinsic motivation and occurs when the identified regulation is fully integrated into the self (Ryan & Deci 2000).

RESEARCH QUESTIONS

The main research question that this study aims to address is "Does learning motivation facilitate online learning?"

The following are the sub-research questions of this study:

1. What types of motivations facilitate student learning?
2. Can motivation improve students' learning outcomes and reduce dropout rates?

3. If students know their motivation type, can they improve their learning and manage their activities?
4. What interventions are effective/appropriate for teachers and faculty to encourage students to continue learning?

ONLINE UNIVERSITY

To answer the abovementioned research questions, I conducted a survey at Tokyo Online University (TOU). Therefore, this section provides an overview of TOU, its learning environment, and its curriculum.

Established in April 2018, TOU is currently in its fifth year of operation. It has two faculties: Information and Management and Human Welfare. Each year, approximately 600 students enroll in each faculty, both of which offer online undergraduate degrees combined face-to-face practical electives. Approximately 70% of students are in full-time employment and a small number come to TOU directly from secondary schools. Students whose ages range from 18 to 80 years come from all over Japan and even abroad. As of May 2022, TOU has about 5,000 enrollees, with students in their 20s, 30s, and 40s comprising 75% of the student body. The average age is around 35 years.

The TOU classes are briefly described below. As shown in Figure 1, each class unit consists of four 15-minute asynchronous video sessions, preparation and review study, and a quiz session, for a total of 90 minutes. Some classes have online discussions or report assignments, and most classes are delivered on-demand.

Figure 1. The structure of a basic class

Meanwhile, we can see in Figure 2 that each credit unit consists of eight classes, online discussions, a report assignment, and a final examination. TOU utilizes an academic quarter system, in which most courses run twice a year. The Japanese credit system is different from the European one. Specifically, in Japan, a bachelor's degree requires 124 credits over four years of study, with each credit representing approximately 45 hours of study. Furthermore, one unit of credit in Japan is equivalent to about 1.5 in the European Credit Transfer System, and most Japanese students take between 30 and 40 credits per year.

Figure 3 shows the special class delivery pattern for the compulsory course for new students in the first quarter of 2022. As can be seen, all classes are available from the first week of the first quarter, although the normal delivery period differs from this pattern.

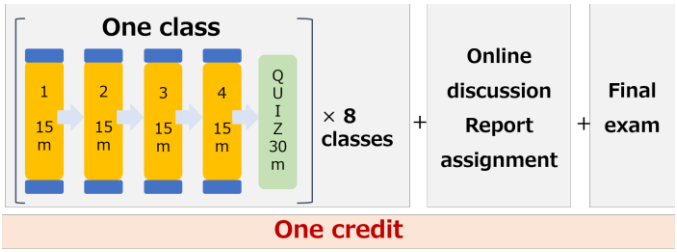

Figure 2. Structure of one credit unit

	1st quarter, 2022								
	1W	2W	3W	4W	5W	6W	7W	8W	9W
1	8/Apr~28/Apr								
2	8/Apr~28/Apr								
3	8/Apr ~6/May								
4	8/Apr ~6/May								
5	8/Apr ~12/May								
6	8/Apr ~19/May								
7	8/Apr ~26/May								
8	8/Apr ~2/June								
Final exam									29/May-7/Jun

Figure 3. Class delivery pattern

LEARNING MOTIVATION SURVEY

To address the research questions, a web-based motivation survey using Google Forms was administered to 90 volunteers at the end of the Japanese academic year in March 2022. The participants were first- to fourth-year students enrolled at TOU. The survey consisted of 82 questions, all based on previous motivational research. The survey had three parts, including Survey I, which was designed primarily based on self-determination theory; Survey II, which focused on topic-oriented motivation classification; and Survey III, which was based on students' experiences and preferences at TOU. The details of the study are as follows.

First, the invitation to participate in the survey was posted on the TOU portal site and the notice period was two weeks. Student volunteers were required to complete all surveys I, II, and III. Survey I consisted of 34 learning motivation items based on previous research (Okada & Nakatani, 2006). Survey II also consisted of 30 learning motivation items based on a previous study (Asano, 2002). The students were asked questions, presenting options from different perspectives, and were required to choose a score from 1 to 4 or from 1 to 5 on a Likert scale. An example question is "What reasons can you give for your study-related activities at TOU?" Finally, Survey III consisted of 18 questions related to student life in general, their experiences with the LMS, and their preferences for motivational interventions.

The Mann–Whitney U-test was performed using the Python module of Scipy, while violin plots were generated using the Seaborn library in Python.

RESULTS

Results of Survey I

Following previous studies (Ryan & Deci, 2000; Okada & Nakatani, 2006) that categorized the different types of motivation into four main types, intrinsic motivation, identified regulation, introjected regulation, and external regulation, the 34 questions were grouped into four categories in the current study. Each question was scored on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A comparison of the means for each category in 2021 and 2022 is shown in Table 1. In all four categories, the 2022 scores are higher than the 2021 scores. In particular, intrinsic motivation shows the largest increase.

Results of Survey II

The 30 questionnaire items were grouped into five categories, named self-development orientation, experience orientation, friend orientation, professional orientation, and specific topic orientation, in accordance with previous research (Asano, 2002). A comparison of the means for each category in 2021 and 2022 is shown in Table 2. These were scored on a Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Again, it can be seen that the mean scores have increased in all categories.

Table 1. Comparison of Survey I results

	March 2021	**March 2022**
Intrinsic motivation	3.7	**4.2**
Identified regulation	3.7	**3.9**
Introjected regulation	2.2	**2.3**
External regulation	1.9	**2.3**

Table 2. Comparison of Survey II results

	March 2021	**March 2022**
Specific topic	3.3	**3.4**
Self-improvement	3.0	**3.2**
Experience	2.8	**3.0**
Profession	2.8	**3.0**
Friend	2.0	**2.3**

Table 3. Comparison of Survey III results

	March 2021	**March 2022**
Delivery pattern	2.9	**3.5**
Academic advisors	2.8	**2.8**
Q&A with teachers	3.3	**3.5**
Dashboard	3.5	**3.8**
Social Network	-	**3.1**

Results of Survey III

Four characteristic questions were selected from the 18 questions and the results for 2021 and 2022 are shown in Table 3. The social networking questions were asked for the first time in the 2022 survey. These were scored on a Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree).

DISCUSSION

Comparisons between the 2021 and 2022 results for each category are presented in Tables 1 and 2. Here, one question at a time, the Mann–Whitney U-test was used to test whether there was a significant difference between 2021 and 2022 (significance level of 0.05). The results showed that 19 of the 82 questions were significantly different: nine for Survey I and eight for Survey II. Table 4 shows the number of questions per category and the number of significantly different items in each category in Surveys I and II. In Survey III, there were significant differences in the two questions of the delivery pattern and the dashboard across 18 questions.

Table 4. Number of Significant questions

		Total	**Significant**
Survey I	Intrinsic motivation	11	**6**
	Identified regulation	7	**1**
	Introjected regulation	4	**0**
	External regulation	12	**2**
Survey II	Specific topic	5	**1**
	Self-improvement	5	**3**
	Experience	5	**2**
	Profession	5	**1**
	Friend	5	**1**

In Table 4, it can be seen that the smallest p-value in the test was for the intrinsic motivation item in Survey I, "I study because I feel more confident when I can understand something I don't understand." The violin plot graph for this question is shown in Figure 4.

Meanwhile, in a comparison of the results of the first- and fourth-grade students in 2022, only four of the 82 questions were significantly different in the U-test (significance level of 0.05). The following item from Survey II had the lowest p-value: "I study because I need to study for the activities and work I am involved in." The violin plot graph for this question is shown in Figure 5.

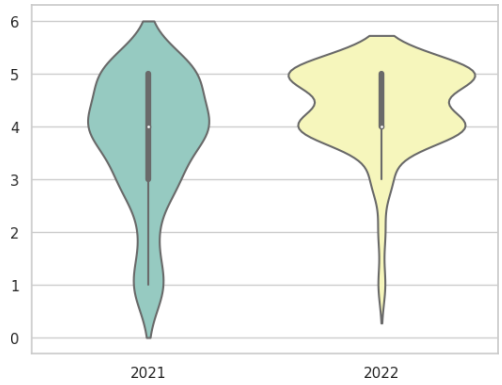

Figure 4. Intrinsic motivation: "I study because I feel more confident when I can understand something I don't understand."

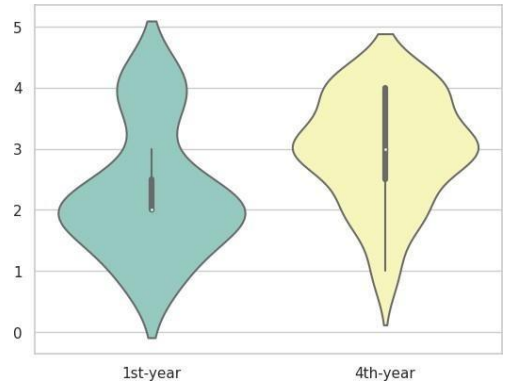

Figure 5. Profession-oriented: "I study because I need to study for the activities and work I am involved in."

LEARNING PROGRESS

The study results presented above are the outcomes of a questionnaire survey of volunteers in years 1–4. This chapter describes the analysis of the learning process of the first-year students in the compulsory subject. By analyzing the learning process of the first-year students, we want to determine when and to what extent we should intervene in the students' learning process and consider actions according to their motivations.

Figure 6 shows the pattern of learning progress. As can be seen, the vertical axis represents the number of classes from the first to the eighth. The horizontal axis is the date when each student finished his/her class. Figure 6 displays the two final score groups and the learning progression from the first to the eighth class. In particular, the upper part of Figure 6 shows the learning pattern of students who scored between 50 and 60 points (i.e., those who failed the subject), while the lower part shows the learning patterns of those who scored 90 or above (i.e., those who achieved the highest grades). Comparing the top and bottom figures, it can be seen that the students with the highest grades worked on the first part of the course, although there does not seem to be a particularly large difference. Yet, even among the highest-achieving students, there is a great deal of variation in their study patterns. As shown at the top of Figure 6, some students who failed also worked on it in the first half of the quarter, and some students who failed also worked on it regularly.

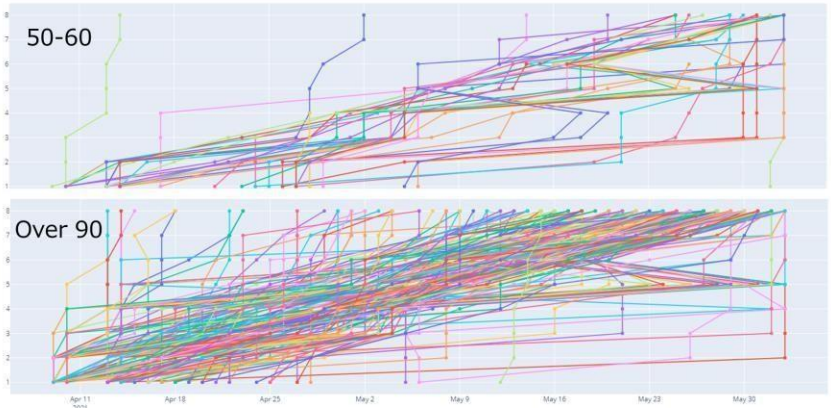

Figure 6. Learning progress pattern.

Meanwhile, Figure 7 shows a scatterplot of the learning status of students who completed the first and the final eighth class of the course. The vertical axis is the final score, with those scoring 60 or above—indicated by the red line—being successful in the subject. At the same time, the horizontal axis shows the dates in which the first and eighth classes were completed. The upper part of Figure 7 indicates that a certain number of students completed the first class very early but eventually dropped out of the course, while the lower part reveals that most students passed the course after completion of the eighth class.

Figure 8 shows the average of weekly progress for all first-year students taking the same compulsory online course in 2020 and 2021. The solid and dashed lines show the results for 2021 and 2020, respectively. Assuming average study, the average weekly progress would be 12.5%, as 100% would be achieved in eight weeks. Furthermore, it was assumed that the ideal learning pattern would be to approach the red straight line, 12.5%, by studying regularly throughout the eight weeks. In reality, the first week was above average, but the second week was below average; the third and fourth weeks included a major holiday in Japan, so the learning at that period was more than the second week. Before this major holiday, teachers sent messages to students who were behind to motivate them. Details are given in the next chapter.

Figure 7. Final scores and completion dates of the 1st and 8th classes.

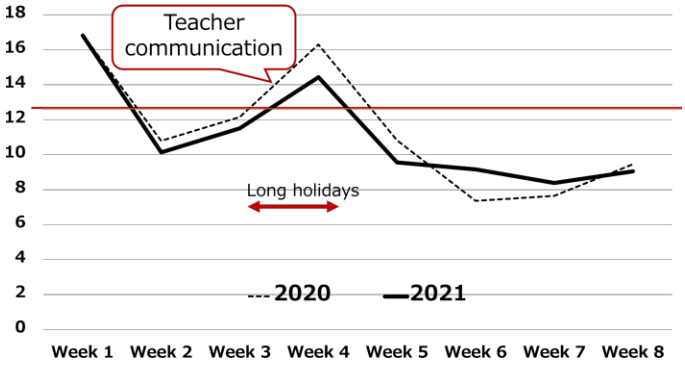

Figure 8. Students' weekly progress.

INTERVENTIONS FOR STUDENTS

At TOU, all enrolled students are assigned an academic advisor, known as an AA, who assists students with their registration, course selection, course planning, and choice of online learning methods. New students are the main target of the AAs' support, but the same faculty member continues as the AA until they graduate. To ensure seamless communication, there is a personal electronic bulletin board between the AA and the student, and 24-hour communication via an e-portfolio. Teacher–student interactions are also shared with other teachers to improve student support.

Table 5 shows the support provided to students during the academic quarter. In Week 0, which was before the start of the course, the lecturers and teaching assistants welcomed students. In Week 3, the lecturers sent encouraging messages only to students who were behind, while in Week 4, university staff called or emailed students who had not logged in at any time during the previous three weeks. In Week 5, the teaching assistants sent encouraging messages to the students, and in Week 8, the teaching assistants sent encouraging messages to the enrolled students again, reminding them that they were nearing the end of the course and that the final exams were coming up.

Table 5. Interventions for students

Timeline	Who	Whom	What
Week 0	Instructor	Course participants	Greetings
Week 0	Teaching assistant	Students in charge	Greetings
Week 3	Instructor	Delayed students	Encouragement
Week 4	Staff	Students with no logins	Encouragement
Week 5	Teaching assistant	Course participants	Encouragement
Week 8	Teaching assistant	Course participants	Encouragement & Reminder

Figure 8 and Table 5 are combined to show Figure 9. Figure 9 shows that the rate of progress increased from Week 3 to Week 4. This suggests that the encouraging messages from the AAs in Week 3 may have motivated the students and had a positive effect on their behavior.

Next, consideration should be given in categorizing students so that they can be supported according to their learning patterns. As support is needed early on, we considered grouping students according to when they finish the first class. As shown in Figure 10, the group that finished the first class by the third week (i.e., finished the first class without being late) was Group A with a high score, while Group C had a low score. Meanwhile, students who were late for the first class and had a high score was Group B, while that with the low score was Group D.

In Group A, the students started and finished the first class within three weeks and finally received a credit. These students are highly motivated and self-directed; thus, no intervention is required.

In comparison, Group B could not finish the first class within three weeks, but they eventually recovered. They are also relatively motivated and self-managed, but some intervention might be useful. Meanwhile, the students in Group C seemed to have problems: they were able to start and finish the first class within three weeks, but

eventually failed the course. It is possible that an intervention was effective because students were relatively motivated to finish on time in the first class, but then, for whatever reason, did not manage well and lost credits. It may be that they did not know the appropriate time management strategies for the whole eight weeks of the course. There were many reasons for this. As they depend on the student, there are different possible methods of intervention.

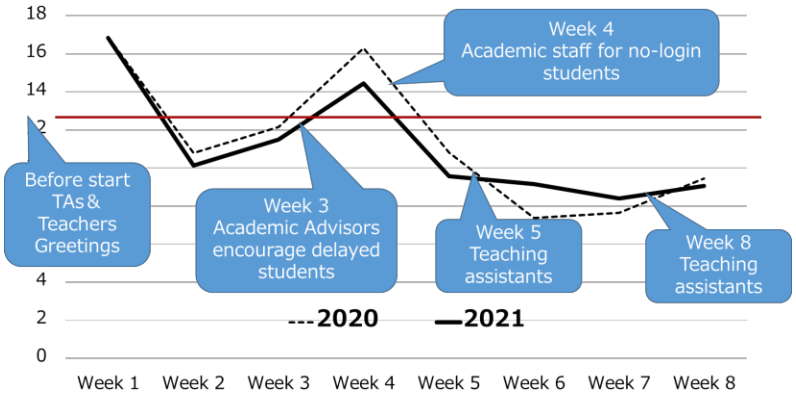

Figure 9. Student weekly progress and interventions.

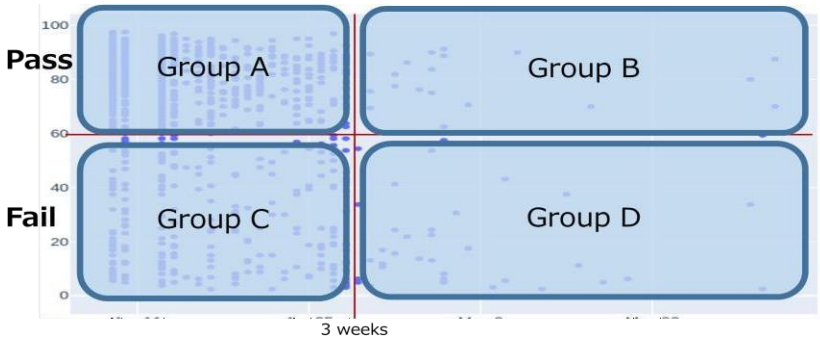

Figure 10. Grouping of students by date of completion of the first class and final score.

Finally, Group D students are expected to first develop self-regulation skills such as procrastination avoidance. They will need to develop these skills before or while taking classes.

Although the student intervention by grouping described above has not yet been implemented, the results of the quiz at the end of the first lesson seemed to be able to predict the final scores to some extent, and we would like to consider how to effectively implement the student intervention by grouping in the third week in the future.

CONCLUSION

Staying motivated is crucial to achieving success at an online university. Our results showed that while online students were found to be more intrinsically motivated than regular commuter students, they tended to be less motivated to make new friends. In addition, the 2022 survey showed that the students were more intrinsically motivated but also slightly more friend-oriented than in 2021.

Identical encouraging messages are currently sent to students who are likely to be late, and this seems to be having some effect. We will continue to intervene with students, but may need to consider a more detailed response. This is because some students pass even if they are late, while others fail even if they finish early. The results of the first quiz would show that there is the great potential to reduce drop-out rates by dividing students into four categories and considering tailored interventions for each.

However, there are limitations to these web-based questionnaires. Firstly, the surveys were administered to student volunteers. This may have skewed the distribution of students, as volunteers tend to be more motivated than the general student population. Therefore, it is necessary to look not only at the results of the motivation surveys, but also at the students' credit acquisition as a whole. Consideration should also be given to the best method of intervention for the students and the grouping of students.

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REFERENCE

Asano, S. (2010). The effect of university students' motivation on learning: In relation to life planning. *The Journal of Sagami Women's University*, *74*, 91–100. (in Japanese).

Díaz-Noguera, M. D., Hervás-Gómez, C., De la Calle-Cabrera, A. M., & López-Meneses, E. (2022). Autonomy, motivation, and digital pedagogy are key factors in the perceptions of Spanish higher-education students toward online learning during the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, *19*(2), 654.

Greenland, S. J., & Moore, C. (2022). Large qualitative sample and thematic analysis to redefine student dropout and retention strategy in open online education. *British Journal of Educational Technology*, *53*(3), 647–667.

Kato, Y. (2021). Analysis of learning motivations and consideration for appropriate interventions for online students. Proceedings of European Association for Practitioner Research on Improving Learning (EAPRIL 2021), 105–120.

Li, D. (2022). The shift to online classes during the Covid-19 pandemic: Benefits, challenges, and required improvements from the students' perspective. *Electronic Journal of e-Learning*, *20*(1), 1–18.

Nodera, A., & Nakamura, S. (2016). Access log analysis to prevent drop out from e-learning. *Journal of the Faculty of Human Cultures and Sciences Fukuyama University*, *16*, 91–98. (in Japanese).

Okada, R., & Nakatani, M. (2006). Motivational style and interest in tasks: Self-determination theory. *Educational Psychology Research*, *54*(1), 1–11. (in Japanese).

Pokhrel, S., & Chhetri, R. (2021). A literature review on impact of COVID-19 pandemic on teaching and learning. *Higher Education for the Future*, *8*(1), 133–141.

The Quality Assurance Agency for Higher Education (2022). From Pivot to Permanent: Examining Lessons Learned from the Shift to Online and Hybrid Teaching and Learning. https://www.qaa.ac.uk/docs/qaa/news/from-pivot-to-

permanent-examining-lessons-learned-from-the-shift-to-online-and-hybrid-teaching-and-learning.pdf

Ryan, R. M., & Deci, E. L. (2017). Self-Determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness. Guilford Publications.

Simpson, O. (2006). Predicting student success in open and distance learning. *Open Learning: The Journal of Open, Distance and e-Learning*, *21*(2), 125–138.

Xavier, M., & Meneses, J. (2021). The tensions between student dropout and flexibility in learning design: The voices of professors in open online higher education. *The International Review of Research in Open and Distributed Learning*, *22*(4), 72–88.

TRANSITIONING INTO NEW STAGES OF LEARNING: DEVELOPING COMPETENCES AND IDENTITIES FOR SUCCESS

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ABSTRACT

The impact of Covid-19 on incoming students and researchers is plain: students and researchers were denied access to their usual educational experiences, to their usual networking and social interaction, and to their usual assessment types. This resulted in an incoming cohort of students and researchers with higher levels of anxiety and, often, less awareness of the requirements of higher education/research. Recognising the need to engage with new students and researchers in innovative ways, the Student Learning Development (SLD) team and the Researcher Development (RD) team undertook two institution-wide projects to provide students with a "world-changing" start to their studies.

For our undergraduates, a new course – T2G: Transition to Glasgow – was created by SLD. Designed around developing competences, instilling identity and easing the transition to formal education, the course provided students with the skills required to succeed. For our postgraduate researchers, a short-term pandemic intervention – PGR@Home – morphed into a week-long induction for doctoral researchers by RD. Designed around integration and developing competencies, this offered asynchronous and synchronous opportunities for research students to begin the process of joining the University community in their new role.

This joint case study presents and reflects on the ways in which we adopted a whole-institution response to transition to new stages of learning and research.

INTRODUCTION

The COVID19 pandemic caused an unprecedented disruption to education for students at every stage: from those entering Higher Education from secondary school to postgraduate researchers approaching their final viva examination. Acutely aware of the impact of the disruption on our new students joining, two teams at the University of Glasgow designed, developed, and delivered novel, targeted transitions-in initiatives to improve the student experience.

The University of Glasgow, an Ancient, Russell Group, research-intensive institution in Scotland has almost 38,000 students enrolled. The University benefits from a central team of Learning Developers, called Student Learning Development (SLD), who are tasked with the enhancement of all undergraduate and taught postgraduate students' academic literacies. For the postgraduate and early career researcher, there is a dedicated team of Researcher Developers (RDs) based within the Research and Innovation Service. Combined, these teams work to enhance the student experience through the delivery of bespoke, evidence-based programmes, courses, workshops, and online provision that engage with all areas of student and researcher academic life.

At the height of the COVID-19 pandemic-enforced lockdowns in the United Kingdom, and with all students and researchers studying or working from home, SLD and the RD teams became central features of the university's response to ensuring continued excellence in the student experience.

Both SLD and the RD teams embrace a pedagogical model that utilises academic literacies (see, amongst others, Boyle et al., 2019; Lea, 2004, 2008; Lea & Street, 1998, 2006; Street, 1984; Struan, 2021). This pedagogical model requires that students and researchers are exposed to the variety of literacies that underpin the various academic communities into which they are transitioning, and that this is exposure is done through a student-centred, active learning model of teaching and learning. As such, both *T2G* and *PGR@Home* adopted models that encouraged students to engage with, debate, challenge, interpret, and learn the academic literacies of their broad subject areas. Both case studies also utilised as student-centred led to, for example, community creation to further ease the transition.

This paper discusses the key goals, rationale, and implementation of two institution-wide projects that aimed to ease student and researcher transition into the University. For undergraduate students, SLD designed and delivered a new transitions-in course, known as *T2G*: *Transition to Glasgow*. For postgraduate researchers, the RDs

implemented a community-based approach to easing the transition in, called *PGR@Home.*

Goals

Our goal was to ensure a smooth transition into formal education at a time of crisis for students and researchers, and to maintain and enhance guidance and support for continuing students and researchers. We aimed to provide a sense of connection to and integration within the University community.

Recognising that incoming cohorts would be joining the institution at a moment of flux, our priorities were to:

- Provide clear expectations of university-level work or postgraduate research (Fox and O'Maley, 2022).
- Create structured, scaffolded engagement opportunities that allowed dedicated space/time for engagement with peers and staff and developed capacities to succeed (Bond and Castagnera, 2006).
- Provide authentic experiences for participation in the academic community.
- Provide a solid bedrock and framework for success and achievement at, and integration into, the institution (Cairns, Hervey and Johnson, 2018).

CASE STUDY OVERVIEWS

T2G: Transition to Glasgow

T2G ran for two weeks before semester and was offered to all 5000 incoming undergraduate students. Over 1000 students signed up in the first year, with a similar number signing up in the second year of the course running. The courses utilise a mixture of synchronous and asynchronous content delivery. There are two courses: one for students coming into Arts and Social Sciences, and one for students coming into Science and Engineering and Medical, Veterinary and Life Sciences. The courses are tailored to provide students broadly subject-relevant academic development and subject-aligned content.

The course provided core modules on academic literacies/academic practice, and then a broad selection of multi- and interdisciplinary modules (all designed and taught by current research students and/or SLD staff). Students are presented with a range of learning environments to best prepare them for university-level study.

Students receive asynchronous lectures, course materials, reading and reading lists, and interactive content via Moodle. In addition, students receive synchronous, live lectures via Zoom and participate in synchronous small group seminars/tutorials with their tutor via Zoom or in the classroom. (Students are able to pick whether they wish to attend online classes or face-to-face classes). Students also receive opportunity to engage in the social elements of university life through, for example, interaction with the university's student union, the Student Representative Council (SRC), and a variety of clubs and societies.

The courses provide students with a maximum of six hours of synchronous and asynchronous content per day. Students receive a core course module on academic/scientific development and academic/scientific writing. These core modules run via large live lectures and asynchronous content, and they form the backbone of the courses. All students are expected to attend and engage with this core module.

Students also have access to a range of synchronous 'bitesize' sessions and asynchronous resources on mental health and well-being, all produced by the mental health and well-being team in the university's Counselling and Psychological Services. In addition, students choose from a range of elective modules. Students select two elective topics to study in more depth. Once selected, the core academic/scientific development module and the two elective modules form that student's personalised course structure.

This approach has been designed to: mimic the breadth of choice across general degrees in all subject areas of the university; provide students with choice and flexibility in their course design; cater for student interests and areas of focus; and provide a realistic experience of studying multiple subjects at one time.

Students submit coursework; this coursework provided students with 'credit' to complete a compulsory first year module before semester. Students are able to select one elective course for which to submit an assessment. This assessment is a subject-aligned essay or report of *c.* 800-1000 words. Students receive information, guidance and support in putting their essays/reports together, and submit via the in-built functionality in Moodle. Students will receive feedback on their work with developmental, supportive information on strengths and areas of development, alongside information on further sources and resources.

Student feedback has been overwhelmingly positive: students valued a structured approach that allowed them to cohort form, the opportunity to learn the ways of academia in advance of first year, and to begin to engage with an academic literacies discourse.

Information: www.gla.ac.uk/T2G.

PGR@Home

PGR@Home was devised as an emergency response in 2020 for postgraduate researchers who might feel disconnected from the institution and worried about their development. As a group, postgraduate researchers can often be omitted by university communications implicitly aimed at UG and PGT students or at staff, and the Researcher Development team aimed to ensure that this group received the specialised support it required.

PGR@Home provided online asynchronous training on various aspects of the PhD for those at every stage of their research. The resources were designed using Rise360, Weeks dedicated to topics such as establishing a healthy writing practice, data management or tackling the literature review were aimed at those beginning their research, while the topic of careers was more suited to those towards the end of their research. Other topics, such as managing work/life balance, were relevant to everyone.

Weekly asynchronous modules allowed researchers to work at their own pace and at times that suited them (many researchers were based in different time zones). There were also synchronous activities held weekly: an online 'chat café', where researchers could meet and discuss the weekly topic (alongside members of staff), as well as a purely social afternoon event.

Although PGR@Home was initially seen as a standalone resource, its success prompted a broad examination of PGR induction, leading to a new, extended approach, including a student-led conference. Engagement has been strong and reception positive: PGRs who participate are more likely to participate in further training throughout the year, and often return in second year to assist induction.

SUCCESSES AND CHALLENGES

Several factors led to success. At the forefront was expertise in pedagogical innovation and practice. Drawing on best practice and a solid grounding in the theory of learning and teaching, both teams were able to create and design initiatives on firm pedagogical foundations utilising academic literacies frameworks (Lea & Street, 1998, 2006).

Pedagogical innovation also required willingness to collaborate, boldness, and a recognition of the scale of the challenge. As a result of an openness to change, and changed ways of working, both teams could construct programmes tailored to disparate cohorts. In practice, this meant significant collaboration in the time-constrained development of the programmes: course philosophy and design,

teaching materials, course content, social content, and so on, all had to be developed at speed and with multiple people working together to build a coherent package of provision. In both instances, we adopted a collaborative approach to course design: PhD student tutors were actively involved in the process of course design and creation (Bale & Anderson, 2022; Gaia et al., 2003) through active discussion and meetings using Microsoft Teams.

Core course design philosophies and structures were agreed upon early, with all team members agreeing on the goals discussed above. Standardised, but entirely flexible, Virtual Learning Environment templates were created to ease the burden of workload on the PhD student tutors, and guidance around setting assessment and feedback criteria was shared. The process of course design involved numerous conversations, mentorship meetings between more established staff and newer staff, and a focus on the successful implementation of meaningful academic literacies content at each point of the course (Brown & Baume, 2022; Bury & Sheese, 2016; Lea, 2004).

Engagement

There were concerns that students and researchers might not feel enthusiastic about engaging with the projects or feel that they had the capacity to undertake additional work. However, both projects had high levels of engagement and positive feedback. Engagement was instead a feature of success: students have continued to engage (with each other by, e.g., student-created Discord servers) and with the teams. We learned quickly that students gained most from structured, themed discussions online; using a broad, open discussion format did not tend to work. Instead, we adopted scaffolded or purposeful events with which students could engage directly and with purpose (Nordmann et al., 2021).

To conclusive, we believe that our two key successes were:

- Excellent student feedback that highlighted the need for such initiatives. Comments discussed the joy of the experience, its benefits, and the ongoing impact on their transition.
- Career development opportunities for student researchers through providing experiences in the creation, development and delivery of unique courses and initiatives. Utilisation of peer-led learning and early-career expertise was a recognised strength in both initiatives.

Challenges

The timescale presented significant challenges. Pandemic working resulted in demanding deadlines, and those involved were also working in a uniquely challenging set of circumstances: remote working, navigating online tools, balancing

heavy workloads, etc. We recognise that we were not alone in this situation as many institutions adopted new models of provision or radically altered their teaching methods in light of lockdowns (Ashencaen Crabtree et al., 2021; Bartolic et al., 2021; Gibbons, 2022; Kosiba et al., 2022; O'Toole et al., 2022). In addition, and given the tight time frame, there was no opportunity to create new posts to provide the required administrative support. This administrative burden was added to the workload of those designing and delivering the courses.

Pedagogically, the challenge of ensuring consistency in standards and provision across such disparate subjects and course content provided a challenge. With this, we adopted a peer-led approach to course review and oversight: staff worked in peer teams to design and develop course materials. Multiple stages of review and check-in were adopted to maintain a consistency in message and appropriate level of content. These regular discussions and meetings were key to the success of the project: they allowed for clarification on points, open communication, and a productive dialogue.

CONCLUSIONS

The need for targeted, meaningful induction is not new (Darnell, 2020; Donovan and Erskine-Shaw, 2020; Scanlon *et al.*, 2020; Ding and Curtis, 2021; Gregersen, Holmegaard and Ulriksen, 2021). For students (re)joining academia at any stage, transitioning into formal education can be daunting. New norms, new practices, new foci, and new social interactions require students and researchers to adapt quickly and adopt the literacies and practices of their subject(s). Universities have responded to these challenges by providing a variety of induction initiatives.

The crucial stress point of students and researchers entering university through the peak of the pandemic forced institutions to act quickly to support transition (Bartolic *et al.*, 2021; Yowler *et al.*, 2021). These actions drew on experience and understanding of the need to improve, enhance and embed authentic and meaningful initiatives. (Cage *et al.*, 2021; Thompson, Pawson and Evans, 2021).

The University of Glasgow responded by implementing institution-wide projects that allowed new students and researchers to embed themselves in the culture(s) and practice(s) of the institution. Through collaborative course design – employing current research students in creation and teaching – and authentic pedagogies that challenged our students to consider themselves part of the institution, *T2G* and *PGR@Home* provided structured inductions that targeted specific needs.

We conclude that:

- Extended induction should be normal practice.
- Authentic, scaffolded programmes of induction are required to engage students and researchers.
- Identity and community creation, alongside teaching in academic and research literacies, are essential.
- Collaboration at design stage and delivery is essential.
- For learning practitioners, reflecting on the process of induction and transition is key to ongoing pedagogical success.

REFERENCE LIST

Ashencaen Crabtree, S., Esteves, L., & Hemingway, A. (2021). A 'new (ab)normal'?: Scrutinising the work-life balance of academics under lockdown. *Journal of Further and Higher Education*, *45*(9), 1177–1191. https://doi.org/10.1080/0309877X.2020.1853687

Bale, R., & Anderson, M. (2022). Teacher identities of graduate teaching assistants: How we (De)legitimise GTAs' role identities. *Teaching in Higher Education*, *0*(0), 1–17. https://doi.org/10.1080/13562517.2022.2109015

Bartolic, S. K., Boud, D., Agapito, J., Verpoorten, D., Williams, S., Lutze-Mann, L., Matzat, U., Moreno, M. M., Polly, P., Tai, J., Marsh, H. L., Lin, L., Burgess, J.-L., Habtu, S., Rodrigo, M. M. M., Roth, M., Heap, T., & Guppy, N. (2021). A multi-institutional assessment of changes in higher education teaching and learning in the face of COVID-19. *Educational Review*, *0*(0), 1–17. https://doi.org/10.1080/00131911.2021.1955830

Bond, R. and Castagnera, E. (2006) 'Peer Supports and Inclusive Education: An Underutilized Resource', Theory Into Practice, 45(3), pp 224-229.

Boyle, J., Ramsay, S., & Struan, A. (2019). The Academic Writing Skills Programme: A Model for Technology-Enhanced, Blended Delivery of an Academic Writing Programme. *Journal of University Teaching and Learning Practice*, *16*(4). https://eric.ed.gov/?id=EJ1229920

Brown, S., & Baume, D. (2022). 'Not another group activity!': Student attitudes to individual and collaborative learning activities, and some implications for distance learning course design and operation. *Innovations in Education and Teaching International*, *0*(0), 1–10. https://doi.org/10.1080/14703297.2022.2062424

Bury, S., & Sheese, R. (2016). Academic Literacies as Cornerstones in Course Design: A Partnership to Develop Programming for Faculty and Teaching Assistants. *Journal of University Teaching and Learning Practice*.

Cage, E. *et al.* (2021) 'Student mental health and transitions into, through and out of university: student and staff perspectives', *Journal of Further and Higher Education*, 45(8), pp. 1076–1089. doi:10.1080/0309877X.2021.1875203.

Cairns, J., Hervey, T. and Johnson, O. (2018) 'Neither "bolt-on" nor "built-in": benefits and challenges of developing an integrated skills curriculum through a partnership model', *Journal of Learning Development in Higher Education* [Preprint], (13). Available at: https://journal.aldinhe.ac.uk/index.php/jldhe/article/view/435 (Accessed: 16 June 2020).

Darnell, W. (2020) 'An exploration of instructors' accommodation discourse on the first day of class', *Teaching in Higher Education*, 0(0), pp. 1–15. doi:10.1080/13562517.2020.1729723.

Ding, F. and Curtis, F. (2021) '"I feel lost and somehow messy": a narrative inquiry into the identity struggle of a first-year university student', *Higher Education Research & Development*, 40(6), pp. 1146–1160. doi:10.1080/07294360.2020.1804333.

Donovan, C. and Erskine-Shaw, M. (2020) '"Maybe I can do this. Maybe I should be here": evaluating an academic literacy, resilience and confidence programme',

Journal of Further and Higher Education, 44(3), pp. 326–340. doi:10.1080/0309877X.2018.1541972.

Fox, J.G. and O'Maley, P. (2022) '"That classroom, that camaraderie … it's uplifting": how a pedagogy designed to strengthen academic literacies and skills in critical analysis and address the adverse influence of liberalism created a vibrant, empowering learning community', *Teaching in Higher Education*, 0(0), pp. 1–20. doi:10.1080/13562517.2021.2021392.

Gaia, A. C., Corts, D. P., Tatum, H. E., & Allen, J. (2003). The GTA Mentoring Program: An Interdisciplinary Approach to Developing Future Faculty as Teacher-Scholars. *College Teaching*, *51*(2), 61–65.

Gibbons, C. (2022). Surviving a pandemic—Understanding the role of student stress, personality and coping on course satisfaction and anxiety during lockdown. *Innovations in Education and Teaching International*, *0*(0), 1–14. https://doi.org/10.1080/14703297.2022.2064326

Gregersen, A.F.M., Holmegaard, H.T. and Ulriksen, L. (2021) 'Transitioning into higher education: rituals and implied expectations', *Journal of Further and Higher Education*, 45(10), pp. 1356–1370. doi:10.1080/0309877X.2020.1870942.

Kosiba, J. P. B., Odoom, R., Boateng, H., Twum, K. K., & Abdul-Hamid, I. K. (2022). Examining students' satisfaction with online learning during the Covid-19 pandemic—An extended UTAUT2 approach. *Journal of Further and Higher Education*, *46*(7), 988–1005. https://doi.org/10.1080/0309877X.2022.2030687

Lea, M. R. (2004). Academic literacies: A pedagogy for course design. *Studies in Higher Education*. https://doi.org/10.1080/0307507042000287230

Lea, M. R. (2008). *Academic literacies in theory and practice*. https://www.scinapse.io/papers/1598786590

Lea, M. R., & Street, B. V. (1998). Student writing in higher education: An academic literacies approach. *Studies in Higher Education*, *23*(2), 157–172. https://doi.org/10.1080/03075079812331380364

Lea, M. R., & Street, B. V. (2006). The 'Academic Literacies' Model: Theory and Applications. *Theory Into Practice*, *45*(4), 368–377. https://doi.org/10.1207/s15430421tip4504_11

Nordmann, E., Hutchison, J., & MacKay, J. R. D. (2021). Lecture rapture: The place and case for lectures in the new normal. *Teaching in Higher Education*, *0*(0), 1–8. https://doi.org/10.1080/13562517.2021.2015755

O'Toole, S., O'Sullivan, I., O'Brien, E., & Costelloe, L. (2022). From nice to know to "newfound popularity": Academic developers' perceptions of how COVID-19 has changed their role. *International Journal for Academic Development*, *0*(0), 1–5. https://doi.org/10.1080/1360144X.2022.2082438

Scanlon, M. *et al.* (2020) '"My biggest fear was whether or not I would make friends": working-class students' reflections on their transition to university in Ireland', *Journal of Further and Higher Education*, 44(6), pp. 753–765. doi:10.1080/0309877X.2019.1597030.

Street, B. V. (1984). *Literacy in Theory and Practice*. Cambridge University Press.

Struan, A. (2021). Active Blended Learning at Scale: University-Wide Writing Programmes. In B. C. P. Rodriguez & A. Armellini (Eds.), *Cases on Active Blended Learning in Higher Education* (pp. 106–121). IGI Global.

Thompson, M., Pawson, C. and Evans, B. (2021) 'Navigating entry into higher education: the transition to independent learning and living', *Journal of Further and Higher Education*, 0(0), pp. 1–13. doi:10.1080/0309877X.2021.1933400.

Yowler, J.Y. *et al.* (2021) *Rapid adaptation and remote delivery of undergraduate research training during the COVID 19 Pandemic | bioRxiv*. Available at: https://www.biorxiv.org/content/10.1101/2021.02.24.432694v1.full (Accessed: 26 February 2021).

DIGITALITY AND STEM IN EDUCATION: A QUALITATIVE PEDAGOGICAL COMPETENCE FRAMEWORK

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ABSTRACT

Many technological devices that are used in school rely on digital technologies that are used for information searches or to change the modality of learning. Teachers develop competences to pedagogically implement these devices. In any respect, the devices themselves are hardly understood neither by the students nor by the teachers. STEM education hardly addresses this deficit, engineering and technology mainly deal with the re-assembly of objects, the sciences with the explanation of phenomena, and mathematics and ICT with rules and algorithms. It seems that digitality has not been identified as a separable area of content knowledge within the universe of STEM subjects, yet. In this paper we perceive digitality as a transversal and unique entity of STEM that encapsulates its own content knowledge. In a conceptual understanding of digitality from a usage perspective, a nature of digitalization perspective, and a human-social perspective, we also provide a suggestion of how to integrate these perspectives into an educational curriculum based on a qualitative pedagogical competence framework. Our suggestion sees the opportunity to leverage digital STEM education beyond a sheer level of usage and allows all disciplines to approach digitality from different perspectives.

INTRODUCTION

These days school education is busy in terms of technologisation. Many development agendas address technological professional competences of teachers in schools and how to improve the teachers' instructional knowledge about digital resources (Mishra & Koehler, 2006; Ay et al., 2015; Huwer et al., 2019), how to implement technology into their instruction (Hutchison & Woodward, 2014; Lin et al., 2012; Ay et al., 2015; McKnight et al., 2016; Bates, 2019) or the use of technology, as an instrument to access content information and to support the learning experience through digital features (Herzig, 2014; Zinn, 2019).

Most models and frameworks make use of the terms technology digitalization. Even though many technological systems rely on digital smart or artificial intelligence processes (Kruse & Koch, 2020), STEM education research has hardly addressed digitality as a learnable content. It seems digitality is mostly seen as a usable feature (National Research Council, 2002; Siekmann, 2016) or as an educational resource in terms of technology, virtual platforms or the internet. In this paper we want to suggest viewing digitality as a separable part of STEM education and propose a qualitative pedagogical competence framework for future digital STEM education.

STEM CONTENT KNOWLEDGE AND KNOWLEDGE ABOUT DIGITALITY

Besides the challenges in the digital transformation processes, there is also a growing interest in interdisciplinary learning, predominantly because technologised learning is not restricted to a single subject. Technology is an omnibus instrument to access content information through the digital features of an engineered device. Yet, the device that is used is hardly understood by the users. To date most basic technological student and teacher competences are widely addressed in a technology-use-oriented and instrumental manner, e. g. use the internet for information acquisition, use programmes and applications for presentation purposes, use media to communicate with others, or adapt and improve given templates or ideas. Often, digital learning is implemented in terms of alternate modalities or representations to access a topic. This means that instead of reading a paper-based text an e-book is used or an internet video is watched; instead of doing an experiment, a digital animation/ simulation is explored.

While the pedagogical advantages of additional variation in the access to a phenomenon prominent, the implementation of technology seems to neglect the difference between using an engineered device and its digital features such as applications and software. STEM education and neighboring subjects like ICT and

media education rarely differentiate between the engineering part and the digital identity of devices.

A clearer disentanglement of digitality from the sciences, mathematics, ICT/ technology and engineering (Siekmann, 2016) can help to systematically approach a digital STEM literacy, in particular to

- understand how phenomena work (sciences),
- foster the application of laws and rules (mathematics and ICT),
- render a more precise understanding of what objects are and how they function in (engineering),
- perceive devices as a ravel of digitality and STEM knowledge (technology),
- view digitality as a separable domain of understanding.

The conceptual differentiation between digitality and STEM education results in two entities: knowledge about STEM content and knowledge about digitality. This conception of digital learning incorporates a technological usage perspective and moves onward to the idea of understanding the digital feature of objects that are used as vehicles in the content learning within STEM subjects (see Figure 1).

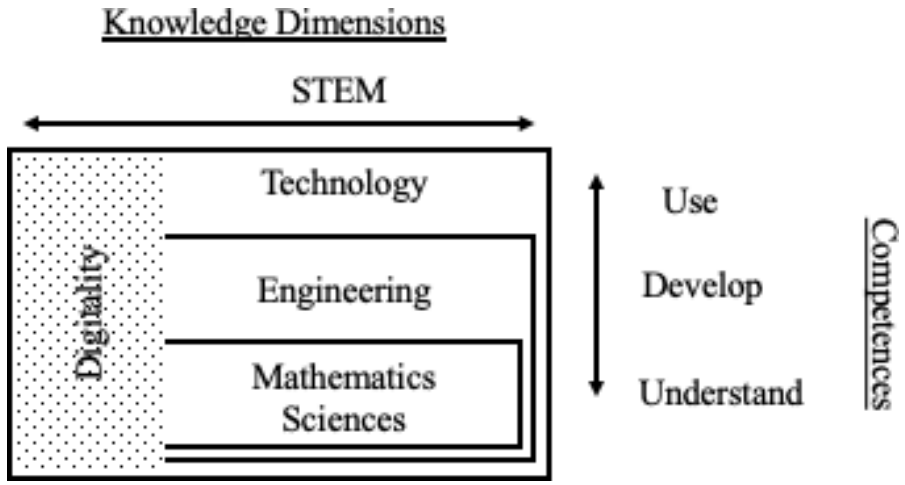


Figure 1: Digitality as a feature of STEM education

In Figure 1 the STEM subjects and digitality are shown as separate entities. This a schema that follows the current terminology, yet it is still flawed by overlapping contents. While mathematics, the natural sciences and engineering can be kept apart fairly well, it seems harder to differentiate between engineering, technology and digitality. Staring with separating out digitality, which is included in technology, the

technology content is reduced down to technical objects. It is comprehensible that the technical objects can now merge with engineering. What is now left from technology, is informatics which includes computer science, developing algorithms that automate engineered objects, but also to produce software or model the communication/ information transmission between objects. This process of disentanglement is shown in Figure 2. In a systematic deconstruction of the original STEM quadruple one arrives at a D-SIEM quintuple that seems to be a) clearer in terms of content, and b) more adequate with reference to school curriculums and subjects. Yet, in this paper we will keep to the term STEM, as the readers have a good understanding about it and an introduction of D-SIEM in combination with our additional ideas might lead to confusion. It also needs to be mentioned that D-SIEM does not replace terms like technology. D-SIEM does not neglect the existence of technological devices or technology as a content area, it rather tries to picture a clearer borders between content areas. Just as the red-yellow-blue colour model does not neglect the existence of the orange colour.

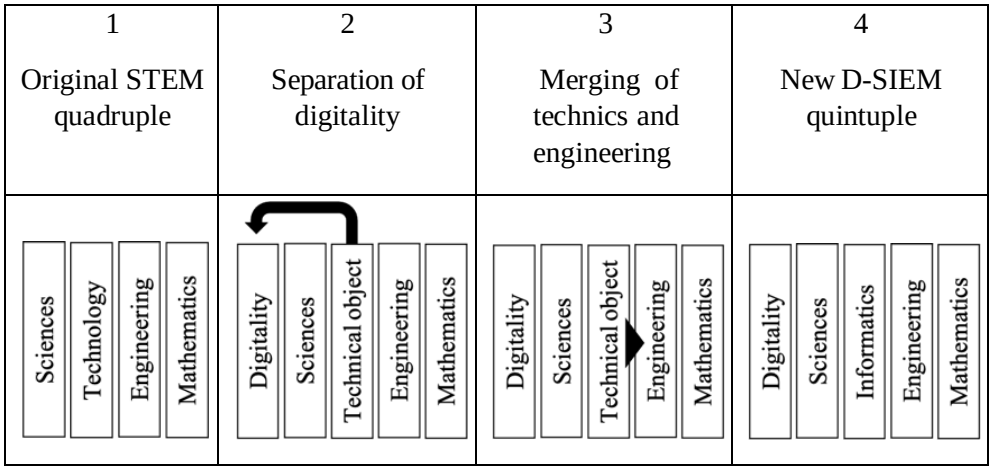


Figure 1: Disentanglement of STEM and digitality

In addition to a technological and content-oriented perspective, as explained above, in educational contexts it also seems essential for learners to develop an understanding of how objects work and in how far that goes beyond an engineering understanding of digital and analog technology. This is called technological literacy. To achieve technological literacy that enables learners to become autonomous and responsible users of technology, it is essential to include a human-social perspective in the considerations (Tuchel, 1967; Ropohl, 2009; Schmayl, 2021). In terms of school education we want to put a focus on three dimensions of technology education in the context of STEM learning: the technology usage perspective, the nature of digitalisation perspective, and the human-social perspective. We will also suggest a qualitative competence framework.

The technology usage perspective

The technology usage perspective depicts a view on digitality that is to be inspired by a pedagogical variation goal. This means that variation is an instructional quality aspect that helps motivate students to learn or to give access to a content through a different perspective. In most cases this leads to a dichotomy of two independent dimensions of access to a phenomenon: analog vs. digital. While analog comprises a direct and living access, digital is determined by its high reproducibility; analog gives unique direct feedback, digital can be reused many times. Due to the advantage of reproducibility and the possibility to focus on isolated issues, many phenomena and experiments have been digitalized and can be used in simulations. That way, dangerous analog experimentations and exercises can be avoided and be replaced by digital variants. Aviation training and medical surgery may be the two most prominent educational settings in which digitality has advanced to a high level. Pilots and physicians are trained to solve complex situations in simulations. And by today, even digital surgery is possible, where doctors and patient are not at the same location, but far from each other. The surgeon used a digital knife that is actually held by a robot arm connected via the internet. These examples show how far we can go today by using what digital technology is capable of.

Altogether, the technology usage perspective highlights variation as an instructional quality aspect that helps motivate students to access a content through representation (e. g. analog vs virtual) and modality variation (e. g. text vs film) or to retrieve information from the internet. A technology usage perspective may specifically address students' application competences and usage strategies that allow them to be productive learners.

The nature of digitalisation perspective

The nature of digitalization perspective takes into account that D-SIEM (and also STEM) education incorporates the understanding of the nature of an object[5], i. e. to identify its incremental compilation. STEM education wants to develop the capacity to understand how things work, or even more precise: what they are and how to use them. One crucial goal of STEM education thus needs to be the understanding of the nature of an object, i. e. to perceive an object's separable features, understand their function and to evaluate the consequences of the features in order to re-assemble the feature for a new purpose.

[5] This idea is borrowed from "the nature of science", which denotes the literacy to understand science concepts and take informed decisions on science questions (Bell & Lederman, 2003).

In this perspective, digitality is seen as a separable entity that can be added to an object and that has unique understandable features. The nature of digitality includes the questions of understanding how digitality is produced, how digitality can be used as an asset in an engineering development process, and how a resulting technological object can be re-used in terms of digitality. In school education the nature of digitality can be treated as a translateral competence to better understand the digital duplicates of analog objects and support an informed view on technology.

Human-social perspective

From a pedagogical point of view, building technological competence requires a multi-perspective understanding of the technical artefacts or objects that are an essential part of our living world. Competence in engineering thinking allows the formation of skills that enable technological progress as explained above. Undoubtedly, this is a very important educational task when it comes to STEM skills training. However, a competent and responsible use of technology also includes a sensitization to human or social concerns and realities. One danger inherent in the purely technological or mathematically oriented approach to digital development is that humans place themselves at the service of technology (Ropohl, 2009; Schmayl, 2013) which means that technology and technological progress determines the competences that are developed and that technology shapes how the world is perceived by individuals.

In the effort to exploit the possibilities of digitalisation to an even greater extent with a high level of technological creativity, it should be noted that only humans give meaning to the technological artefact. If technological development is judged exclusively from the perspective of technical or digital possibilities, the exploitation of these possibilities could change social structures to the effect that humans place themselves at the service of technology. The development of artificial intelligences should be mentioned here in particular. It is necessary to train the ability to weigh the social influences of newly developed digital technologies, to examine them and to integrate them into the living world.

The training of STEM competences therefore also means sensitizing to the human-social perspective of technology. It is important to develop the competence to be able to shape digital artefacts in a targeted and differentiated way in order to put them at the service of social needs. This does not mean that digital opportunities are not used - on the contrary: It is of great importance to understand them in order to train innovation competence in the sense of STEM skills. The pedagogical challenge in developing this competence, however, is to help learners to take a multi-perspective view of digital developments in order to develop creative digital competence.

In sum, the human-social perspective incorporates a multi-perspective understanding of technical objects as essential parts of our living world. Besides the development of STEM skills, this perspective emphasizes a responsible use of technology including a sensitization to human-social concerns and realities in order to avoid that humans place themselves at the service of technology (Ropohl, 2009; Schmayl, 2021). The training of STEM competences therefore also means to develop the competence to engineer objects to put them at the service of social needs.

COMPETENCES

The three perspectives can get translated for instructional contexts. This makes the idea of D-SIEM – combined with the perspectives – applicable to school education. In a first step we propose a competence framework that is based on the cognitive processes of remembering/ recognising, understanding, application, evaluation, development, and communication and specifically addresses digitality as a unique knowledge entity that can be acquired in a factual, conceptual, procedural or meta-cognitive way (Anderson & Krathwohl, 2001; Krathwohl, 2002, see Table 1). It adds qualitative pedagogical aspects to facilitate learning goals and incorporates the perspectives in a transversal way, i. e. they are all addressable by the framework.

Table 1: Qualitative framework for digital D-SIEM education

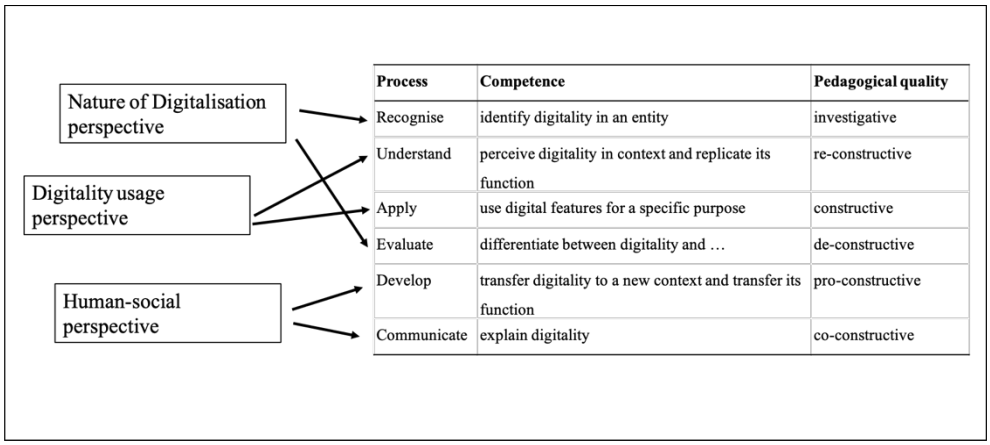
Process	**Competence**	**Pedagogical quality**
Recognise	identify digitality in an object	investigative
Understand	perceive digitality in context and replicate its function	re-constructive
Apply	use digital features for a specific purpose	constructive
Evaluate	differentiate between digitality	de-constructive
Develop	transfer digitality to a new context and transfer its function	pro-constructive
Communicate	explain digitality	co-constructive

Table 1 shows how process steps of a learning goal taxonomy can be aligned with competences. For example, if the learning goal is to recognize digitality as an entity, the competence to identify digitality in an object needs to be addressed in instruction.

The pedagogical quality is also added in Table 1. The pedagogical quality refers to methodological access to the competence and process. Therefore, the recognition process is optimally initiated in investigative pedagogical approaches such as exploratory learning, inquiry-based learning etc.

The recognition process is the only entirely investigative process, all other processes are constructive. Construction refers to a pedagogy that allows not only the investigation of phenomena, but also to use the knowledge from the investigative process. In other words, investigation sets the basis of pre-knowledge that is needed for any further constructivist learning process.

As pointed out above, the three perspectives "Nature of digitalization", "Digitality usage" and "Human-social" can be applied to the framework in Table 1. One example of where the perspectives can be implemented is shown in Figure 2.



Process	Competence	Pedagogical quality
Recognise	identify digitality in an entity	investigative
Understand	perceive digitality in context and replicate its function	re-constructive
Apply	use digital features for a specific purpose	constructive
Evaluate	differentiate between digitality and …	de-constructive
Develop	transfer digitality to a new context and transfer its function	pro-constructive
Communicate	explain digitality	co-constructive

Figure 2: Example for the implementation of perspectives

In Figure 2 we show an example that follows a digital literacy idea which starts at the Nature of Digitalisation perspective as a highly individual competence, i. e. a learner starts to recognize that there exists something like digitality as an entity. In the next step the Digitality usage perspective allows the learner to interact with digitality in order to understand it and gets a first idea of how or where digitality can be applied. Within the evaluation process the Nature of DIgitalisation perspective is picked up again and, together with the previous processes, gives the learner the chance to evaluate digitality itself or in a comparative way against what is not digitality. The Human-social perspective then builds on top of what has been learnt and addresses the more advanced processes of development and communication, because the two processes can be directly related to ongoing discussions in contemporary media and in interaction with others/ peers.

At this point we want to make clear that the application of the perspectives to the learning processes is just one example. There are multiple versions of how to implement the perspectives as well as there are alternative ideas of the learning taxonomy logic that we present here.

DISCUSSION

In this study we tried to extract digitality from STEM education content. The idea was to separate terms within the STEM acronym and find unique contents. The most confounded term was "technology" which includes digitality as well as technical artefacts. The differentiation between digitality and technical artefacts allows to perceive digitality as a separate entity and thus needs special consideration in terms of knowledges and competences for teachers and students. It also leads to a new abbreviation: D-SIEM, Digitality, Sciences, Informatics, Engineering and Mathematics. D-SIEM does not replace or neglect technology or STEM, it is a model to keep content areas separate when digitality is added.

In terms of D-SIEM literacy a multi-perspective view on the content areas was introduced: technology usage perspective, nature of digitalization perspective and human-social perspective. These perspectives give an idea of how to evaluate the content areas and guide the learner toward a broader understanding of what digitality is and what its impact can be. Yet, all example that we gave need to be seen as one suggestion among various other approaches. At first, one may change the order of learning processes in the framework. The way we presented it in this paper suggests a linear hierarchical structure. Second, one may choose the perspectives in a different way as compared to our example. Again, our suggestion intends a logic that goes from individual self-learning toward a profound maturity and finally to interaction with other individuals. Depending on the pedagogical approach one may change our logic and start out with peer interaction, for example.

The competences need not only be seen entirely technically but also on a social level, which is expressed in the human-social perspective on digitality. Based on our suggestion, we also open the opportunity to leverage digital STEM education beyond a sheer level of usage. Considered from this angle it is our intention to contribute to the development of new ideas and innovation in STEM pedagogy and perceive digitality in a multi-dimensional way. The core point of seeing STEM and digitality as separate entities also includes a suggestion for an integrative competence framework to handle the "old" and "new" perspectives in a goal-oriented but also pedagogical way.

We provided a qualitative theoretical framework for digital STEM education. This framework needs to be put into practice and be evaluated. The suggestion we provide is only meant to give an idea how an abstract entity like digitality can be transferred into a practical pedagogical schedule.

REFERENCES

Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman.

Ay, Y., Karadağ, E., & Acat, M. B. (2015). The Technological Pedagogical Content Knowledge-practical (TPACK-Practical) model: Examination of its validity in the Turkish culture via structural equation modeling. *Computers & Education*, *88*, 97–108. https://doi.org/10.1016/j.compedu.2015.04.017

Bates, A. W. (2019). *Teaching in a Digital Age Guidelines for designing teaching and learning*. Tony Bates Associated LTD. https://opentextbc.ca/teachinginadigitalage/

Herzig, B. (2014). Wie wirksam sind digitale Medien im Unterricht. *Gütersloh: Bertelsmann Stiftung*.

Hutchison, A., & Woodward, L. (2014). A planning cycle for integrating digital technology into literacy instruction. *The Reading Teacher*, *67*(6), 455–464.

Huwer, J., Irion, T., Kuntze, S., Schaal, S., & Thyssen, C. (2019). Von TPaCK zu DPaCK–Digitalisierung im Unterricht erfordert mehr als technisches Wissen. *MNU Journal*, *72*(5), 356–364.

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into Practice*, *41*(4), 212–218.

Kruse, S., & Koch, A. F. (2020). Competences in a digitalised world in the context of general and vocational technical education and training. In M. de Vries, S. Fletcher, P. Labudde, M. Lang, I. Mammes, C. Max, D. Münk, B. Nicholl, J. Strobel, & M. Winterbottom (Eds.), *The impact of technology education: International insights* (pp. 85–106). Waxmann Verlag.

Lin, J. M.-C., Wang, P.-Y., & Lin, I.-C. (2012). Pedagogy*technology: A two-dimensional model for teachers' ICT integration. *British Journal of Educational Technology*, *43*(1), 97–108. https://doi.org/10.1111/j.1467-8535.2010.01159.x

McKnight, K., O'Malley, K., Ruzic, R., Horsley, M. K., Franey, J. J., & Bassett, K. (2016). Teaching in a Digital Age: How Educators Use Technology to Improve Student Learning. *Journal of Research on Technology in Education*, *48*(3), 194–211. https://doi.org/10.1080/15391523.2016.1175856

Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A new framework for teacher knowledge. *Teachers College*

Record, 108(6), 1017–1054.

National Research Council. (2002). *Technically Speaking: Why All Americans Need to Know More About Technology*. The National Academies Press. https://doi.org/10.17226/10250

Ropohl, G. (2009). *Allgemeine Technologie: Eine Systemtheorie der Technik* (3., überarbeitete Auflage). KIT Scientific Publishing.

Schmayl, W. (2021). *Didaktik allgemeinbildenden Technikunterrichts* (Pädagogische Hochschule Karlsruhe, Ed.; 4. unveränderte Auflage). Schneider Verlag Hohengehren GmbH.

Siekmann, G. (2016). *What is STEM? The need for unpacking its definitions and applications.* Commonwealth of Australia.

Tuchel, K. (1967). *Herausforderung der Technik: Gesellschaftliche Voraussetzungen und Wirkungen der technischen Entwicklung*. Schünemann.

Zinn, B. (2019). Editorial: Teaching and learning between virtuality and reality. *Journal of Technical Education, 7*(1), 1–15. https://doi.org/10.48513/JOTED.V7I1.181

LEARNING TO TEACH WRITING – AN INTERVENTION TO PROMOTE TEACHERS' SKILLS

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ABSTRACT

Students need the support of their teachers when learning to write. To effectively support students, teachers need pedagogical content knowledge about the didactics of writing (PCK-W). An intervention was developed, piloted, and evaluated in a study with 554 participants to promote PCK-W among prospective teachers. This contribution focuses on the theoretical background and the practical realization of the intervention in the sense of a best-practice example. The contribution provides a detailed description of each module. Additionally, learnings from the intervention's implementation are presented, focusing on the difficulties and promising aspects for the future application of the intervention. The article aims to provide suggestions for further interventions to promote PCK-W.

BACKGROUND AND FRAMING

Theoretical background

Writing is critically relevant in everyday life, work, and school. Thus, writing is a crucial skill to develop in today's society (Graham, 2019). Furthermore, it is essential to write comprehensibly to facilitate clear communication. Due to this high relevance, the curricula in Baden-Württemberg (the federal state location of the evaluation of the intervention) specify that writing is a compulsory subject of school instruction and further designate the importance of mother-tongue German lessons and other language subjects (e.g., Ministerium für Kultus, Jugend und Sport Baden-Württemberg, 2016). Several studies indicate that many students struggle to write clearly (National Center for Education Statistics, 2012). This finding is partly due to the intricate complexity of writing and the interaction of several interdependent sub-processes occurring throughout the writing process. For example, the sub-processes of text production include planning, formulating, and revising (Kim & Graham, 2022). Students struggling with writing often do not show coordinated planning and revision activities, which are essential for high-quality writing (Sturm & Weder, 2016). When they do revise, they often address superficial aspects rather than improve the texts qualitatively (MacArthur, 2016). Theory suggests that students typically rely on teachers' writing instruction for a systematic acquisition and further development of writing skills (Graham, 2019). In these instructions, teachers support students to use what they have learned to reduce the complexity of the writing process (e.g., writing strategies; Graham, Tavsanli, & Kaldirim, 2022). To promote writing in school, which includes planning and implementing writing lessons, teachers need professional pedagogical content knowledge about the didactics of writing (PCK-W). PCK-W forms one part of teachers' professional knowledge, which is, in turn, part of the professional competence of teachers; their competence is one of the most powerful predictors of students' learning outcomes (Hattie, 2012). Moreover, PCK-W serves as a disposition that can facilitate the perception and interpretation of classroom situations deemed relevant by subject didactics and make decisions on this basis (Blömeke, König, Suhl, Hoth, & Döhrmann, 2015). According to Keller (2016) and Keller and Glaser (2019), PCK-W includes three dimensions:

(i) Knowledge of the communicative aspects of writing: Texts are addressed to readers and should be written as precisely as possible for these readers. Thus, texts should be adapted to their readers in not only language and style but also the prior knowledge of the readers. Cooperative writing settings effectively introduce students to this complex skill of addressing an addressee in writing (Graham & Perin, 2007)—especially in the planning and revision phases of writing (Rütti-Joy & Unger, under review). Therefore, teachers must know how to design settings and in which phase each setting is appropriate for their students (Keller, 2016). Professional competence generally and PCK-W specifically can develop through utilizing appropriate learning opportunities. Individual prerequisites and learning conditions influence the

utilization of learning opportunities (Kunter, Kleickmann, Klusmann, & Richter, 2011). Learning opportunities are primarily provided in formalized teacher education, in-service, and continuing education programs (Tynjälä, 2008). There are heterogeneous findings on the development of teachers' professional competence during their education (Lindl & Krauss, 2017), and Keller (2016) shows that there is still a high need for the promotion of PCK-W. Specific interventions to promote PCK-W are rare and typically conceptualized as relatively short measures (Grausam, Metz, Jäger, & Maier, 2016) or focus only on a part of PCK-W.[6]

(ii) Knowledge of writing strategies: If students are to write well, their educational institutions and teachers must equip them with writing strategies (Graham & Perin, 2007). Writing strategies are intended to reduce cognitive load during the writing process by providing the writer with ways to accomplish a writing task (for example, making a mind map can provide students with cognitive relief in the planning phase). They are mentally represented plans that can strategically guide writing actions. Writing strategies must be consciously acquired (Philipp, 2016). In the school context, the teacher is the central transmitter of writing strategies and therefore plays a central role in students' learning to write. Accordingly, the teacher needs knowledge of writing strategies, including their role and relevance and declarative and procedural knowledge about these strategies (Keller, 2016).

(iii) Knowledge of writing instruction: In order to provide good writing support, it is also essential that teachers know how to motivate and guide their students to write effectively. Knowledge of how to teach writing strategies is part of this domain: Writing strategies should be taught explicitly. For instance, Harris and Graham (2009) developed the six-step approach of Self-Regulated Strategy Development (SRSD), which guides students to use writing strategies in a self-regulated manner. Meta-analyses point to the effectiveness of this approach in enhancing text quality (Graham, Harris & McKeown, 2013). Additionally, teachers must know how to design writing assignments to motivate students to write. Following political guidelines, PCK-W ought to be built up systematically and cumulatively over three phases of teacher training in Baden-Württemberg: Phase 1: academic studies, Phase 2: preparatory service, Phase 3: in-service and further training (Wacker, Unger, & Rey, 2021). However, a study by Keller (2016) showed that the PCK-W of students at the end of their studies is still expandable. This is also shown by the finding, that many teachers self-report that they feel inadequately prepared for teaching writing through their teacher education programmes (Brindle, Graham, Harris, & Hebert, 2016). There is, therefore, still a need for development, prompting this study to develop its intervention suggestions.

[6] e.g., https://www.thinksrsd.com/

Framing of the new intervention and structure of the contribution

This contribution's detailed presentation of the intervention and its theoretical foundations is the central aim. The development and initial application of the intervention involved several practical steps, which are not at the centre of the present contribution and will thus be only touched upon briefly. The intervention was first tested in a pilot study in 2017 and subsequently revised (Unger, Rutsch, Keller, Dörfler, & Glaser, 2018). Next, the intervention was evaluated to ascertain its usefulness in a comprehensive empirical study in 2017 and 2018. In this study, prospective teachers from different teacher education programs at several universities in Baden-Württemberg (Germany) participated in the intervention. To assess the change in PCK-W, a vignette test (Keller, 2016; Keller & Glaser, 2019) was used in a pre-post experimental design. Based on a latent change model to capture the development in PCK-W, we found medium intervention main effects compared to control groups. These results indicate that the intervention successfully promotes students' PCK-W. Furthermore, the intervention was generally positively evaluated by the participants, who rated all modules as highly supportive. For details on the evaluation of the intervention, see Unger (2021) and Unger, Dörfler, Hochweber, and Glaser (in preparation). In addition, one may assume that the extraction and isolated use of materials from the intervention could facilitate the development of PCK-W.

Theoretical framework model

For the development of the intervention, a theoretical framework model was derived from literature and regularly discussed with experts from the field of empirical didactics of writing (see Figure 1). This model subsumes the didactic and methodological principles for its intervention design and content alignment. The seminar's purpose is to teach the principles of teaching German L1 writing. Therefore, the contents were derived from the three dimensions of the theoretical construct of PCK-W: knowledge of the communicative aspects of writing, knowledge of writing strategies, and knowledge of writing instruction.

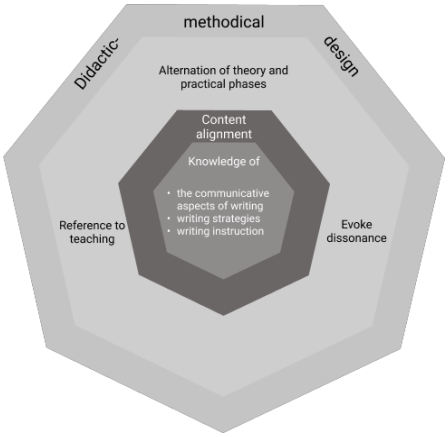

Figure 1. Theoretical framework model for the conception of the intervention

Due to the limited scope of previous work on the didactic-methodical design of interventions in terms of writing didactics, the didactic-methodical principles were adopted from work on teacher in-service training. Ingvarson, Meiers, and Beavis (2005) reported that teachers consider the *content focus*, i.e., the reference to the content (in this case, the teaching of writing didactic content derived from the three dimensions of the theoretical construct of PCK-W), essential to learning. Furthermore, teachers considered it vital that they could actively apply and practice the content conveyed, summarized by Ingvarson et al. (2005) under the term *active learning* (in this case, the application of the writing didactic content). Therefore, the intervention was conceived as having alternating theory and practice phases. Thus, theoretical input was always followed by possibilities to apply the knowledge. Lipowsky (2010) showed that teachers consider the reference to their lessons to be positive (reference to teaching). The same study demonstrated that evoking dissonance between learners' ideas and the learning content could promote learning. Therefore, reference to teaching and evoking dissonance were further principles reflected in the model.

IMPLEMENTATION

Organisational implementation

The intervention study was implemented in the structure of a block seminar at five universities of education in Baden-Württemberg and the University of Heidelberg in Germany. The seminar was integrated into the curriculum. According to the university's guidelines, the seminar was either part of students' compulsory or elective curricula. Thus, universities widely advertised the courses, and the participants could complete the formalities of their studies (e.g., certificates of achievement, term papers) within the framework of the seminar. The seminar took place at the respective university over two weekends (each Friday afternoon and all day Saturday) with a one-weekend break in between. The participants were studying

in different teacher training programs and were, on average, in the middle of their studies at the time of participation. The lecturer of the intervention was the first author of this contribution. The seminar was taught in German.

Didactic-methodical background of the intervention

This study's intervention design aims to support the *alternation of theory and practical phases* (see Figure 1) so that the content is taught first, referencing relevant literature. Thus, a theoretical basis is established such that participants can actively apply the respective concepts. Examples of how to support this implementation are as follows: (i) The theoretically-taught strategies are applied to participants' writing process to build knowledge of writing strategies. Independent writing is, therefore, a central methodological principle of the intervention measure. (ii) In teaching *knowledge of writing instruction*, the theory of instruction is taught first (e.g., the explicit teaching of writing strategies). The participants are then asked to teach a strategy themselves in role-play situations. (iii) Cooperative writing settings from the area of *knowledge of the communicative aspects of writing* are taught theoretically, then tested practically. Finally, classroom implementations are discussed theoretically in the intervention, and concrete lesson plans are prepared to establish the reference to the classroom. The following didactical actions are employed to create the most extensive possible *reference to teaching*: (i) Original student texts are used. (ii) Some work assignments are framed by fictional written classroom situations in the intervention. Thus, the tasks are formulated for concrete situations. (iii) To simulate learning-enhancing, hands-on learning experiences (Kind, 2009), role-play within lessons allows teachers to demonstrate their teaching through play. (iv) Finally, videos from real-world writing lessons are shown during the intervention, which has much potential for higher education didactics (Unger, Rutsch, & Benz, 2020). The modules frequently ask about their personal beliefs on issues to *evoke dissonance*. Then, evidence in discussions provides comparisons for these beliefs. The goal is to encourage participants to reconsider their prior beliefs, further developing the participants' existing mental concepts to achieve the most significant possible learning success reference.

MODULES OF THE INTERVENTION

The content of the intervention's initial design aimed to meet the needs of prospective secondary school teachers. However, due to institutional requirements, the intervention was also opened to prospective primary school teachers; some content was adapted to this group's needs. For example, student texts from secondary and primary schools were analyzed, and assignments were developed for both types of schools. The modules are clustered by content, each with a different duration. The following sections represent the chronological order of the intervention measure.

What is writing? – Theoretical background: This module provides a theoretical background that is important for the further intervention. The module consists of four components: (i) Findings of studies, (ii) the term "writing", (iii) oral and written communication, (iv) text production model.

(i) "Findings of studies: In the module, participants review the main findings of studies in the areas of writing and writing instruction (e.g., National Center for Education Statistics, 2012) in small groups. Afterward, the findings are discussed as a class. (ii) "The term 'writing'": To illustrate the diversity of writing, the lecturer then presents various definitions of the term "writing" (Huneke, 2007; Philipp, 2014). Then a class discussion proceeds concerning which cognitive sub-processes are involved in the writing process (high and low-level sub-processes, López, Torrance, Rijlaarsdam, & Fidalgo, 2021). In this context, it is discussed what the teacher's task is in different age groups and proficiency levels when promoting the respective processes. (iii) "Oral and written communication": Afterwards, the overlapping areas between oral and written communication are introduced based on the concept of conceptual and medial orality and writtenness and illustrated with examples (for example, a messenger dialogue between friends vs. a text of the law). In this context, participants discuss the extent to which the close relationship between orality and writtenness can facilitate the teaching of German. Furthermore, they examine which aspects must be considered (e.g., the addressee's orientation, despite an absence of facial expressions and gestures in written language). This context additionally emphasizes the cooperation of writers. (iv) "Text production model": To discern an impression of the writing process, the text production model of Hayes and Flower (1980) is studied. The model subsumes all processes and aspects involved in writing. For playful elaboration, the participants develop their writing process model from the original Hayes and Flower (1980) model within the framework of a puzzle. The goal of this unit is for the participants to engage productively with the individual aspects of the model. Using the original model (presented by the lecturer), the macro processes of planning, formulating, and revising are explained in more detail. In addition, the didactic and methodological consideration of the processes in writing instruction is discussed.

Everybody can write – Writing an argumentation using planning strategies: In this module, participants learn about planning strategies. They learn theoretical basics but also gain practical experience. The module consists of three components: (i) writing a text without guidelines, (ii) writing strategies, (iii) writing again – with SNERV.

(i) "Writing a text without guidelines": The participants first write an argumentative text themselves. Apart from the topic ("presence regulations in universities"), the participants are not provided guidelines or assistance. In addition, their allotted time limit is deliberately short (25 min.). A discussion as a class about the difficulties in the writing process follows. Possible problems here include limited time, too little guidance on the structure and function of the text, and little information about the text type. (ii) "Writing strategies": A theoretical input on writing strategies (Sturm & Weder, 2016). The lecturer also presents selected strategy bundles that may help

unburden the cognitive planning phase. In addition to a multi-text strategy bundle (a bundle of interrelated writing strategies that unburden entire writing processes), an argumentation-specific strategy bundle is presented: the "NERV" strategy bundle (**N**och nicht festlegen, or Don't Decide Yet; **E**ntscheide dich für eine Seite, or Decide for a Side; **R**eihenfolge festlegen, or Decide Order; **V**iel mehr schreiben, or Write Much More – if you come up with more ideas in the formulation process). This bundle is supplemented by the step "S" (**S**chreibziel festlegen = set writing goals – "SNERV"; Philipp, 2014). The strategy bundle provides students with assistance in the planning-to-formulation process of writing. Its potential is primarily due to students going back into themselves and drawing up a writing plan before they start writing. (iii) "Writing again – with SNERV": The theoretical knowledge is then transferred to the own writing process in the sense of active learning: Using the strategy bundle "SNERV," another text is written. Since the topic ("the use of term papers in universities") has similarities with the topic of the text written at the beginning of the module, one may expect a comparable text in terms of content and concept and a similar writing process. This likeness facilitates the later comparison of the texts. A discussion of the two writing processes in this module (without help and guidelines vs. with SNERV) follows the writing assignment. The aim is to let the participants experience, in practice, the usefulness of planning strategies.

Formulation strategies: This module provides participants with an overview of formulation strategies. Some of the few strategies mentioned in the literature are described in the module: For instance, it is a good idea to teach students to avoid overly complicated sentences, as this unnecessarily ties up the cognitive resources of the writers. It is also advisable to maintain a steady writing speed (possibly even just in a short passage, Ortner, 2000). The students can be relieved in the preparation of the writing process by the specification or joint elaboration of the argumentation structure (e.g., by marking in example texts so that templates are available for their writing). It is also helpful to provide students with phrasing blocks (such as sentence starters or connecting words) or to work on them together (Sturm & Weder, 2016). The module concludes with a discussion on how the formulation strategies can be used as measures of internal differentiation in the classroom, for instance, by making the phrasing blocks available only to the lower-performing students.

Structured revision of the argumentation – Revision strategies: This module provides declarative and procedural knowledge about revision strategies. It consists of four components: (i) Revising a text without guidelines, (ii) theoretical input, (iii) writing conference, (iv) using the writing conference.

(i) "Revising a text without guidelines": The module starts with the assignment that the participants should revise their texts on the topic of "presence regulations in universities" (see module "everybody can write – Writing an argumentation using planning strategies") individually without guidelines or assistance. Subsequently, an online voting system enables the anonymous querying of which problems arose during the individual working phase and which aspects of the texts were revised as a matter of priority. (ii) "Theoretical input": Subsequently, the instructor provides theoretical input on revising in the writing classes, followed by leading a discussion

on the difficulties that may arise in the revision of texts (one possible problem, for example, could be that only surface characteristics, such as spelling or grammar, are revised). (iii) "Writing conference": As an exemplary method in the field of revision strategies, the concept of the writing conference (Spitta, 1992) is theoretically introduced. Based on the critique of the "traditional" approach to this concept mentioned in the literature (Sturm & Weder, 2016), a modified version of this writing conference is presented. (iv) "Using the writing conference": In the sense of active learning, the participants engage with this writing conference in small groups using their texts on the topic of "the use of term papers in universities" (see module "everybody can write – Writing an argumentation using planning strategies"). The procedure of this modified form of the writing conference is as follows:

1. The participants are divided into small groups (3-4 participants each).
2. The participants stick their texts on a poster so there is free space around the text (feedback can then be recorded in the margins).
3. The participants each read their texts aloud in the small group.
4. At an audible signal, the participants pass their texts to the left.
5. The participants use a checklist to write feedback on their teammates' texts on the poster in front of the individual (here, they should use the margin noted above). It is possible to use different colours so that it is possible to see who has made which comments.
6. At a new audible signal, the procedure recommences at 5. This cycle repeats until each participant has their text in front of them again.
7. In the final step (when everyone has their text again), the participants can read through their feedback and ask questions if something needs clarifying.

After the writing conference, the participants receive a worksheet with instructions for each revision mark. The instructions intend to help them use the comments to improve their texts (For example, if fellow students had marked an error of logic in the text, students should ask themselves the following: Am I aware of the error? If so, try to increase the internal coherence of the text. If not, ask your fellow student for help). The comments are reviewed using the provided worksheet. Then, the texts' revisions are done individually until the next intervention day.

How can I help students?: This module presents effective writing support measures and actively applies them. The module consists of three components: (i) Evidence-based writing support measures, (ii) exploring some writing support measures in greater depth, (iii) presentations.

(i) "Evidence-based writing support measures": At the beginning of the module, the lecturer presents a tabular overview of various meta-analyses of evidence-based writing support measures by Philipp (2014, p. 28). Significantly, the table sorts the writing support measures according to their empirically-determined effectiveness (for example, see ii). The assignment for the participants is to work through the overview individually. The lecturer starts with a short methodological excursus on meta-analyses and effectiveness research to assist the participants. One of the guiding questions is: Does the writing support measures' order of effectiveness coincide with your original ideas about effective writing instruction? The aim is to

generate dissonance between the participants' beliefs and the research findings. (ii) "Exploring some writing support measures in greater depth": From the overview presented, the writing support measures "Cooperative writing with other students," "Setting clear text product goals and promoting text structure knowledge," and "Explicitly teaching writing strategies," which are singled out and explored in greater depth. To this end, the participants work in groups by request on a short theoretical presentation of the three writing support measures. In addition, the participants are presented with fictitious written teaching situations. Then, the previously-learned writing support measures apply to these situations by devising classroom implementations of these measures with the background of the written teaching situations. (iii) "Presentations": At the end of the module, the groups' short presentations and ideas for classroom implementation are presented and discussed as a class.

Effective writing instruction: This module works on how to make writing instruction effective. It consists of six components: (i) SRSD, (ii) modelling, (iii) modelling a strategy, (iv) teaching the writing conference, (v) writing tasks, (vi) analysing writing tasks.

(i) "SRSD": In this module, the lecturer first introduces the participants to the six-step teaching approach "Self-Regulated Strategy Development (SRSD)," the goal of which is to guide students in the self-regulated use of writing strategies (Harris & Graham, 2009). In addition, evidence of the effectiveness of the approach is mentioned (Graham et al., 2013). (ii) "Modelling": One step from the SRSD approach is addressed in more depth because it might not be intuitive for inexperienced teachers at first: "modelling" (i.e., a teacher saying out loud what is being done and thought in the strategy applied in a planned way; Harris & Graham, 2009). The lecturer first explains modelling theoretically and then describes how it is realized. Next, the lecturer emphasizes the importance of developing a didactic plan for modelling and presents an example (Sturm & Weder, 2016). (iii) "Modelling a strategy": The participants are tasked with writing their plan for modelling a strategy. The instructor provides the strategy to be modelled and a framing fictitious teaching situation in the form of a text vignette. Participants then execute the didactic plan within a role play in partner work: The participant who had developed the plan fills the role of the teacher; the partner plays the role of the student—afterward, the roles exchange. (iv) "Teaching the writing conference": The participants are asked to develop a concept for teaching the writing conference method to their students based on the SRSD approach. (v) "Writing tasks": Effective writing instruction requires high-quality writing tasks; therefore, this module addresses writing tasks explicitly. In the beginning, the basics of the term "writing task" are discussed (e.g., the term "writing task" is understood in different ways, and appropriate writing tasks subsume different steps; Sturm & Weder, 2016). Following this, participants receive an overview of the theoretical-conceptual differences between writing tasks in writing in product-oriented and process-oriented didactics (Hochstadt, Krafft, & Olsen, 2013). (vi) "Analysing writing tasks": The lecturer presents the participants with a theory-based checklist for analysing and developing writing tasks (a similar

checklist can be found in Sturm & Weder, 2016, p. 157). Then, participants analyse original writing task arrangements from textbooks using the list.

Analysis of student texts with the help of specific criteria: In this module, participants learn how to analyse the strengths and weaknesses of texts. They also learn about the relevance of specific criteria for text analysis. The module consists of four components: (i) Assessing student texts without guidelines, (ii) studies, (iii) re-evaluating using rubrics, (iv) formulating feedback.

(i) "Assessing student texts without guidelines": The module is started by assigning participants to assess the original student texts, individually and without particular guidelines. Next, the participants write the grades on slips of paper and hang them on the board separately for each text. This way, the distribution of grades can be compared visually; it is typically very heterogeneous. The aim is for the prospective teachers to experience how difficult it is to evaluate texts reliably without guidelines. (ii) "Studies": Subsequently, empirical studies are presented that provide evidence on reasons for such heterogeneous distributions (e.g., Birkel & Birkel, 2002). (iii) "Re-evaluating using rubrics": The participants then use a rubric to develop differentiated criteria for analysing student writing. These rubrics include categories such as whether spelling and grammar are correct, but also whether, for example, the work meets the communicative writing goal of the text and whether the text is legible. With the help of these criteria, the participants re-evaluate the texts and compare the results with their initial grading. The aim is to demonstrate that evaluation based on clear criteria leads to more homogeneous grades and is easier to legitimize since the focus on specific aspects allows for a more systematic and reliable judgment about the quality of a text. (iv) "Formulating feedback": The lecturer then gives input on formulating effective feedback on student texts (feedback should be formulated dialogically and relate to the text, MacArthur, 2016; Sturm, 2016). Based thereon, the participants formulate detailed feedback. The participants then practice presenting this feedback orally to the student in a role-play—again, in partner work playing the alternating roles of teacher and student.

Howdo others do it? – Analysis of other people's writing lessons: In this intervention videos were used to demonstrate relevant aspects of writing instruction, with the theoretical knowledge from the previous modules serving as a basis for reflection (Schaffner Menn, 2013). Since literature demonstrates that learners take a more critical stance and name more alternatives for action when analyzing other people's lessons instead of their own (Seidel, Stürmer, Blomberg, Kobarg, & Schwindt, 2011), the intervention uses videos showing the writing lessons of a teacher who is unknown to the participants (two double lessons in a seventh-grade writing class). The teacher recorded in the video was not given any in advance instructions with respect to the content taught or the methodology used in the lessons. In total, the lecturer selected four sequences from the video (with a length between 2:25 and 14:16 minutes) for the intervention, each showing a didactically relevant scene (For example, one video shows the collection of arguments in the planning phase). Since videos cannot depict the full complexity of the school or classroom environment (Krammer, 2014), research indicates the need to provide participants with contextual

information and additional materials, such as the teaching materials used in video scenes (Biaggi, Krammer, & Hugener, 2013). Therefore, the lecturer gives the participants some contextual information about the school and the filmed class in advance. In addition, the students receive the working material used in the video sequences. Another problem with using instructional videos is that they are perceived differently by learners depending on their background experience. Therefore, some viewers may miss relevant aspects, which is why the use of analysis grids has been recommended (Biaggi et al., 2013). The grids used to analyse the videos in the intervention focus on the consideration of writing strategies in the setting, the writing instruction, the design of the writing tasks and work materials, and the usefulness of the realized social forms (for a detailed description of the use of instructional videos in the intervention, see Unger et al., 2020).

What do I do with it? – Working out own lessons: Participants are asked to develop their own writing lesson sequence in this module. The module consists of two components: (i) Input on tabular lesson presentations, (ii) developing writing lessons.

(i) "Input on tabular lesson presentations": To provide initial assistance, the instructor gives input on tabular lesson presentations. Here, the participants learn how to represent a planned lesson's flow in tabular form. (ii) "Developing writing lessons": Then, the participants work in small groups to develop 45-minute lessons based again on fictional written classroom situations. The situations frame the lessons to be planned by specifying the topic, the grade level, and students' learning progress in the classroom with respect to the contents to be taught. The goal of this assignment is for the participants to transfer the theoretically acquired knowledge into the practice of lesson planning. In this way, the proximity to teaching can be further strengthened in participants.

Implementation of the worked-out lessons and evaluation: In this module, participants are asked to simulate their planned lessons so that they can apply them in a fictional practice and check for success. The module consists of two components: (i) Role-play, (ii) discussion.

(i) "Role-play": The participants role-play one aspect of their 45-minute lesson plan to simulate learning-enhancing, hands-on learning experiences (Kind, 2009). The role-play occurred in the seminar's context, meaning that each participant put themself in the role of a teacher and presented the lessons to the other participants, acting as students. The "students" had two tasks: (1) to interact as realistically as possible in the "classroom," (2) to record comments on the "lesson" they attended based on a criteria grid, allowing for the discussion of the results in the aftermath.

(ii) "Discussion": A discussion based on the criteria grids concludes the implementation of the intervention.

LEARNINGS AND PROSPECTS

In the following, some learnings based on the experience of implementing the intervention will be discussed, considering both the intervention elements that are recommended for future use and the elements that the lecturer would design differently in future seminars. For illustration purposes, exemplary quotations from the final evaluation survey are provided. The students' quotations were originally given in German and translated for this article. The aim is to give readers a sense of how the implementation of the intervention worked in practice, thus allowing readers to adopt elements of the intervention for themselves and prevent problems in their implementation.

Positive aspects of the current implementation

From an organizational perspective, embedding the intervention into the curriculum worked well and seemed suitable for future applications. It also allows participants to comply with other university formalities, such as certificates of achievement or term papers, thus guaranteeing high participation rates. A further positive aspect of the current intervention design is that it fostered a pleasant working atmosphere, emphasized by several participants. For example, one participant answered the question, "What did you particularly like about the seminar?" with, "The atmosphere was good." Among others, this positive atmosphere resulted from a suitable size of the learning groups: "good group size, pleasant working atmosphere." Fostering these positive sentiments appears highly relevant to maintain participants' interest in an intensive block seminar. Participants also highlighted the use of group work as a positive aspect: "Thanks to all the group work, the time went by really fast, and this resulted in an effective learning time!" Most of the participants were highly motivated during the intervention. According to the evaluation results and feedback in discussions with the prospective teachers, this was due to the high relevance of the intervention to later everyday work life: "Practical relevance, interestingly designed, assistance for the later teaching profession". Accordingly, the "reference to teaching" described in the theoretical framework model was honoured by the participants. The usefulness of the "alternation of theory and practical phases" was also confirmed. Some participants highlighted it as a particularly positive aspect of the seminar, for example: "good ratio of input and own activity." The didactic-methodical design aspect of "evoke dissonance" can also be considered valuable. The lecturer perceived the discussions as fruitful due partly to the dissonances evoked. Overall, the seminar was conducive to learning, which, apart from its empirically determinable effect, was also evident in the participants' responses: "After the seminar, I feel that I can gain something for me! Really super! So far, the best seminar of my studies!"

Critical aspects of the current implementation

Due to organizational circumstances, this block seminar had to take place within four days. This setting guaranteed intensive work on the content but also led to a high density of information and tasks, resulting in a considerable workload for the participants. The workload was frequently criticized by participants in the final evaluation (question: "What did you not like at all about the seminar?"), for example: "The Saturday block was very long, which meant that attention and concentration suffered at times." If more time and a pool of partner schools are available, it might be beneficial to have the last module, "Implementation of the worked-out lessons and evaluation," applied in real school lessons. Doing so would allow the participants to test their planned lessons in small groups in the classroom outside of the block seminar. Thus, the length of the seminar days could be more equalized, participants would experience more variety, and the proximity to teaching and the theory-practice connection could be bolstered. Participants further criticized that the focus of the intervention was on the needs of secondary school teacher training, while as one participant remarked, "so little attention was paid to the primary level." Although the intervention employed materials from the primary level (e.g., student texts from elementary school) and discussions in the seminar considered the transfer of content to the primary level, the needs of prospective primary school teachers were not sufficiently met. Therefore, more content from the primary level might be included, or the intervention might be split to address this issue, as one participant suggested: "perhaps a separation of Sek I [lower secondary school] and primary school; so that work can be even more specific." Another potentially critical aspect is that the intervention is very broadly conceived. Due to this breadth, it was not yet possible to address the contents in too much depth. Therefore, the intervention appears most suitable for participants with relatively little prior PCK-W, which is also reflected in the empirical finding that those with a low level of prior PCK-W benefited most from the measure (Unger, 2021; Unger et al., in preparation). In the future, further in-depth measures should be developed that build on the current intervention and consider certain aspects in more detail.

REFERENCES

Biaggi, S., Krammer, K. & Hugener, I. (2013). Vorgehen zur Förderung der Analysekompetenz in der Lehrerbildung mit Hilfe von Unterrichtsvideos: Erfahrungen aus dem ersten Studienjahr. *Seminar, 19*(2), 26–34.

Birkel, P. & Birkel, C. (2002). Wie einig sind sich Lehrer bei der Aufsatzbeurteilung? Eine Replikationsstudie zur Untersuchung von Rudolf Weiss. *Psychologie in Erziehung und Unterricht, 49*(3), 219–224.

Blömeke, S., König, J., Suhl, U., Hoth, J. & Döhrmann, M. (2015). Wie situationsbezogen ist die Kompetenz von Lehrkräften? Zur Generalisierbarkeit

der Ergebnisse von videobasierten Performanztests. *Zeitschrift für Pädagogik, 61*(3), 310–327.

Brindle, M., Graham, S., Harris, K. R., & Hebert, M. (2016). Third and fourth grade teacher's classroom practices in writing: A national survey. *Reading and Writing: An Interdisciplinary Journal, 29*(5), 929–954. https://doi.org/10.1007/s11145-015-9604-x

Graham, S. (2019). Changing How Writing Is Taught. *Review of Research in Education, 43*(1), 277–303. https://doi.org/10.3102/0091732X18821125

Graham, S., Harris, K. R. & McKeown, D. (2013). The writing of students with learning disabilities, meta-analysis of self-regulated strategy development writing intervention studies, and future directions: redux. In H. L. Swanson, K. R. Harris & S. Graham (Hrsg.), *Handbook of learning disabilities* (2. ed., pp. 405–438). New York, NY: The Guilford Press.

Graham, S. & Perin, D. (2007). *Writing next: Effective strategies to improve writing of adolescents in middle and high schools: A report to Carnegie Corporation of New York, Alliance for Excellent Education.* https://media.carnegie.org/filer_public/3c/f5/3cf58727-34f4-4140-a014-723a00ac56f7/ccny_report_2007_writing.pdf

Graham, S., Tavsanli, O.F. & Kaldirim, A. (2022). Improving writing skills of students in turkey: a meta-analysis of writing interventions. *Educational Psychology Review,* 34 889–934 (2022). https://doi.org/10.1007/s10648-021-09639-0

Grausam, N. C., Metz, K., Jäger, S. & Maier, U. (2016). Diagnostik und Förderung von Schreibkompetenz in Gemeinschaftsschulen: Eine Interventionsstudie zur Prüfung von Effekten einer Lehrerfortbildung. In T. Bohl & A. Wacker (eds.), *Die Einführung der Gemeinschaftsschule in Baden-Württemberg: Abschlussbericht der wissenschaftlichen Begleitforschung (WissGem)* (pp. 115–134). Münster: Waxmann.

Harris, K. R. & Graham, S. (2009). Self-regulated strategy development in writing: Premises, evolution, and the future. *BJEP Monograph Series II, Teaching and Learning Writing, 2*(6), 113–135. https://doi.org/10.1348/978185409X422542

Hattie, J. (2012). *Visible learning for teachers: Maximizing impact on learning.* London: Routledge.

Hayes, J. R. & Flower, L. S. (1980). Identifying the organization of writing processes. In L. W. Gregg & E. R. Steinberg (Hrsg.), *Cognitive processes in writing* (pp. 3–30). Hillsdale, NJ: Lawrence Erbaum Associates.

Hochstadt, C., Krafft, A. & Olsen, R. (2013). *Deutschdidaktik: Konzeptionen für die Praxis.* Tübingen: Francke.

Huneke, H.-W. (2007). Zur Entwicklung des Metawissens von Studierenden über Textkompetenz und Schreibprozesse. In R. Jost, W. Knapp & K. Metz (eds.), *Arbeit an Begriffen: Fachwissenschaftliche und fachdidaktische Aspekte* (pp. 106–129). Baltmannsweiler: Schneider Hohengehren.

Ingvarson, L., Meiers, M. & Beavis, A. (2005). Factors affecting the impact of professional development programs on teachers' knowledge, practice, student

outcomes & efficacy. *Education Policy Analysis Archives, 13*(10), 1–28. https://doi.org/10.14507/epaa.v13n10.2005

Keller, E. (2016). *Professionelle Kompetenz angehender Deutsch-Lehrkräfte: Entwicklung und Validierung eines Testverfahrens zur Erfassung fachdidaktischen Wissens im Kompetenzbereich Schreiben.* Dissertation. Pädagogische Hochschule, Heidelberg. urn:nbn:de:bsz:he76-opus4-2227

Keller, E. & Glaser, C. (2019). Empirische Befunde zum Wissen angehender Lehrkräfte über evidenzbasierte Maßnahmen zur Förderung der Schreibkompetenz. *Zeitschrift für Erziehungswissenschaft, 22*(6), 1433–1460. https://doi.org/10.1007/s11618-018-0848-5

Kim, Y.-S. G., & Graham, S. (2022). Expanding the Direct and Indirect Effects Model of Writing (DIEW): Reading–writing relations, and dynamic relations as a function of measurement/dimensions of written composition. *Journal of Educational Psychology, 114*(2), 215–238. https://doi.org/10.1037/edu0000564

Kind, V. (2009). Pedagogical content knowledge in science education: Perspectives and potential for progress. *Studies in Science Education, 45*(2), 169–204. https://doi.org/10.1080/03057260903142285

Krammer, K. (2014). Fallbasiertes Lernen mit Unterrichtsvideos in der Lehrerinnen- und Lehrerbildung. *Beiträge zur Lehrerinnen- und Lehrerbildung, 32*(2), 164–175.

Kunter, M., Kleickmann, T., Klusmann, U. & Richter, D. (2011). Die Entwicklung professioneller Kompetenz von Lehrkräften. In M. Kunter, J. Baumert, W. Blum, U. Klusmann, S. Krauss & M. Neubrand (eds.), *Professionelle Kompetenz von Lehrkräften: Ergebnisse des Forschungsprogramms COACTIV* (pp. 55–68). Münster: Waxmann.

Lindl, A. & Krauss, S. (2017). Transdisziplinäre Perspektiven auf domänenspezifische Lehrerkompetenzen: Eine Metaanalyse zentraler Resultate des Forschungsprojektes FALKO. In S. Krauss, A. Lindl, A. Schilcher, M. Fricke, A. Göhring, B. Hofmann et al. (eds.), *FALKO: Fachspezifische Lehrerkompetenzen: Konzeption von Professionswissenstests in den Fächern Deutsch, Englisch, Latein, Physik, Musik, Evangelische Religion und Pädagogik. Mit neuen Daten aus der COACTIV-Studie* (pp. 381–438). Münster: Waxmann.

Lipowsky, F. (2010). Lernen im Beruf: Empirische Befunde zur Wirksamkeit von Lehrerfortbildung. In F. H. Müller, A. Eichenberger, M. Lüders & J. Mayr (eds.), *Lehrerinnen und Lehrer lernen: Konzepte und Befunde zur Lehrerfortbildung* (pp. 51–70). Münster: Waxmann.

López, P., Torrance, M., Rijlaarsdam, G., Fidalgo, R. (2021). Evaluating effects of different forms of revision instruction in upper-primary students. *Reading and Writing, 34*, 1741–1767. https://doi.org/10.1007/s11145-021-10156-3

MacArthur, C. A. (2016). Instruction in evaluation and revision. In C. A. MacArthur, S. Graham & J. Fitzgerald (eds.), *Handbook of writing research* (2. ed., S. 272–287). New York: The Guilford Press.

Ministerium für Kultus, Jugend und Sport Baden-Württemberg. (2016). *Gemeinsamer Bildungsplan der Sekundarstufe I: Bildungsplan 2016: Deutsch.*

National Center for Education Statistics. (2012). *The nation's report card: Writing 2011*. (NCES 2012-470), Institute of Education Sciences, U.S. Department of Education. http://www.nationsreportcard.gov/writing_2011/summary.aspx

Ortner, H. (2000). *Schreiben und Denken.* Tübingen: Niemeyer.

Philipp, M. (2014). *Grundlagen der effektiven Schreibdidaktik und der systematischen schulischen Schreibförderung.* Baltmannsweiler: Schneider Hohengehren.

Philipp, M. (2016). Lese- und Schreibstrategien: Zur Wichtigkeit und Wirksamkeit kognitiver Werkzeuge im Umgang mit schriftlichen Texten. *SAL-Bulletin* (160), 5–16.

Rütti-Joy, O. & Unger, V. (under review). *Developing plurilingual writing competence in collaborative and cooperative settings.*

Schaffner Menn, A. (2013). Individuelle Unterstützung von Grundstufenkindern: Studierende erkennen pädagogisch-psychologische Theorien in der Praxis: Eine Praxis-Theorie-Verknüpfung anhand von Videoanalysen. *E-Beiträge zur Lehrerbildung, 4,* 1–24.

Seidel, T., Stürmer, K., Blomberg, G., Kobarg, M. & Schwindt, K. (2011). Teacher learning from analysis of videotaped classroom situations: Does it make a difference whether teachers observe their own teaching or that of others? *Teaching and Teacher Education, 27*(2), 259–267. https://doi.org/10.1016/j.tate.2010.08.009

Spitta, G. (1992). *Schreibkonferenzen in Klasse 3 und 4: Ein Weg vom spontanen Schreiben zum bewußten Verfassen von Texten* (Lehrer-Bücherei: Grundschule). Berlin: Cornelsen Scriptor.

Sturm, A. (2016). Beurteilen und Kommentieren von Texten als fachdidaktisches Wissen. Leseräume. *Zeitschrift für Literalität in Schule und Forschung, 3*(3), 115–132. http://xn--leserume4za.de/wp-content/uploads/2016/12/lr-2016-1-sturm_115-132.pdf

Sturm, A. & Weder, M. (2016). *Schreibkompetenz, Schreibmotivation, Schreibförderung: Grundlagen und Modelle zum Schreiben als soziale Praxis (Lehren lernen - Basiswissen für die Lehrerinnen- und Lehrerbildung).* Seelze: Klett Kallmeyer.

Tynjälä, P. (2008). Perspectives into learning at the workplace. *Educational Research Review, 3*(2), 130–154. https://doi.org/10.1016/j.edurev.200

Unger, V. (2021). *Diagnostik und Förderung schreibdidaktischen Wissens angehender Deutschlehrkräfte.* Heidelberg, Pädagogische Hochschule. urn:nbn:de:bsz:he76-opus4-4095

Unger, V., Dörfler, T., Hochweber, J., & Glaser, C. (in preparation). *Evaluation of an intervention to promote teachers' pedagogical content knowledge about the didactics of writing.*

Unger, V., Rutsch, J. & Benz, J. (2020). Videographierter Schreibunterricht als Lerngelegenheit für angehende Lehrkräfte. In M. E. Friesen, J. Benz, T.

Billion-Kramer, C. Heuer, H. Lohse-Bossenz, M. Resch et al. (eds.), *Vignettenbasiertes Lernen in der Lehrerbildung: Fachdidaktische und pädagogische Perspektiven* (pp. 86–102). Weinheim: Beltz Juventa.

Unger, V., Rutsch, J., Keller, E., Dörfler, T. & Glaser, C. (2018). Pilotierung einer Intervention zur Förderung schreibdidaktischen Wissens bei Lehramtsstudierenden. *Leseräume. Zeitschrift für Literalität in Schule und Forschung, 5*(5), 1–18. http://leseräume.de/wp-content/uploads/2019/02/lr-erg-2018-3-Unger_et_al.pdf

Wacker, A., Unger, V., & Rey, T. (2021). Entwicklungspfade und aktuelle Strukturen staatlicher Sekundarschullehrerbildung in Baden-Württemberg. In H. Lohse-Bossenz, M. Rehm, M. Friesen, M. Seidenfuß, J. Rutsch, M. Vogel, T. Dörfler (eds.), *Professionalisierung in der Lehrerbildung. Erkenntnisse und Perspektiven des interdisziplinären Forschungsprogramms "Effektive Kompetenzdiagose in der Lehrerbildung"* (pp. 161-178). Münster: Waxmann.

STUDENT PERCEPTIONS OF KNOWLEDGE TRANSFER: AUGMENTING A GRADUATE EDUCATIONAL PSYCHOLOGY PROGRAM

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ABSTRACT

Knowledge transfer is the "ultimate aim of teaching" (McKeough et al., 2013, p. 1). Although researchers have thoroughly examined the importance of teaching for transfer, how transfer is accomplished and assessed, and the relationship between transfer and academic achievement, minimal research investigates student perceptions of knowledge transfer. As such, a grounded theory, qualitative methodology employing open, axial, and selective coding was used to determine graduate student insights concerning knowledge transfer, which pedagogical and course design elements learners assume cultivate knowledge transfer, and precisely when and how learners believe transfer occurs. Results analysis revealed variance between student and research conceptions of transfer, including variable descriptions and application of transfer when applying source knowledge to solve target problems. To facilitate transfer, students emphasized the need for application feedback, topic relevance, prompts to promote transfer, peer review, and group collaboration. Suggestions for cultivating transfer in graduate education are advanced.

INTRODUCTION

Application of learned classroom knowledge is a primary education goal and often used as a foundational measurement of teaching success (McKeough et al., 2013). The application process, described as "knowledge transfer," means a learner can transform instruction to solve real-world problems while concurrently adapting and applying existing knowledge to diverse tasks or novel contexts. Cross-contextual research in multiple domains considers source to target knowledge application as paramount to any instructional activity (Kolb, 1984; Mayer, 2019) and transfer is the learning bridge underpinning many constructivist teaching ideologies (Perkins & Salomon, 2012). While many students can productively earn high grades and learn course content, they intermittently apply the knowledge they gain (Hoffman, 2021).

Transfer ineffectiveness is especially detrimental when ill-prepared university graduates enter the workforce and struggle to complete basic job requirements, which ultimately results in organizational turnover or career derailment. One survey of 400 employers (AACU, 2015) asked employers to rate the type of skills and the degree of preparedness of graduates on skills crucial for work success including application of knowledge, judgement, decision making, and critical thinking. Student self-perceptions of their skills were grossly inflated compared to employer perceptions of those same skills, with only 40% of employers rating the graduates as "well-prepared" for a successful career. Another survey (Gallup, 2014) revealed only 11% of business leaders strongly agreed that university graduates had the competencies needed for job success, while 96% of referring academic officers rated those same graduates as qualified. Calibration disparities of skill application suggest that effective transfer of knowledge from school to work is indispensable, but indeed questionable.

Quantitatively, transfer effectiveness is often studied by comparing pedagogical methods and student performance on a dependent variable, or by measuring the efficiency of learning source knowledge through repeated measures, contrasting target-task and source-task knowledge. Approaches such as problem-based learning (Hung, 2013), performance-based simulations (Falloon, 2020), and cognitive apprenticeships (Lyons et al., 2017) reveal some of the best practices to facilitate transfer. Hoffman (2021), while controlling for GPA and years of vocational experience, investigated student transfer capability from an applied, skills-based master's degree program on mediating real world teaching, learning, and motivational challenges. Results revealed preferential transfer for blended learning students compared to distance learning students using declarative, procedural, and self-regulatory knowledge, while concurrently showing that the transfer ability of all students was limited.

Cross-contextual transfer studies that have received less attention in the literature are those dealing with students' perceptions of transfer, how students accomplish

transfer (if at all), and which pedagogical strategies or design elements students believe cultivate knowledge transfer. Qualitative studies on transfer in education and psychology are minimal with a noticeable void concerning student perceptions of transfer. Thus, this research augments Hoffman (2021), by using grounded theory and a three-step data coding and analysis process to answer four research questions:

1. How do you define knowledge transfer? Is it important to you? If so, why, or why not?
2. What design aspects of your course(s) promoted (or inhibited) knowledge transfer?
3. How will you apply the knowledge you gained from your course(s)?
4. What recommendations might increase transfer of knowledge from your course(s) to your professional practice?

The emphasis of the current study is designed to enhance instructor ability to promote learning transfer primarily during online graduate education in an applied learning program. Knowledge of student perceptions are crucial for instructional design and lack of consideration of student transfer perceptions may impede instructional effectiveness and knowledge transfer. Inferences from this research should be instrumental to understand user perceptions of which instructional design elements promote transfer and which pedagogical methods will facilitate application of knowledge from the classroom to the workplace. The ultimate aim of this research was to determine how graduate educational psychology instruction can enhance graduate student success in the workplace.

PARTICIPANTS, RESEARCH DESIGN, AND METHODS

Open-ended question response data was supplied by 19 graduate students (M=2, F=17) from an educational psychology graduate program at a large southeastern U.S. university. Participants were enrolled in two different required courses taught by the same instructor. Responses were routine end-of-semester reflection coursework after all other course requirements were completed. Demographic data was not collected to maintain confidentiality of responses in a small sample. All participants had been enrolled in the degree program for a minimum of one year and had earned at least 12 program credits out of the 33 needed for program completion. Participation was voluntary and no incentive was provided for participation.

Grounded theory was used to generate a model explaining student transfer perceptions, when and how students engage in transfer, and which teaching strategies or course design elements enhanced knowledge transfer. A grounded theory methodology was used due to the dearth of research on student transfer perceptions. Creswell (2008) suggested grounded theory is preferred when "it fits the situation,

actually works in practice, is sensitive to individuals in a setting, and may represent all the complexities actually found in the process" (p. 432). Satisfaction of Creswell's premises resulted in the decision to use a grounded theory approach.

Content analysis was conducted using open, axial, and selective coding (Creswell, 2008; Strauss & Corbin, 1990). Open coding (Table 1) generated in-vivo codes (verbatim responses) which were subsequently categorized as lean codes (labels phrased in the words of the researcher, reflective of participant emphasis). Lean codes were also necessary to eliminate verbosity. For example, one participant answered the question "How do you define knowledge transfer?" by indicating "Having the ability to transfer allows people to integrate prior skills into new assignments, as well as practical applications, like previously mentioned." By example, this statement led to three in-vivo codes "ability, integrate, and apply," which were transformed into the lean codes of "conceptual," and "procedural."

The second data analysis step, axial coding, consisted of selecting codes generated in the open coding step, positioning them at the center of the strategic thinking process concerning transfer research (Mayer, 2019), and relating to other categories (Creswell, 2008; Strauss & Corbin, 1990). Torrey and Shavlik (2009) indicated that "The goal of transfer learning is to improve learning in the target task by leveraging knowledge from the source task" (p. 2). Thus, during axial coding, transfer was analyzed using at least four distinct perspectives (Torrey & Shavlik, 2009). Four conceptual codes were used to describe variations in transfer type. Inductive, hierarchical, imitation, and alteration transfer were segregated as shown in Table 2. Considering the procedural nature of transfer and the application of transfer knowledge in multiple contexts, the axial codes of "procedural" and "context" also emerged, with context of transfer application categorized as either "personal," or "professional."

Additional axial codes were developed through lexical analysis as a means of data reduction and the elimination of redundant language describing similar terms. For example, analysis of responses to the question prompt "What design aspects of your course(s) promoted (or inhibited) knowledge transfer?" revealed open codes including "discussions" "peer review" and "meetings." Consolidation of these open codes supported the lean (axial) code of "design."

The third data analysis step, selective coding was employed to extract conceptual themes and practical recommendations related to the application of transfer. Theme construction was aligned with the Torrey and Slavick (2009) transfer model, as well as categorizing specific student strategy recommendations perceived to enhance knowledge transfer.

Participants provided their responses by completing an untimed, online survey that consisted only of responses to the four aforementioned research questions. The

survey purpose communicated to respondents was described as a "means to improve course and program instruction." Students participated voluntarily without the expectation of incentives. 100% of invited students completed the survey within a one-week time period at the end of their "Capstone" course, which is a research-focused course that concludes graduate studies in an educational psychology program. Results of the survey were aggregated, removing all identifiers, and the survey results were communicated to respondents.

RESULTS

Results presented here represent lexical analysis from 7,608 text words categorized by research question. Full analysis led to creation of a data model (Figure 1), representative coding and thematic examples as described below, as well as tables illustrating codes and frequencies generated during each data coding step.

Initial coding of student responses showed minimal knowledge of research perceptions of transfer. Summarily, students believed that transfer was monastic indicating that transfer merely means using classroom knowledge in other contexts. For example, transfer definitions included statements such as "I define knowledge transfer as the ability to take information or skills learned in one context and apply that to a new situation," or "the knowledge I gained in this course successfully transferred if/when I can remember the concepts and put them into practice in another course." While respondents believed transfer was multidimensional, perceptions did not reflect the categorization process found in most educational and psychology literature (Falloon, 2020; Hung. 2013; Lyons et al., 2017) and rhetoric minimally mirrored the Torrey and Slavik (2009) classification paradigm.

However, almost universally (92%), and without a specific prompt, respondents indicated the value of transfer as indicative of educational effectiveness. One student asserted, "Formalized education that does not empower its students to transfer knowledge is hollow," while another stated, "Knowledge transfer may be the most essential element of learning in my view." Another stressed transfer as a motive for enrolling in their graduate program implying, "I began the coursework with the intention of taking the knowledge gained in my courses and applying them to my professional career. To me there doesn't seem to be a benefit to gaining knowledge if that knowledge cannot be used." Thus, while respondents may have different conceptions of how to describe transfer, there appears to be a high positive correlation between the value of transfer as measurement of the utility of education. Table 1 indicates the frequency of each open code classified by question response.

Table 1

Open coding codes and frequency

Question 1	N	Question 2	N	Question 3	N	Question 4	N
knowledge	71	knowledge	24	knowledge	24	students	22
transfer	52	program	20	learned	12	transfer	17
learning	23	course	17	apply	12	discussions	15
important	16	transfer	17	writing	11	knowledge	15
learned	15	research	9	research	8	professional	11
apply	13	process	9	strategies	8	think	10
ability	13	learning	8	learning	6	project	10
information	10	discussions	8	skills	6	course	9
use	8	capstone	7	motivational	5	teaching	8
define	8	writing	7	students	5	helpful	8
learn	7	learned	7	understand	4	practice	7
professional	7	academic	7	courses	4	courses	6
skills	6	peer review	6	career	4	research	6
setting	5	project	6	class	4	semester	6
context	5	bibliographies	6	approach	4	writing	5
motivation	4	information	5	learners	4	strategies	5
classroom	4	meetings	5	final	4	feedback	5
courses	4	assignments	4	capstone	3	learning	5
personal	4	peer	4	evaluation	3	lesson	5
goal	4	reviews	4			process	4
education	4					paper	4

						topic	4
						assignment	4

The second analysis step, axial coding resulted in creating coding clusters related to the continuum of knowledge transfer (definition, application, context, evaluation) as well as for specific content, design, and pedagogical recommendations that could potentially enhance course and programmatic transfer knowledge. One dominant cluster was conceptual representations of transfer related to how students defined or perceived transfer. For example, open coding of "knowledge," "academic," and "learning" in aggregate resulted in the primary axial code of "conceptual." Thus, a perception of transfer such as "I define knowledge transfer as the ability to apply one's knowledge to contexts or situations that differ from the ones in which the knowledge was first developed, representing true mastery" was coded in the "conceptual/inductive" sub-category based on the response emphasis stressing direct source to task knowledge.

Similarly, behavioral applications of transfer emanating from codes such as "practice," "apply," "use," and "think" were conceived as procedural aspects of transfer and coded accordingly. One student revealed, "The steps of knowledge transfer start with identifying the knowledge, seizing what you wish to know, storing the knowledge/information for retrieval, then sharing that others can learn." Contextual clustering focused on the transfer environment or where and how the knowledge transfer would be applied such as indicated in the example, "I will apply the knowledge I gained in this course to improving educational experiences and outcomes for students," which was coded in the contextual/professional category. An evaluative lean code was used when respondents emphasized self-regulatory knowledge by reflecting on the transfer process and how it might be improved.

Identical axial codes across responses were warranted as many times respondents would infuse multiple ideas into similar phrases such as "I define *knowledge transfer* as my ability to leverage knowledge I gain in one place—such as school or by reading a book—and apply it in another context—such as work," which was coded both as conceptual and contextual. Figure 2 illustrates the 11 unique codes generated during axial coding and the frequencies observed during the second step of data analysis.

Table 2

Axial coding and response frequency

Question 1	N	Question 2	N	Question 3	N	Question 4	N
conceptual/ inductive	14	conceptual/ inductive	2	conceptual/ inductive	11	conceptual/ inductive	3
conceptual/ hierarchical	11	conceptual/ hierarchical	1	conceptual/ hierarchical	6	conceptual/ hierarchical	2
conceptual/ imitation	12	conceptual/ imitation	3	conceptual/ imitation	5	conceptual/ imitation	5
conceptual/ alteration	4	conceptual/ alteration	1	conceptual/ alteration	3	conceptual/ alteration	1
procedural	7	procedural	-	procedural	10	procedural	4
contextual/ professional	11	contextual/ professional	15	contextual/ professional	9	contextual/ professional	7
contextual (personal)	4	contextual (personal)	1	contextual (personal)	5	contextual (personal)	7
evaluative	2	evaluative	3	evaluative	2	evaluative	1
content	6	content	12	content	4	content	5
design	8	design	15	design	5	design	13
pedagogy	10	pedagogy	8	pedagogy	9	pedagogy	7

The third step, selective coding, in addition to following the Torrey and Shavlik classification scheme (2009), led to the identification of three main types of revisions suggested by students: course content, instructional design, and teaching methods. These categories were created based upon the groupings that emerged during axial coding. The subsequent model presented in Figure 1 categorizes student emphasis and consolidates specific strategies that content creators and instructors might consider using to address student perceptions of how knowledge transfer can be accomplished or improved.

Transfer perceptions and application

Substantial variation of transfer perceptions was observed. Four themes related to transfer were categorized according to the directory of transfer types suggested by Torrey and Shavlik (2009).

Inductive transfer implies target-task performance is chosen or adjusted based on source-task knowledge (e.g., "I have been able to apply my knowledge to a completely different context than the context in which I initially learned," or "Synthesizing and analyzing research results, can be applied to my professional work," or "The knowledge I gained in this course successfully transferred if/when I can remember the concepts and put them into practice in another course.")

Hierarchical transfer means part of the source task and/or previous knowledge is used as a building block to learn the target task. (e.g., "Formalized education that does not empower its students to transfer knowledge is hollow, or "The culminating projects of the capstone classes require transfer of knowledge from all of the other classes taken throughout the program," or "To identify areas in which I can apply some of the knowledge gained, not all at the same time, but piece by piece in different scenarios and multiple tasks.")

Imitation transfer indicates no direct changes from the source task to the target-task solution (e.g., "A holistic approach will allow me to see the entire picture in any situation and how all components interact, rather than only seeing each component as an isolated system," or, "The content of each week had at least one principle, idea, or theory I've been able to immediately bring back to my job.")

Alteration transfer alters the state/action space of the target task based on source-task knowledge. (e.g., "Apply the information learned in the course to analyzing or reflecting on a presented problem or past personal, academic, or professional situation," or "Knowledge transfer starts with identifying the knowledge, seizing what you wish to know, storing the knowledge/information for retrieval, then sharing so that others can learn," or "I believe that knowledge transfer can be utilized across subject areas (e.g., knowledge in math can assist in learning science.")

Content, design, and pedagogical recommendations

In aggregate, students felt that how course content and assessments were presented contributed to or detracted from transfer. Students indicated that assignment instructions and paper proposals should include wording such as "How does this project or paper contribute to knowledge transfer?" Another suggested, "Students could be asked to reflect on how their project could improve by relating the project steps to benefit their profession." A third implied that students should be quizzed on

content related to transfer of knowledge. Numerous individuals felt that content changes were highly instrumental in encouraging transfer and that transfer should *not* be expected when there is minimal content emphasis on transfer. Thus, while assessments were previously created with transfer in mind, students wanted more.

Design recommendations revealed that transfer emphasis should be more explicit. For example, respondents indicated, "Have a discussion board for us to explain how or what practical use of our papers might look like," or ask "Why did you choose this project?" Another stated, "Students could be asked to identify an education-related problem they learned about by reading the articles thus far that they had not previously thought about, as well as how they could address this problem through their own profession or life." Others suggested, "Require students to indicate "why is this important to me?" Feedback of this nature implies that accomplishing transfer is the responsibility and obligation of the instructor and must be an intentional part of instructional design.

For others, the type of instructor feedback (pedagogy) contributed to transfer (e.g., "Feedback and the opportunity to make corrections to my work has helped to promote knowledge transfer"). Collaboration and peer-review were suggested as transfer catalysts (e.g., "The peer review process also promoted my knowledge transfer, by reviewing a classmate's work, I had to apply my knowledge by identifying gaps and providing recommendations," or "I think that pairing students up by topic or type of project at the beginning of the semester would be helpful." Collaboration in general was encouraged by respondents as reflected by the statement "The opportunity to discuss research with other students who are in a similar position would be helpful for knowledge transfer." Overall, students felt that a higher degree of interactivity with others would be instrumental to promote discussion of transfer. Based on student perceptions, worked examples from others served as a model that promoted greater transfer in their own work.

INTERPRETATIONS AND PRACTITIONER BENEFITS

The model below (Figure 1) summarizes both student transfer perceptions as well as categorizing which elements of course content, design, and pedagogy students advocated to enhance the transfer process. While this model has not been tested empirically, it serves as a first step toward hypothesizing how transfer can be increased during the design of course and programmatic instruction. Researchers are encouraged to test this model by developing course iterations that measure the quality and quantity of knowledge transfer.

While variably emphasizing transfer as indispensable for learning effectiveness, participants stressed the importance of timeliness, relevance, interactivity, peer review, and collaboration to promote transfer. As such, instructors should explicitly emphasize transfer in pedagogy and instructional design, including opportunities for learners to formatively reflect on the quality and frequency of knowledge transfer.

Explicit instruction begins with transfer inducing metacognitive prompting and infusing personal relevance into course design.

Instructors who adapt a social constructivist learning perspective (Perkins & Salomon, 2012) through group work and peer review can foster discussions among learners that assess the practical and cultural suitability of their proposed teaching and vocational interventions. Finally, regular instructor feedback on the application of theory to practice will allow learners to enhance the probability of knowledge transfer and ultimately the success of their educational investment.

REFERENCES

American Association of Colleges and Universities (2015, January 20). *Falling Short? College Learning and Career Success.* https://www.aacu.org/research/falling-short-college-learning-and-career-success

Creswell, J. W. (2008). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* Prentice Hall.

Falloon, G. (2020). From simulations to real: Investigating young students' learning and transfer from simulations to real tasks. *British Journal of Educational Technology*, *51*(3), 778-797. https://doi.org/10.1111/bjet.12885

Gallup (2014, February 25). *What America needs to know about higher education redesign*. https://www.luminafoundation.org/files/resources/2013-gallup-lumina-foundation-report.pdf

Hoffman, B. (2021). Teaching for knowledge transfer: Best practices from a graduate-level educational psychology distance learning program. In W. B. James, C. Cobanoglu, & M. Cavusoglu (Eds.), *Advances in Global Education and Research* (Vol. 4, pp. 1–9). USF M3 Publishing. https://www.doi.org/10.5038/9781955833042

Hung, W. (2013). Problem-Based Learning: A learning environment for enhancing learning transfer. New directions for adult and continuing education, 137, 27–38. https://doi.org/10.1002/ace.20042

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*, Prentice Hall.

Lyons, K., McLaughlin, J. E., Khanova, J., & Roth, M. T. (2017). Cognitive apprenticeship in health sciences education: A qualitative review. *Advances in Health Sciences Education*, *22*(3), 723-739. https://doi.org/ 10.1007/s10459-016-9707-4

Mayer, R. E. (2019). Thirty years of research on online learning. *Applied Cognitive Psychology*, *33*(2), 152-159. https://doi.org/ 10.1002/acp.3482

McKeough, A., Lupart, J. L., & Marini, A. (2013). *Teaching for transfer: Fostering generalization in learning*. Routledge.

Perkins, D. N., & Salomon, G. (2012). Knowledge to go: A motivational and dispositional view of transfer. *Educational Psychologist*, *47*(3), 248-258. https://doi.org/ 10.1080/00461520.2012.693354

Strauss, A., & Corbin, J. (1990*). Basics of qualitative research: Grounded theory procedures and techniques*. Sage Publications.

Torrey. L. & Shavlik, J. (2009) *Transfer learning*. IGI Global.

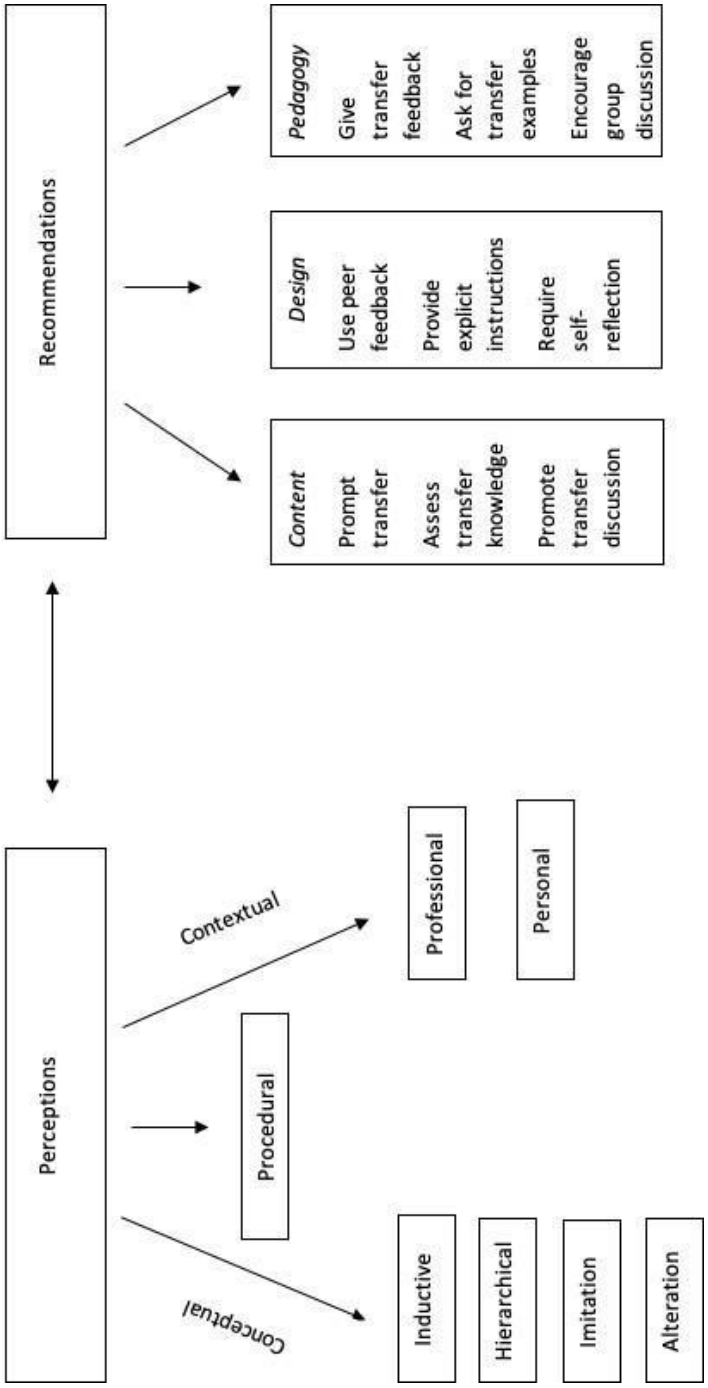

Figure 1 – *Model of student perceptions of transfer and strategy recommendations*

THE UNRELIABILITY OF CONFERENCE PROPOSAL REVIEW: DON'T BE A JUDGE BE A TEACHER

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ABSTRACT

Scientific feedback—peer-review—is more than a product. Rich, clear, and accurate feedback requires expertise and experience to engage recipients. Journal and conference reviewers need feedback literacy. Conference proposal review is difficult, also at the EAPRIL conference. Reviewers' comments typically reflect their own research experiences and viewpoints in respect to the review system's criteria. This paper examines EAPRIL conference reviewers' experiences. This study used qualitative data from a focus group (roundtable discussion) and a short quantitative online survey. Results show that formative scores help submitters understand conference expectations and identify areas for improvement. Formative and summative grades help novice authors and researchers track their progress. The survey indicated that abstract reviewers and submitters prioritize various characteristics. This study suggests a comprehensive evaluation process. This method would assess work quality and provide constructive feedback.

INTRODUCTION

Feedback, or peer-review, is more than just a product in the scientific world, as well as in the run-up to published articles and conference abstracts. It is a comprehensive process consisting of several steps (Birukou et al., 2011; Winstone & Carless, 2019). Expertise and experience are required in providing rich, clear, and accurate feedback and inspiring recipients to engage with it. As a result, developing feedback literacy among peer reviewers of journals and conference reviewers is crucial. With a plethora of conceptual and empirical works published in the last two years, feedback literacy (both in skill and format) is an emerging but very interesting research topic. In a nutshell, feedback literacy refers to the talents, capacities, and tendencies of individuals (in our case, submitters and reviewers) to deal with feedback cognitively, emotionally, and behaviorally and to give it in the most suitable way so that the receiver (submitter) can actually use it.

Peer review can be described as the process by which the performance of a person or research team is quantitatively and qualitatively evaluated by other (peer)researchers using a set of quality standards (Jackson et al., 2018). However, it is also a two-way process in which proposers can learn from reviewers' feedback on their own work, and the reviewer also learns something from this effort by discovering a topic or by reflecting on the review method itself, and goes through a learning process in giving, formulating and following up review feedback to the submitter (Nicol et al., 2014). Previous research has focused on the learning benefits of receiving feedback reviews, but few studies examined the merits of giving feedback reviews or the learning paths that are activated as a result (Nicol et al., 2014). This also applies to reviews of conference proposals.

The review of conference proposals provides several challenges. First, we see that the revision abilities of beginning authors often fall short, and giving them a helping hand, for example with better scripting of peer review, can help. As a conference where both young researchers and seasoned professionals participate in workshops, lectures, and round tables, it is important to actively promote proper review procedures. Peer review can provide this support, and it is crucial to know how the benefits of peer review differ depending on the skills of the researcher (ranging from young researcher to seasoned professor) (Patchan & Schunn, 2016).

Second, conference proposals are often reviewed by two reviewers who face the challenge of assessing or evaluating the quality of a rather short proposal. Reviewers' feedback often depends on their own and personal experiences and views of research in relation to the in-the-review-system provided review criteria. As a result, the outcomes of the reviews can differ significantly between reviewers. Therefore, this paper aims to explore EAPRIL conference participants' experiences with reviewing including current review formats and a new developed review format. In doing so, we consider the following research questions:

- Is reviewing really a two-way learning moment for both the reviewer and the submitter?
- Do the reviewer and the submitter consider the same issues important in the review process?
- How do they view the quantitative and qualitative feedback they give and receive?

METHODS

For this study, a mixed method approach was used in which qualitative data was collected through a focus group (roundtable discussion) and a short quantitative online survey (Cohen et al., 2002).

Focusgroup

To find out how participants of the EAPRIL conference think about review formats, a focus group was organized in the form of a roundtable. A focus group is a strategy in which a group of people is gathered to talk and generate ideas on a specific issue (Padgett, 2016). A focus group has various strengths, including the diversity of perspectives, which is required for exploring review forms. By bringing together individuals with varying experiences and viewpoints (EAPRIL is extremely diverse), a focus group can collect a vast array of thoughts and ideas. Moreover, a focus group is highly dynamic and permits sufficient collective thought. Because focus groups are participatory and dynamic, group norms and group procedures have a significant impact on the group's outcome (Cohen et al., 2002).

We may expect a strong response rate if we discussed this topic during a roundtable at the conference itself. The response rate in group discussions is frequently higher than in individual surveys. And finally, the natural context of the chosen site is also a strength. Because the focus group is conducted in a natural environment, it can provide a more accurate depiction of how individuals will behave in the real world. This is because they are at the conference, where they are presented with the results of the review process, and are therefore in the proper frame of mind (Padgett, 2016).

As an introduction to our roundtable, we reconstruct the theoretical model of the effects of peer review, using Hayes and Flower's model and the widely documented influence of peer skill on different review procedures (Hayes & Flower, 1986; Patchan & Schunn, 2016). Most conferences and their review processes are targeted toward academic research, taking into account factors like theoretical substantiation in a clear conceptual framework, the rigor of the research design, and sound formulation of the research question. However, EAPRIL is focusing on research with a strong orientation on practice, which implies other criteria for quality, for example, relevance of the research for practice and the quality of the related articulation of the question in practice. Next to this, this kind of research next to knowledge has other products like design, tools or changes in practice (Greven & Andriessen, 2019).

We developed two new rubrics for reviewing the submission formats "present and discuss" and "inspiring practices" (formerly ‘case study’) to support peer review that is helpful in improving contributions to a conference and addresses the specific quality criteria of research oriented at practice. These are single-point rubrics in which a reviewer is primed to think about what is appreciated and what can be improved by the submitter. At the round table, we piloted these rubrics by applying them with the participants to a specific case and by discussing the following issues:

- Are these rubrics sufficient to provide (young) researchers with valuable feedback and do they sufficiently take into account the practice-based nature of the research?

- Is there other intervention necessary besides these rubrics to improve the quality of given feedback? For example, is it desirable to eliminate the rejection of proposals? Or do we need training for reviewers?
- How can we use these rubrics given the constraints of the current technical system of EAPRIL?
- Can reviewers give one holistic mark or is it necessary to mark every criterion in the rubric?
- Is it desirable to use different standards for different categories of researchers?

In the process, participants were given an example of each format and the two rubrics to complete. These were then compared with each other. The narrative data was transcribed and comments in the subsequent interview as well.

Survey

In addition, a quantitative survey was carried out using an internet platform. This consisted of a series of questions that asked whether the individual had previously been a reviewer or submitter, as well as what they would think to be relevant when evaluating an abstract. In order to meet with ethical norms, an IC was included at the beginning of the survey, and a call-in newsletter was used to distribute the survey to any and all potential members of the EAPRIL community. You can get a copy of the whole questionnaire by contacting the first author.

Participants

During the focus group, there were 6 participants. All had been participants and reviewers before. Twenty participants took part in the survey. The two main characteristics that were asked, namely the experience one has and whether one has ever been a reviewer or submitter are shown below in Figure 1A en 1B.

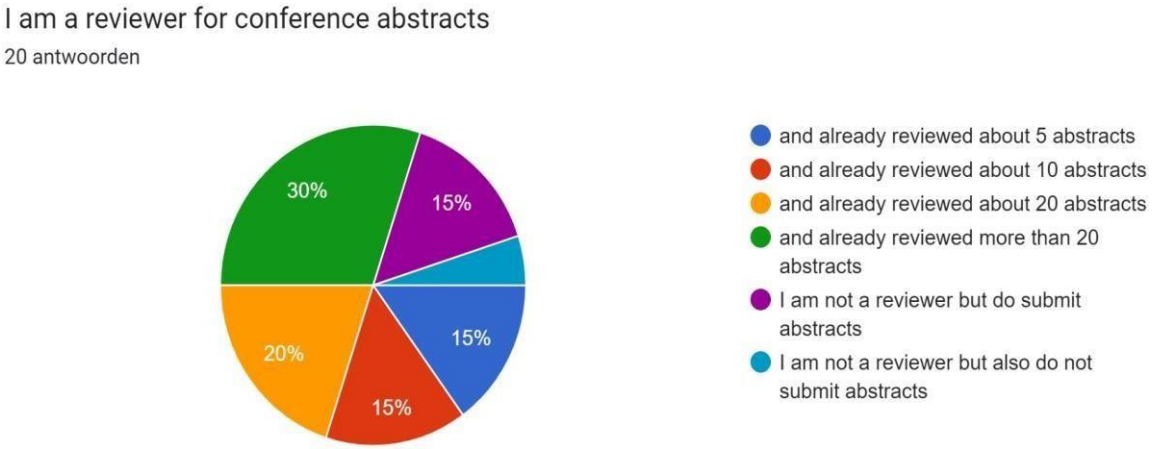

Figure 1A participant characteristics survey

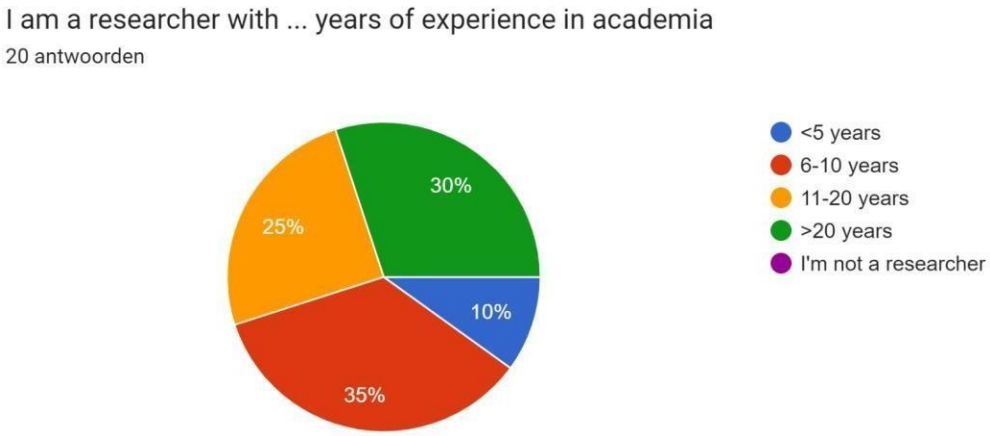

Figure 1B participant characteristics survey

ANALYSIS

The results of the focus group were presented in a narrative format after being analyzed thematically. After this step, the themes that emerged by themselves were clustered, and then they were coded. A data analyst helped to develop

the appropriate cross-tabulations and also thematically clustered some of the findings of the survey, which were used in the survey's analysis. This included both exploratory and descriptive methods of analysis.

RESULTS

It quickly becomes clear, in the qualitative and quantitative results, that in practice-based research assessment styles for conference abstracts should include both formative and summative assessments for young submitters for several reasons.

First, in response to the research question, "How do they view the quantitative and qualitative feedback they give and receive?" results show that formative scores give young submitters or inexperienced conference participants important information about areas where they can improve their research and presentation skills. These comments can help the submitter to understand better conference expectations and adjust their work accordingly before final submission.

During the discussion that took place in the focus group, two of the participants mentioned that the submitter's learning should be included in the formative feedback, and that it might be important to use the previously summative questions (for which a score is given) as a guide to order the formative feedback, as demonstrated in the following quote:

> *"Use the various criteria for qualitative evaluation in order to provide the submitter with information regarding where his proposal can be improved."*

An answer along the same lines was also given in the survey question, namely: *"If I can choose as a reviewer: 1 Then I like to use a scoring system that gives an aggregate score to the submitter, 2 Then I like to use a scoring system that gives an aggregate score but also a field for qualitative feedback to the submitter (68.8%), 3 Then I like to use a systematic grid with qualitative fields for each part of the submission to give qualitative feedback to the submitter, 4 Then I like to use a completely open field to give my qualitative feedback to the submitter of 5. Then I like to use a dichotomous scoring field, Then I like to use a dichotomy between "accept" and "reject"."*

Therefore, the second choice receives the greatest score in this category. Figure 2 displays all of the scores and continues to emphasize how important it is to be able to offer that kind of qualitative feedback.

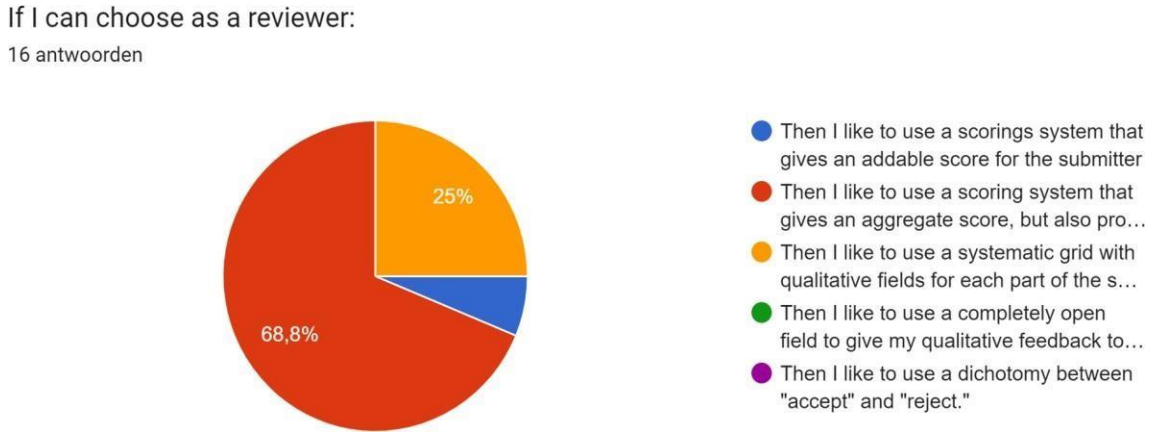

Figure 2 Reviewer preferences related to review style and outcomes

Second, summative scores provide an objective evaluation of the quality of the work and its readiness for presentation at the conference. This can help the submitter understand how his work compares with that of others in the field and can provide important suggestions on whether the research should continue or if other topics should be explored.

There was rapid agreement among participants in the focus group that submitting a proposal to a conference is an essential component of the process of professionalizing one's research, and that this is true for both novice and more experienced researchers. As a result of this, participants indicated that there should therefore be a learning activity in the process of getting the feedback:

> *"One should be able to properly identify where growth is still possible, and for that one could perhaps work with track changes or possibly with a resubmission based on the reviewers' feedback."*

This clearly answers the research question of whether there is a two-way flow in learning among both the reviewer and the submitter. Along with it, the following citation was mentioned:

> *"Be welcoming and educational, but instead of acting as a judge, take on the role of a teacher during the review process. To put it another way, there is no requirement to profile or be very critical about the proposal at this point; instead, operate in a productive and constructive manner."*

This is also reflected in the survey, and it would appear that the review system, in its current iteration, has some learning potential. For example, as can be shown in Figure 3, the majority of the contributors claim that they have improved their knowledge as a result of feedback they have received at some point in the past.

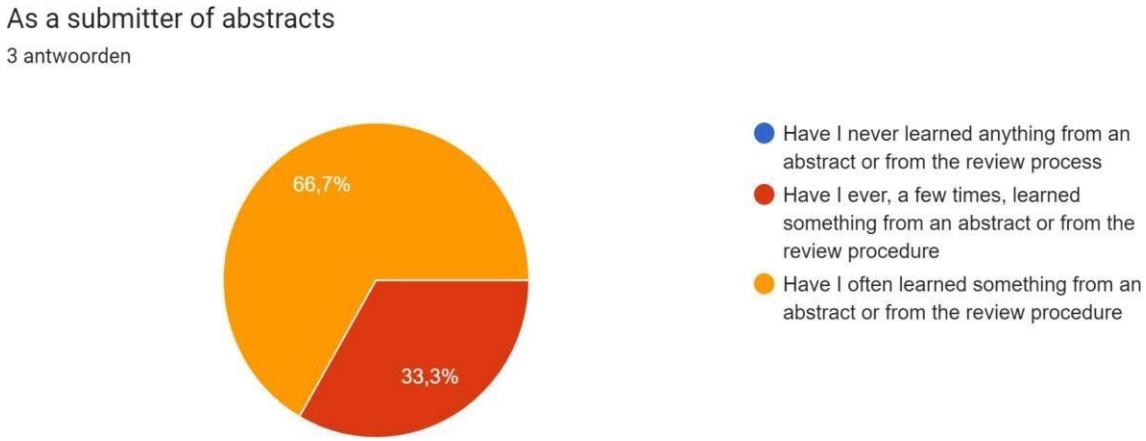

Figure 3 Learning experience of the submitter during the review process.

Third, both formative and summative grades allow novice authors to see how their work and skills change over time. This can help them set goals and track their progress as they gain more practical experience.

As a practitioner researcher, the opportunities you have to speak, present, and engage in conversation with other specialists are an essential component of

your professional development. According to the findings of the focus group talks, your abstract will serve as your entry ticket for this. People believe that it is necessary to possibly indicate in the submission of the abstract "what kind of researcher you are in terms of experience" in order to be able to correctly apply or adjust the feedback.

> *"Give everyone the opportunity to identify the type of practice researcher they are and the level of experience they bring to this discussion. When providing feedback, it is essential to have a clear understanding of the role that one is moving into (for example, junior or senior). There is a difference between the issues that one might concentrate on in the review there, and it seems vital to add that then."*

The survey asked the following question to both reviewers and submitters: *"When you review an abstract. What is the most important thing you review/When you submit an abstract. What is the most important thing you want to see assessed? Please rank the following by importance, with 1 being the most important."*

When looking at the results on the research question: "Do the reviewer and the submitter consider the same issues important in the review process?" Table 1 shows that both the reviewers and the submitters place the highest value on the research questions; nevertheless, there is a significant gap in opinion on the significance of the other criteria. These findings also contradict the findings from the focus group, which suggested that the status of the researcher played a significant role in the findings.

Table 1 Items most important to score in a review process

	M Reviewers (N=20)		**M submitters (N=3)**
Research questions	3,69	Research questions	5
Language	4	Description of method	6
Description of method	4,13	Theoretical background	6,33
Theoretical background	4,50	Added value for the research field	6,33
Practical implementation	4,50	Results	6,67
Added value for the field of practice	4,50	Language	7,33
Added value for the research field	4,56	Added value for the field of practice	7,33
Policy relevance	4,69	Submitter's background (if known)	7,33
Results	4,75	Policy relevance	7,67
Submitter's background (if known)	5,19	Practical implementation	8

DISCUSSION

According to the findings of this practice-based study, the review procedure for submissions for a conference that focuses on educational practice-based research should incorporate both formative and summative evaluations to give quality feedback to both novice and seasoned researchers. Formative scores offer valuable input on areas that need to be improved and have the potential to assist the submitter in better comprehending conference expectations, which is something that we, too, place a high value on for our conference.

The summative ratings offer an unbiased assessment of the level of quality contained in the work as well as its preparedness for presentation at the conference. Novice authors and beginning researchers may observe how their work and skills evolve over time with the use of both formative and summative grades. This can assist them in setting objectives and tracking their progress as they receive more hands-on experience.

As a conference, one of our goals is to serve as a breeding ground for the aforementioned topic. In addition, the majority of those who took part in the focus group and the survey concurred with the statement that the review process ought to be welcoming, instructive, and offer opportunities for growth. In order to support this, we will be modifying both our review system and our review approach.

The survey found a disparity in the importance placed by reviewers and submitters on different criteria in the abstract review process, with both groups prioritizing the research question, but differing in other criteria. These results contradict the focus group findings. Our hypothesis is that the gap in opinion on the importance of criteria besides the research question could be due to the differing roles and expectations of reviewers and submitters in the abstract review process. The status of the researcher may not play as significant a role as previously thought.

When offering feedback, it is essential to take into account the level of experience of the researcher, as the concerns that should receive the most attention may be different for junior researchers and experienced researchers. The findings of this research point to the necessity of adopting an evaluation

procedure that is more all-encompassing and holistic in nature. Such an approach would not only evaluate the quality of the work performed, but it would also offer constructive criticism and chances for personal development.

This is a very preliminary study, so there are bound to be some restrictions. For example, there was a very small sample size for both approaches to the problem. However, the investigation and enhancement of our own practice was the primary focus, and generalization was not one of our goals at any point. In subsequent research, this topic might be approached with a bigger sample, which would make room for more studies. Nevertheless, we believe that we have sufficiently accomplished our goal, and we are now in a position to put our results into effect in a way that can once more direct the abstract reviewing process across a number of years.

CONCLUSION

In conclusion, the results of the study indicate that both formative and summative assessments are important for novice conference abstract submitters. Formative assessments provide feedback on areas for improvement, and summative assessments provide an objective evaluation of the quality of the work. The majority of participants believe that the review process has learning potential and that the submitter's learning should be a part of the feedback process. The results also show that the importance of various aspects of the abstract may vary between reviewers and submitters, so it is important to consider both perspectives when conducting assessments. Practitioners should be encouraged to identify their experience level and for reviewers to take a teaching role during the review process.

The challenge now lies in putting this into practice, and so we as EARPIL can, for example: (1) develop a comprehensive evaluation process that takes into account multiple factors and considers the work done holistically; (2) ensure that the evaluation process not only assesses the quality of the work but also provides constructive feedback to the submitters; (3) encourage personal development by including opportunities for growth and improvement in the evaluation process and possibly offer training on reviewing; or (4) implement this new evaluation process in a consistent and transparent manner to increase its effectiveness and possibly experiment with it in oter similar conferences.

REFERENCES

Birukou, A., Wakeling, J. R., Bartolini, C., Casati, F., Marchese, M., Mirylenka, K., Osman, N., Ragone, A., Sierra, C., & Wassef, A. (2011). Alternatives to peer review: Novel approaches for research evaluation. *Frontiers in computational neuroscience*, *5*, 56.

Cohen, L., Manion, L., & Morrison, K. (2002). *Research methods in education*. routledge.

Greven, K., & Andriessen, D. (2019). Practice-based Research Impact Model for Evaluation: PRIME. *EAIR Conference 2019, August*, 1–11.

Hayes, J. R., & Flower, L. S. (1986). Writing research and the writer. *American psychologist*, *41*(10), 1106.

Jackson, L., Peters, M. A., Benade, L., Devine, N., Arndt, S., Forster, D., Gibbons, A., Grierson, E., Jandrić, P., & Lazaroiu, G. (2018). Is peer review in academic publishing still working? *Open Review of Educational Research*, *5*(1), 95–112.

Nicol, D., Thomson, A., & Breslin, C. (2014). Rethinking feedback practices in higher education: A peer review perspective. *Assessment & Evaluation in Higher Education*, *39*(1), 102–122. https://doi.org/10.1080/02602938.2013.795518

Padgett, D. K. (2016). *Qualitative methods in social work research* (Vol. 36). Sage Publications.

Patchan, M. M., & Schunn, C. D. (2016). Understanding the benefits of receiving peer feedback for text revision: Relations between author and reviewer ability. *Journal of Writing Research*, *8*(2), 227–265. https://doi.org/10.17239/jowr-2016.08.02.03

Winstone, N., & Carless, D. (2019). *Designing effective feedback processes in higher education: A learning-focused approach*. Routledge.

INTERNSHIPS IN TIMES OF CRISIS: COLLABORATIVE PRODUCTION OF INSTRUCTIONAL VIDEOS AT A DISTANCE

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ABSTRACT

The Bachelor in Educational Sciences (BScE) at the University of Luxembourg offers a thorough and demanding teacher training program that combines academic and practical knowledge. As in many other initial teacher training programs, internships are a key part of each semester in the BScE. In the face of the COVID-19 health crisis, this essential part of our teacher training program could not be maintained. Indeed, the schools were closed, and the pupils were taught at a distance by their teachers. We therefore had to quickly innovate and set up alternative learning activities that best met the objectives of the internships. We thus asked our students to design and produce educational videos, in dyads, for the country's schools. The aim was to enable our students to develop the necessary skills to produce such learning resources and to make them available to schools via the Internet. We will describe, analyse, and evaluate the solution we had to urgently put in place and the videos that were produced as a result. We will also discuss possible lessons learned that might lead to adaptations in our training program.

INSTITUTIONAL CONTEXT

The initial teacher training programme, preparing for the profession of fundamental schoolteacher, at the University of Luxembourg offers a thorough and demanding training combining academic knowledge, professional skills, and life-long learning attitudes, necessary to meet the many challenges of their future profession as teachers. They are trained to teach in all grades of fundamental school, in classes of the so-called preparatory track (a part of lower secondary education) and in the context of students with special educational needs in Luxembourg. The curriculum takes into account the specificities of the school system and the multilingual and multicultural context of the country. The articulation between theory and practice is central to the training programme. Students learn how to develop children's competences (knowledge, skills, and attitudes) by considering their individual and cultural resources. They learn how to design, set up and manage varied and differentiated learning situations based on a chosen theoretical framework. We also place great emphasis on the analysis and critical reflection of these learning situations in order to train students to become “reflective practitioners” (Schon, 1984). During the 4-year training programme, students are also required to take responsibility for their own learning processes by carrying out various individual and group projects in school and out-of-school contexts. As the teaching profession requires teamwork, learning to work in a team is a central element of the curriculum. The development of knowledge, skills and attitudes related to the use of ICT in school contexts also plays a role, students have a compulsory course in the first year where the theoretical basis of the strategic use of ICT in education is developed (Reuter & Busana, 2019) and a course in the fourth year where students are required to develop, implement, document, analyse, evaluate and regulate techno-pedagogical scenarios (Reuter & Busana, 2018). Moreover, in the various courses related to the different disciplinary didactics, the use of ICT for teaching purposes is thematised in a more or less systematic way (see in particular Haas et al., 2021 for mathematics didactics).

As in many other initial teacher education programmes around the globe, field time (also called school-based internship), is a key part of each semester in our training. Indeed, students carry out fieldwork in the different grades of fundamental school as well as in the preparatory track and in the context of students with special educational needs. From the first semester onwards, students observe students' learning and school practices, and they participate in the design, preparation, implementation, and reflection of teaching and learning activities. During the subsequent semesters students learn to teach more and more independently of their mentors. They are indeed hosted and accompanied by field mentors (classroom teachers) on a daily basis and accompanied by university tutors on a regular, but less frequent, basis, through classroom visits, tutorials and seminars for preparation, exchange and reflection organised on the university campus.

PROBLEM ENCOUNTERED: COVID-19 CRISIS

When faced with the COVID-19 health crisis, these internships could not be maintained. Indeed, in springtime 2020 all schools were closed, and pupils were schooled at a distance by their teachers (schooling-at-home). We therefore had to quickly innovate and set up alternative learning activities that (a) would best match the objectives of the internships, (b) could be deployed relatively quickly, (c) were manageable by the team of university tutors, and (d) would not put additional burden on schoolteachers, who were struggling to organize distance learning activities for their own pupils. In addition, we sought to put in place something that would serve the real needs of schools in these times of crisis.

SOLUTION DEVELOPED AND IMPLEMENTED: A COLLABORATIVE DISTANCE LEARNING SYSTEM

After many discussions internally and with the Ministry of Education, we decided to ask our students to design and produce, in dyads, instructional videos (about German language, French language and mathematics), each accompanied by a lesson plan, for teachers in the country. The focus on German language, French language and mathematics was guided by the Ministry of Education's decision to instruct teachers to concentrate on these domains, because they were deemed essential.

The aim of the task that we gave our students was to enable our students to develop the skills needed to produce such digital learning resources, but also to produce resources with real added value for schools and with a certain technical and didactic quality, and to make them available to schools via the Internet, so that they could be used at a distance (by teachers as well as by pupils and their parents). We had a period of 4-5 weeks during which this process of design, production, revision, and publication would take place. However, we wanted to make the first educational videos available to schools relatively quickly, without making too many concessions on quality assurance. Overall, we aimed to produce 1 video per dyad per week.

The entire setup, given the lockdown conditions, had to be able to run in "distance mode" throughout all the stages, while remaining accessible to our tutors from a technical point of view, given their diversified technical skill profiles. So, we developed specific instructions for our students, we developed and published online resources, we established procedures and we put in place a number of digital tools and platforms to support the process of designing, reviewing, producing, validating and disseminating the videos. The students were provided with some theoretical background for the design and production of educational videos, a range of technical tools for pre-production, production and post-production of the video vignettes and a set of tools for communication, collaboration, and submission for publication on

an online platform. We also put in place a procedure to explain the workflow from conception to production, editing and selection to publication. Quality assurance was ensured by the guidance of tutors and a group of experts in the relevant subject didactics who advised on the videos submitted for publication and invited, if necessary, students to rework their collaborative production together with their tutor.

In order to support the students and their tutors in this task in the best possible way, we provided a number of resources and tools, such as (a) a video with explanations of the process and the resources made available/supposed to be known, (b) texts with general pedagogical and didactical knowledge, specific didactical knowledge, general knowledge on the pedagogical use of ICT (what should ICT-supported teaching look like?), specific knowledge on the pedagogical use of ICT (what should a pedagogical video look like?), (c) a video-conferencing system to facilitate the exchange of students and tutors, (d) an online system to facilitate the exchange of students and tutors.), specific knowledge on the pedagogical use of ICT (what should a pedagogical video look like?), (c) a video-conferencing system to facilitate student-tutor exchanges, (d) an online system for the submission of productions and for feedback by specific didactic experts, (e) an online system for submitting video descriptions in a shared online document to facilitate the management of controls, (f) an online platform for the storage of videos, and (g) an online platform for the publication of videos and lesson plans.

Concretely, the entire process was composed of the following steps. First, students had to choose an area of competence to deal with, then define, in writing, a didactic concept for the video to be produced and write a storyboard for the video. This scenario was then sent to the tutor by email, who notified them by return email or by video conference. They could also ask for feedback from experts in specific didactics via an online forum. Then they would start producing the video with the computer tools they had at home, often a smartphone, a tablet, or a laptop. They had to be careful here, of course, to respect copyright. Once the video had been produced, they submitted it to their tutor for advice and initial validation before submitting it for publication in open access on an online portal (https://oer-bsce.uni.lu) together with a lesson plan describing the content and recommended use of the video. A group of didactic experts viewed each submitted video and decided whether it should be posted on the portal. If the video and the lesson plan were validated, then they were published on the online portal, including a short description and tags to allow schoolteachers to easily search for the kind of resources they needed to support their own teaching-at-a-distance activities.

Over the five weeks, a total of about 600 videos (including resubmissions) were produced, of which 264 were uploaded to the publicly available online portal. For each video there are instructions on how to strategically use it. Some are accompanied by additional worksheets for subsequent exercise activities. Users of the online portal can explore the various resources either by browsing the catalogue,

which is structured by cycle, subject area and skills, or by carrying out a targeted keyword search. Figure 1 shows a screenshot of the online publication portal, displaying one entry on the left and the navigation tools on the right. Each instructional video is displayed above the name of its authors, a description of its content and a downloadable lesson plan. Sometimes, as is the case here, there is additional instructional material that can be downloaded to complement the viewing of the videos with additional learning activities (mainly exercises).

Beziehung zwischen Raum- und Hohlmaße

VIDEO URL: https://vimeo.com/420330290/72e9c00f2e

Autoren: Mara LEUSCHEN & Gil KASEL

Lernziele:

Der/die SchülerIn kann Um- bzw. Berechnungen durchführen.

Beschreibung:

Zunächst werden den SchülerInnen die Merkmale eines Dezimeterwürfels genannt. Anschließend wird ihnen im Rahmen eines Rätsels gezeigt, dass in einen solchen Würfel genau 1 Liter Flüssigkeit passt.

Am Ende des Videos werden den SchülerInnen dann noch 3 Aufgaben in Verbindung mit dem im Lernvideo behandelten Thema angeboten.

Weiterführende Aktivitäten/Links:

Lehrpersonen können andere wichtige Beziehungen zwischen Raum- und Hohlmaße vermitteln.

http://www.ganzklar.at/mathematik/RR/FH2-9.pdf (Seite 3)

Lehrpersonen können den SchülerInnen ein Arbeitsblatt aushändigen, auf welchem Aufgaben zu lösen sind, bei denen sie Raummaße in Hohlmaße (und umgekehrt) umrechnen müssen:

http://www.ganzklar.at/mathematik/RR/FH2-9.pdf (Seite 3+4)

Folgendes Thema kann im Zahlenbuch behandelt werden: Kapitel 47 – Rauminhalt (Volumen)

Unterrichtsplan als PDF:

Mathématiques-Cycle4-Kasel-Leuschen-V2 DOWNLOAD

CHERCHER UNE RESSOURCE

Recherche ...

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  - Compréhension de l'oral (69)
  - Production écrite (54)
  - Compréhension de l'écrit (18)
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  - Grandeurs et mesures (34)
  - Résolution de problèmes d'arithmétiques (13)

ENVOYER

Réinitialiser

Figure 1: Online publication portal displaying an example of an entry for an instructional video (on the left) and the navigation tools (on the right).

CRITICAL ANALYSIS OF THE FUNCTIONING AND IMPACTS OF THE LEARNING SYSTEM

It should be recalled that the distance learning system described above was developed and implemented in response to the emergency health crisis related to COVID-19 in 2020. Our critical analysis of its functioning and impacts is certainly not intended to have the qualities of systematic empirical research, which would have been planned in advance. We did neither carefully and strategically plan this learning system ahead of time, nor did we have the opportunity and means to plan and execute a systematic research study to analyse and evaluate this collaborative distance learning system. Our critical analysis is rather the result of a post-hoc reflection upon our own, more or less improvised, educational practice. Its development was certainly based on our various theoretical and practical knowledge of higher education teaching principles as well as on our collective wisdom regarding our specific institutional and professional context, but we did not have the means (nor the time) to put in place, in parallel, a systematic research study allowing us to document the functioning of this setup and to evaluate its impacts in quantitative ways. We have therefore limited ourselves here to (1) describing a higher education teaching practice that may serve as a source of inspiration for others, (2) critically analysing and evaluating post-hoc how it worked and what impacts it had, (3) identifying the lessons learned and (4) formulating perspectives for future practices in our institutional context.

Overall, we found that the solution implemented under emergency conditions worked well. We all learned to deal with the situation on the job, students and tutors alike. The solidarity and collaboration between all those involved was remarkable. Everyone seemed motivated to do well, to help each other and to face the challenge of the situation. Working under time pressure allowed some to show what they were capable of and to feel a certain pleasure and a rewarding sense of competence and self-efficacy. The tutoring of students required a very flexible mental and temporal availability from the tutors, which was possible for some of us (given the lockdown, we had nowhere else to be than in our respective home offices), but more challenging for others (who needed to take of their own children's educational activities at home). And, in the longer term, it was a heavy emotional and cognitive load for all of us, which did generate some tensions in the team. In the face of the urgency, some things were possible that we would never have dared to consider in normal times. Nobody would have dared to even consider replacing internships with some other learning activity, for instance, for good reasons. Additionally, some things became more visible, which would normally escape our attention. We noticed that some students needed to work on their content knowledge and on their pedagogical content

knowledge (e.g., how to effectively teach certain mathematical or grammatical concepts to young children) and thus realized that under normal internship conditions, we tutors would less directly see that these learning needs existed in our students, given that field mentors would normally accompany them in designing and preparing lesson plans. Thus, our exchanges on the didactic foundations of teaching activities with our students were more intense, also because there was less time pressure associated with normal field time (where a foreseen learning activity needs to happen when it is planned to happen, because you cannot have the pupils simply do nothing in class). The importance of the complementarity of the different kinds of expertise present in our team of tutors became more obvious.

The feedback we received from the schoolteachers was mostly positive. Knowing that we had all contributed to overcoming a (health and educational) crisis was gratifying for our students and our tutors and it contributed to a heightened sense of self-efficacy in some. The students learned to create and produce multimedia videos for an authentic audience and were motivated to do well. It was a good opportunity for our students to develop digital and techno-pedagogical skills (Koehler & Mishra, 2009), which they had never had the (systematic) opportunity to develop before. It was also a good opportunity to work on and revise less mastered content knowledge. If you produce a pedagogical video that will be published online, then you cannot take the risk of having a wrong understanding of what you want your pupils to learn.

However, we also must admit that the quality of our students' productions varied. Many of the videos were too long and too complicated, especially for younger students. The planning and production process made us all more aware of certain gaps in our students' content knowledge, in their pedagogical knowledge, in their pedagogical content knowledge and in their technological pedagogical knowledge. Those gaps were especially visible in our first years' students.

Moreover, many of the educational videos produced were mostly about learning and teaching events (Verpoorten et al., 2007) where the initiative is on the teacher's side (reception-transmission and modelling-imitation). The subsequent use of educational videos by teachers in the field is therefore more likely to correspond to an integration of ICT in education strategy of the directed instruction type (Roblyer & Doering, 2013). Moreover, the task of producing teaching resources for an unfamiliar target audience was very difficult for our students, especially when compared to the task of teaching a specific class where the needs and resources of individual students are better known. But in return, this situation made many students more aware of the importance of taking into account the socio-cultural context and resources of their class.

LESSONS LEARNED AND FUTURE DEVELOPMENTS

Following this critical analysis, we have drawn some lessons from our experience of developing and implementing a collaborative distance learning system, the aim of which was to replace, under pressure, in a short time and for a short period of time, field time as a central element of training in teaching practice. We have also developed some ideas for future developments, some of which have already had repercussions on our current teaching practices.

We have certainly realised that this learning system has enabled us to continue to function in the face of an unforeseen emergency and also to help our students to develop certain skills directly related to the act of teaching, such as (a) confrontation with the subject matter (content knowledge) to be taught to pupils, (b) planning of learning activities on the basis of theoretical foundations (pedagogical knowledge and pedagogical content knowledge), (c) preparation of teaching materials (in this case instructional videos) and (d) awareness of the importance of taking into account the socio-cultural and cognitive resources of pupils, as well as (e) adequacy of explanations given in relation to these resources. On the other hand, we all agreed that this learning system cannot replace field time in schools, as it only covers part of the skills to be developed in the domain of teaching practices. We were obviously aware of this from the start, but can appreciate its value, and the associated challenges, even more now.

We also found that the production of instructional videos led, quite naturally, to our students conceiving learning and teaching from a rather objectivist and transmissive pedagogical posture. This is probably linked to the effects of pre-existing social representations, but also to the inherent characteristics of the video medium, which easily lends itself to a directed instruction approach.

Given the variation in the quality of the various instructional videos produced and the knowledge gaps (disciplinary and didactic) made visible in their design, we will reflect on the possibility of including the design and production of instructional videos as one training activity among others, not necessarily as teaching materials for actual school classes. We rather see them as fruitful opportunities to uncover our students' implicit conceptions of learning theories, their content knowledge, and their pedagogical content knowledge, as well as moments to force our students to become more systematically aware of the importance of the adequacy of explanations and instructions in relation to their pupils' socio-cultural and cognitive resources.

Our first experience with the collaborative design and production of instructional videos has clearly shown us that this task is easier in some respects for our students than we would have thought before embarking on this adventure. But we are also aware that, if we decided to make such a task a standard learning activity in our study programme, then other aspects of this design and production process would merit

specific and in-depth support, particularly as regards to the principles of creating effective educational videos in terms of student learning (Muller, 2008).

We have used this opportunity to set up a platform for publishing our students' work and we have, in the meanwhile, already started to use it to share other productions of our students from other courses and thus to valorise them more and more by giving them an authentic audience and actively contributing to the development of inspiring pedagogical practices in the country's schools. We wish to extend this to other courses and other student productions in the future. We could, for instance, publish (selected) bachelor theses to showcase what our students learn at the university.

Finally, in terms of potential avenues for scientific research, we have here a fairly vast catalogue of instructional videos which could lead to a systematic analysis, particularly with regard to implicit representations of learning and teaching, with regard to the understanding of the content knowledge and pedagogical content knowledge, but also with regard to the technical and media characteristics of the videos themselves. On the other hand, it would have been relevant to conduct interviews or questionnaires with students and tutors in order to study in greater depth the diversity of experiences of the different actors involved in our training system and to identify avenues for development for our university teaching practices.

CONCLUSIONS

Overall, we are quite satisfied with the collaborative distance learning system that we were forced to set up under pressure. We received positive feedback from teachers who still use the instructional videos from our online portal, years later. Our students clearly used this opportunity to develop digital and techno-pedagogical skills (Koehler & Mishra, 2009) that they had never had the opportunity to develop before. We discovered that it was feasible to ask our students to design and produce instructional videos and we have since extended our online portal to publish more and more of our students works for the national (and international) school community to find inspiration for innovative practices.

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REFERENCES

Reuter, R.A.P. & Busana, G. (2018). Moving beyond the Lecture: Towards Collaborative Inquiry-Based Learning with Big Questions. *13th Annual Conference of the European Association for Practitioner Research on Improving Learning*, November 12th -14th , Portorož, Slovenia.

Reuter, R.A.P., & Busana, G. (2019). Dreaming of Constructivist Technology Integration Strategies in Future Teacher Students. *14th Annual Conference of the European Association for Practitioner Research on Improving Learning*, November 27th -29th , Tartu, Estonia.

Haas, B., Kreis, Y., & Lavicza, Z. (2021). Integrated STEAM Approach in Outdoor Trails with Elementary School Pre-service Teachers in Luxemburg. *Journal of Educational Technology &Society*, *24*(4).

Koehler, M., & Mishra, P. (2009). What is Technological Pedagogical Content Knowledge (TPACK)? *Contemporary Issues in Technology and Teacher Education*, *9*(1), 60-70.

Muller, D. A. (2008). *Designing effective multimedia for physics education*. University of Sydney.

Roblyer, M. D., & Doering, A. H. (2013). *Integrating Educational Technology into Teaching (6e ed.)*. Pearson.

Schon, D. A. (1984). *The Reflective Practitioner: How Professionals Think in Action (1st edition)*. Basic Books.

Verpoorten, D., Poumay, M., & Leclercq, D. (2007). The eight learning events model: A pedagogic conceptual tool supporting diversification of learning methods. *Interactive Learning Environments*, *15*(2), 151-160. https://doi.org/10.1080/10494820701343694

DESIGNING DILEMMA TRAININGS AS LIMINAL SPACES FOR BEHAVIORAL CHANGE

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ABSTRACT

There is consensus that compliance, ethical, security and business dilemma trainings, which consume a huge amount of organisational resources, should be radically redesigned to resort effect. The traditional focus on awareness is only a necessary, but insufficient condition for dilemma trainings. Also behavioural judgement and intent should be trained. Trainings also need to prioritize on the learning needs of the trainee instead of the knowledge of the trainer. Trainees have interesting stories to tell. They also have other ways than formal training to learn to cope with dilemmas. A trainee-centred approach, implies that trainers should get to know how staff learns in their organisations. Therefore, dilemma training cannot be separated fully from the work floor. In that light, this working paper proposes design principles for new dilemma trainings based on insights from the concept of liminality. The four conditions for liminality serve as design principles for dilemma trainings. 1) Trainings should find a balanced regulation of proximity/distance between class-room training and the work floor. 2) They should aim for creating trust and mutual recognition of expertise among trainers and trainees. 3) They should tolerate a variety of linguistic accounts from trainers and trainees. 4) Finally, they should have an institutional mandate to experiment with the dilemmas of the work floor. Basically, the idea is that dilemma trainings should become like coffee breaks. In such a setting, staff is no longer assumed to be unaware of dilemmas but assumed to be able to express their issues on a regular basis.

Introduction

Over the past years, organisations have invested heavily in dilemma trainings. The external environment of organisations changes all the time; not only due to competitive dynamics that disrupt business practices; but also because of changing political and social norms. This dynamic context has led to new dilemmas that need to be solved in organisations. Most likely the external shifts in what is acceptable or expected are not fully understood by the workforce. While the workforce might have some clues about certain business, ethical, or compliance risks, corporate training can help them to deal aptly with these dilemmas, at least on paper.

Despite huge investments in different kinds of trainings dealing with dilemmas, many doubt whether these trainings resort any positive effect. For example, Dixon & Overton (2017) observe in a cross-sectional study that organisations have spent a lot of resources on compliance training, yet these learning investments have led to insignificant changes in individual and organisational behaviour. Instead, the compliance trainings are like a drop in the ocean. What should have been learnt in trainings does not get being translated to the work floor.

Therefore, some experts argue that it is time to reduce the budgets on compliance trainings and to invest the free money in other kinds of controls. For instance, Gartner Inc. (2020) has made a prediction that the budget for compliance training will be reduced by 2025 and parts will be used for more “effective” embedded IT controls.

This working paper argues that reducing budgets on dilemma training is not the appropriate response on the long run for at least two reasons. First, human capital is still the most important asset and contributor to ethical behaviour. Not surprisingly, organisations and society at large hold staff accountable for their actions and for the lack of controls. Second, when something goes wrong, often humans are the weakest link. Since IT controls bring their own limitations and weaknesses, the risk increases that work-arounds will pop up; once humans find out how IT controls work.

Hence, instead of cutting back on dilemma trainings, we should invest in new kinds of dilemma trainings. Therefore, this working paper shows what the flaws in the current design of compliance training are. It also advances design principles for more meaningful dilemma trainings.

The main problem is that most compliance trainings traditionally are designed without any consideration of the learning needs of staff. The trainings are instructed by regulators or imposed top-down. The trainees are simply assumed to be unaware of any dilemma. Since most awareness trainings have been developed without any consideration of trainees, employees see it as something that needs to be done and

get it over and done with. Hence, the focus is mainly on scale and efficiency. As long as the attendance is registered, training is good enough (e.g., Biegelman & Biegelman, 2010, p. 244-245). There is no serious evaluation of content of appreciation, even though standards like the Kirkpatrick Phillips evaluation for trainings exist (e.g., Kirkpatrick & Kirkpatrick, 2005). Compliance trainings therefore remain a black box.

Consequently, most of the dilemma trainings today are instructor-centred training where the focus is on raising ethics and compliance awareness or imparting ethics and compliance knowledge. The trainer traditionally takes on the role of content-communicator/evaluator, because that is what (s)he is good at. Trainers may tap on two kinds of expertise. When the trainer is subject matter expert, (s)he knows the regulations or the dilemmas from the past. When the trainers is learning and development expert, (s)he knows how to teach in a class-room setting.

Table 1: framework for new dilemma trainings (without trainee perspective)

Traditional approaches			New approaches	
Content-oriented→		learning-oriented→		Practice-oriented
Raising Awareness	Imparting knowledge	Fostering judgement	Shaping intentions	Provoking ethical compliant, secure behaviour
Content-communicator /evaluator/ Subject matter specialist			Guide	tutor

Source: adapted from Hauser (2020)

Hauser (2020) urges dilemma trainers to adopt new roles. He argues that instead of always putting their compliance knowledge or educational tools to the fore, trainers should evolve into guides and tutors for their trainees. As illustrated in Table 1, they should move from a more content-oriented to a more learning- and practice-oriented approach. According to Hauser (2020), these two new roles really help trainees to solve the dilemmas the face at the work floor. In the roles of guide and tutor, trainers help their trainees to make better judgements. First, they can guide them in making their intentions more explicit; for instance, by means of role plays. Corporate training has already made several substantial steps in that direction. For example, the use of gamification seems to be a promising avenue to increase the behavioural options and

behavioural intent of trainees (e.g., Silic & Lowry, 2020). Second, tutoring is also required to increase the confidence of the trainees in their own experience by discussing real challenges and dilemmas.

In sum, this working paper argues that organisations should stick to compliance, ethical and security trainings because real dilemmas are occurring at the workplace and staff does really need assistance in solving them. These dilemmas entail difficult choices between multiple scenarios. Staff needs assistance in taking responsibility and initiative. They also need to be able to communicate their decisions. Training can help adopt these skills.

This working paper has drawn on Hauser's framework (2020) for the redesign of dilemma trainings. Hauser (2020) invites trainers to get out of their comfort zone. He invites them to become guides and tutors of the staff. Getting out of the comfort zone may be a hard thing to do; but it is necessary because no regulatory framework nor any norm will provide answers to all dilemmas staff face. Hence trainers need to prepare or assist staff to make the right decision as they occur. Therefore, Hauser (2020) has expanded the design options for dilemma trainings. One should not only focus on knowledge and awareness, but also on having training on judgement, intent and real practice. His broadening framework seems to be in line with other complex learning interventions aimed at changing human behaviour that is difficult to change (e.g., de Vries, 2017).

Focussing on a more learning- and practice-oriented training is a good start. In this working paper, we take this argument one step further. The focus in Hauser (2020) is still primarily on what the trainer ought to do. He is not very explicit about the learning needs of the trainees. Much can be gained by flipping the corporate classroom and focusing on the trainee more. This working paper therefore adds the learning needs of the staff to original framework of Hauser (2020). The key to a more fundamental redesign implies that dilemma trainings should become more trainee-centred instead of instructor or regulator led. Not the dilemmas of the trainer, but the dilemmas of the trainee should be put central.

It requires that trainers show genuine interest in the context in which trainees work. It means that trainers acknowledge that they depend on the input from the workforce and share some of the design-power of trainings to them. Before giving the floor to the trainees in dilemma trainings, it is important to be explicit about the assumptions of the human nature of employees.

BOUNDED RATIONALITY

It is important to reflect on what the learning needs of staff might be. A more trainee-centred approach to dilemma trainings starts by making realistic assumptions about

the workforce. In the context of trainings, the starting-point is that staff are often assumed to be unaware or self-serving. These assumptions are rather strong and contra-productive. Of course, people have personal goals, but it is a very strong assumption that their personal goals dominate at the expense organisational goals. If everybody in your organisation is unaware or self-serving all the time, it would make an organisation a dangerous place. In such a situation, it would be challenging for trainers to offer dilemma trainings. It would also imply that there are no relevant HR selection and retention practices in place. The most ignorant and self-serving people get selected and retained. This is an unsustainable situation for any kind of team or group dynamics.

Assuming staff to be unaware or self-serving, is an unrealistic assumption in a knowledge intensive economy. It is hard to make universal claims about the workforce because in (large) organisations staff have different norms, backgrounds and expertise. All the relevant knowledge in an organization is not fully embodied in one person. Instead, the relevant knowledge is distributed all over the organisation. As a result, people are experts in some things, but laymen in many other situations. They are knowledgeable about their field if expertise, but might be unaware of other relevant aspects of organisational life. This applies to all staff, including the trainee and trainer. For instance, the compliance trainer might be an expert on teaching or regulatory compliance, but (s)he will not know all ins and outs of the primary process. Similarly, staff in the primary process will be experts in their field, but not in all regulatory frameworks. Having specific knowledge is not a problem. Nor compliance officers and dilemma trainers, neither trainees should become generalists. They should remain professionals and experts in their fields. Instead, they should find ways to work together and complement each other on occasions where it is necessary.

While it is difficult to make universal claims about the workforce, I assume that minimal assumptions can be made about human behaviour in organisations. I assume that people in organisation have no intent to do harm, at least not to their business. If the right HR practices are in place, it can even be assumed that people in organisations want to contribute; choose to do right; strive to achieve; like to innovate; and want to do competent work (Simons, 1995). While it is not to be ruled out that some are unaware or self-serving, it is much harder to assume that unawareness or self-serving behaviour can be generalized to all staff.

To recap, this working paper has made two assumptions about staff in organisation. First, that different kinds of people, with different backgrounds and expertise are needed in any organisation. At the most basic level it allows us to make a distinction between trainers and trainees. Each of them has unique competences and weaknesses. The second assumption is that almost all staff in organisation tries to do

good. These two assumptions reinforce each other. In organisations where it is possible to contribute, to do right, to achieve, to create, organisations will be able to attract and retain high potentials to them. Attractive organisations will therefore typically consist of a mix of newcomers, high potentials, talents, talents, experts, leaders, masters in different kinds of fields. Because attractive organisations will grow and become more complex, there will be situations where staff will not always know how to contribute and how to do right. This not knowing how to behave will occur especially in situations that are complex or new to them.

A corollary of these two assumptions is that we can assume that people in organisations are boundedly rational. Bounded rationality implies that that staff base their decisions on the limited knowledge they have with the intent of contributing to the organisational goals. While their decisions will be goal-oriented and hence rational, their decisions will not always be optimal. Some of their decisions need to be reconsidered. Boundedly rational staff are willing to learn from their mistakes and are willing to reconsider decisions if it is needed to attain personal and organisational goals. In attractive organisations, the workforce consists of self-directed learners that will do whatever is needed to succeed in their job and to advance their career.

From the assumption that competent staff in attractive organisations are boundedly rational, we can infer that there is a business case for dilemma trainings. The learning need of staff needs to be managed because of attributional mistakes in face of uncertainty and ambiguity. Sometimes staff do not see the problem nor the dilemma. Sometimes they do not see a(n alternative) solution for a complex problem. By acknowledging the bounded rationality of all staff, trainers face a much less a challenging task to develop trainings than in a dangerous organisation where people choose to be unaware or self-serving.

Table 2: framework for new dilemma trainings (with trainee perspective)

<table>
<tr><td colspan="2">Content-oriented→</td><td colspan="2">learning-oriented→</td><td colspan="2">Practice-oriented</td></tr>
<tr><td>Raising Awareness</td><td>Imparting Knowledge</td><td>Fostering judgement</td><td>Shaping behavioural intentions</td><td colspan="2">Provoking ethical compliant, secure behaviour</td></tr>
<tr><td colspan="3">Trainer as Content-communicator /evaluator/ Subject matter specialist</td><td colspan="2">Trainer as Guide</td><td>Trainer as tutor</td></tr>
<tr><td colspan="2">Staff is unaware of the dilemma or problem.</td><td colspan="2">Staff is aware of the dilemma or problem, but not of the solution.</td><td colspan="2">Staff is aware of the dilemma or problem, but not satisfied with the solution.</td></tr>
</table>

Source: adapted from Hauser (2020)

The bounded rationality assumption allows us to introduce the learning needs of staff in the framework of Hauser (2020).When staff is unaware of the problem, the trainer should take a content-oriented approach and focus on raising awareness and imparting knowledge. When staff is aware of the problem, but unaware of the solution, the trainer should take on a learning-oriented approach, aimed at fostering judgement and shaping behavioural intentions. Training might even be relevant for experts in the field when they are aware of the dilemma, know about solutions but are not satisfied with the solutions; then trainers need to act as tutors.

Adding the trainee to Hauser's (2020) framework implies that we need to take his(/her) goals and learning goals seriously. Staff might follow a course because they expect something to learn. Staff will start searching for solutions or looking ways to solve problems once they have difficulties attaining their goals. There are different ways to learn and to search for solutions. Formal training is only one option for staff. In most situations, goal-oriented people do not wait passively for a trainer to come to them. Only when people onboard into a new organisation or take on a completely new project, companies can offer a formal training because the newcomers are curious or eager to absorb new information. When people start having experience in the organisation and start facing challenges and dilemmas, their search for solutions becomes much more personal.

In the search for solutions, it does not mean that they will automatically look for a formal training to solve their goal attainment problem. Even if they decide to follow a promising training, it is not sure that they will find the solution for their learning need in this training. The learning goals of the training might differ from the learning goals of the trainee. Staff, that has followed a training ultimately might realise that what is actually being delivered in the training, is not what they are looking for. Hence after the training, their search for solutions continues.

Hence, adding the trainee to the framework, implies acknowledging that the trainer might be faced with a group of people whose learning needs are ill-defined and whose experience and competence are hard to assess. It implies that trainers will need to invest sufficient time to get to know the staff and their learning needs before they can offer a relevant dilemma training to them. It is not possible to easily assess the level or kind of awareness of staff beforehand. In line with the assumption of bounded rationality, I expect that staff is an unreliable judge of its own knowledge. Research seems to suggest that mistakes in appraisals of own knowledge occur more in the fields where people lack previous expertise than in their fields of expertise. Moreover, confronting people about their assumed lack of level of competence or awareness might lead to defensive behaviour (e.g., Cassin, 2022).

While the trainees are eager to learn something in the training, they might not learn what is needed, nor what they need in the training. The challenge for the trainer is to find out if the value proposition of a formal training can be aligned with the search of boundedly rational staff for solutions. There can be a significant mismatch between demand and supply.

In the next section of this working paper, a sidestep is taken to explain how staff actually learns, searches and finds solutions in the workplace. I therefore introduce the 70:20:10 framework, which provides a broader and more realistic account on how people learn in organizations. Moreover, research on how trainers and learning and development professionals have used the 70:20:10 framework to manage these learning processes has resulted in some important take-aways for the design of dilemma trainings (Johnson et al., 2018).

LESSONS FROM THE 70:20:10 FRAMEWORK

Table 3: framework for new dilemma trainings (a match-making perspective)

Content-oriented→		learning-oriented→		Practice-oriented
Raising Awareness	Imparting Knowledge	Fostering judgement	Shaping behavioural intentions	Provoking ethical compliant, secure behaviour
Trainer as Content-communicator /evaluator/ Subject matter specialist			Trainer as Guide	Trainer as tutor
Staff is unaware of the dilemma or problem.		Staff is aware of the dilemma or problem, but not of the solution.		Staff is aware of the dilemma, but not satisfied with the solution.
10 % formal learning		20 % social learning		70% learning
They do not walk the talk.		They walk the talk.		They don't talk the walk.
It typically occurs at a training or school setting		It occurs mainly at the work floor, and sometimes in a formal training setting		It starts mainly at the work floor, but sometimes some distance is needed to reflect on experiences.

Source: adapted from Hauser (2020)

The 70:20:10 heuristic states that staff typically makes use of three channels to learn and to adopt new behaviour. First, they can learn in a formal learning setting; making use of trainings offered by their employer. Secondly, they can learn by observing, imitating and getting advice from role models (social learning). Thirdly they learn from the feedback loops from their own experience experiential learning.

The percentages in the 70:20:10 framework are an indication of how often the staff learns on average via these channels. Since staff is assumed to be more present at the

work floor than in a classroom setting, the percentage for formal learning is only 10%. Since organisations are social systems, where staff meet and interact with other people, they have more time to identify role models. Therefore, in a natural way, observing others and asking for advice from peers triggers processes of mimetic and vicarious learning. The percentage for social learning is set at 20% in the framework. Finally, staff is assumed to learn most from their own practice. They learn mostly by doing and reflecting on their own experience. The experiential learning that occurs via single loop and double loop learning is set at 70%.

This model has been used by organisations to invest in new learning initiatives: beyond offering traditional class-room learning, staff were assigned mentors and coaches. A critical evaluation of these initiatives by Johnson et al. (2018) has shown that the integration of the three aspects of the 70:20:10 framework is often lacking. More precisely, they found that interventions that aim to stimulate formal and experiential learning often too easily assume that new behavioural change will emerge after the intervention. This is not the case. In case of formal learning, trainees do not always walk the talk. There is little time to assimilate new training content, especially when there are other and more powerful role models at the work floor than in the class room.

In case of experiential learning, when challenges are too hard, practice is messy and solutions are unsatisfactory, staff will suppress their experiences. Hence, they will not talk the walk. The risk exists that experienced workforce will become silent because they want to safeguard their good relationships and positions in the organisation. Most individuals do not like to stand out and challenge dominant behaviour. Instead, they tie their behaviour to the organisational membership. As a result, many successful organisations and their experienced staff are often slow at updating to new realities and norms that have emerged outside their comfort zone. It is a response that might be beneficial both for the organisation and the workforce on the short run, but it will be ultimately counterproductive on the long run. This is a serious risk that might leave the organisations or its staff obsolete.

Finally, Johnson et al. (2018) argue that it is hard to support social learning because it is the trainee who determines who their role models are. Hence even before staff enters a classroom, they already have certain role models outside the classroom. Just as one cannot simply assume unawareness among the trainees or ignore (repressed) experience, one cannot assume that there are no role models present. This would entail a too narrow interpretation of social learning according to Johnson et al. (2018). It is not up to the trainer to determine who their role models are. It is the trainee who decides how and from whom (s)he is going to get advice and feedback. Put differently, they found that trainers will not automatically be accepted as a guide of tutor.

Trainers should therefore not overestimate the capacity of their tutoring role. This warning applies to both human and non-human tutoring. While gamification can assist in guiding the behaviour of trainees, it remains to be shown that it will also lead to real behavioural change. If trainers assign mentors, guides or games to trainees, they will not be as effective in the learning transfer as the role models that were identified by the staff themselves.

It is thus important for trainers to get to know what kinds of role models are present at the work floor. Especially when the ideas of these role models do not overlap or even contradict with the learning goals of the dilemma training, trainers need to incorporate these ideas in the training because trainees walk the talk of their role models. Formally assigned mentors should relate to the natural role models with whom trainees are more familiar with and have more time to build trusting relationships. This can be a very delicate process. Before challenging the logic of the alternative role models, it is important to listen and to make sense out of it. Thus, the existence of alternative role models has important consequences for the selection of the content and the course participation in a dilemma training.

In sum, Hauser (2020) has convincingly argued that trainers ought to increase the value of dilemma trainings by focusing also on social (adding the guiding role) and experiential learning (adding the tutoring role). Johnson et al. (2018) has shown that it is not easy to actively support these learning processes. They found that ignoring the interaction between the three channels, can have devastating effects on the effectiveness of a training. Simply investing in more formal, social and experiential learning separately will not do the trick. The problem with the silo approach is that one ignores that people make use of the learning channels simultaneously.

Acknowledging the need to integrate these approaches leads to both challenges and opportunities. Unsatisfactory on the job learning may trigger a need for mimetic or vicarious learning of even a need for formal learning. Alternatively, one should realise that participants do not walk the compliance talk form classical trainings; but will curate the content first. Trainers should not take for granted that staff will use their courses as a point of contact or see the trainers as the role models. Trainers need to earn the tutoring and guiding role.

Somehow experiential, social and formal learning need to be integrated better. It seems important to involve the trainee as early as possible in the design of compliance training. This working paper thus has identified a new design challenge. A training becomes relevant for trainees when there is a context in which they can reflect on how to professionally relate to disruptive, sometimes contradictory events and developments. In the last section of this working paper, I argue that such a

context can be created if trainers and organizations use the principles of liminality for designing dilemma trainings.

LIMINALITY

Liminality is a concept from anthropology, that described the transitional phase in a life cycle from one stage to the next (e.g., Scaratti et al., 2021). The concept of liminality has been applied to many fields, including governance and compliance (ConCanon & Norberg, 2018), trainings (Scaratti et al., 2021; Zaeemdar, 2017). At the organisational level, there are strong parallels between liminality and the Lewin's "change" phase in the unfreeze-change-freeze model (Burnes, 2004). Liminality implies a state of being or feeling betwixt and between. These feelings can lead to reflection, to new alternative interpretations and a desire to share these feelings and new insights with others. This is a good soil to work on behavioural judgement and intent.

Therefore, and in line with Scaratti et al. (2021, p.9), we define liminality as a place where distinct organizational discourses can take place. Liminality occurs when there is a special and temporal distance from the usual. Fixed structures and routines are temporarily suspended and fade into the background. The lack of structure triggers both opportunities and threats for the people in that space.

On the one hand, it can be a motor to go forward. It can be a place for (brain)experiments, where business as usual can be put on hold, the status-quo can be challenged, and alternatives can be discussed. On the other hand, there can be a desire to go back to the existing normal. The lack of known structures, is not always a safe place for everybody. The state of liminality can trigger feelings of insecurity and resistance. Because one cannot rely on existing frameworks and routines, liminality can be experienced as an uneasy or even threatening place. Therefore, conditions need to be created where people feel at ease to express their thoughts. Concannon & Nordberg (2018) and Scaratti et al. (2021) have identified four conditions to feel safe in a liminal space and to enable the discussion therein.

First, there has to be a regulation of proximity/distance. There needs to be appropriate distance from the work-floor in order to be able to reflect on daily routines. For instance, the opportunities to check your business mail during a training need to be restricted. A good regulation of the distance, in the context of a dilemma training also implies that the practice of the work floor is never lost out of sight. What is discussed in a training needs to have some relevancy for the trainees. They need to be able to relate to it. In sum, the loose coupling with the work floor, allows trainees to reflect on their own position and decisions in the past.

Second, there needs to be trust and mutual recognition in a liminal space. It is an important condition for rich communication. Getting trust from the trainees is difficult to achieve. It is more fundamental than being polite and simply paying respect to the other. Recognizing the others perspective does take time. As trust and sensemaking generally require time to develop, dilemma trainings most probably need to be scheduled more continuous and must be spread over time (e.g., Lanzara, 2021)

Third, there needs to be a variety of linguistic and discursive accounts in a liminal space. In the context of the dilemma training, it implies that you do not restrict to one-directional messages from the trainer to an audience. Instead, you should allow - somehow - trainees to voice their stories, experiences and worries. At least, there should be enough time scheduled to let them talk. Too often, too much time is spent in the design of dilemma trainings on the presentations, cases, or stories of the trainer. The role of the trainee is then restricted to asking questions or to showcasing that they master the insights of the trainer. Instead, presentations, cases and alike should not take too long. They should only serve as conversation starters. The role of trainees in a liminal place is not only to listen and to absorb. Organizing trainings in line with the liminality concept forces trainers to give trainees more time to express their views and to allow new ideas to pop up. They have a story to tell that might be beneficial to the group's level of understanding. The trainer should somehow collect, curate and present these stories too.

Fourth, there needs to be an institutional mandate for liminality. In the context of the dilemma trainings, it implies that sponsor of the training allows that a diverse set of discursive accounts emerges in the training. It should be fine to have (brain)experiments and to voice and listen to ideas that have not yet been institutionalised in the organization. In such a context, both trainees, trainers and the organizations get to learn. A true recognition of mutual respect and openness to absorb distinct narrative discourse of trainees, might lead to resistance from the trainer. After all trainers are also boundedly rational and make the same attributional mistakes as other staff do. When discussions in a training are going unpredictable ways, a trainer might feel that s(he) is losing control over the training process. The trainer might be tempted to stop the discussion too early. Having a mandate to organize training as a liminal space can help stop this temptation. It should not be a problem to grant or get this mandate from the top because the most relevant behavioural change should occur at the work-floor, not in the class-room.

CONCLUDING REMARKS

It is generally acknowledged that the value of dilemma trainings for trainees can be increased by focusing more on social (adding the guiding role) and experiential learning (adding the tutoring role). However, it is not easy to actively support these learning processes in a formal class-room setting because the workforce consists of self-directed learners. This working paper forwards liminality as a design principle for trainee-centred dilemma trainings. When training settings are seen as contexts where one can express and listen to different interpretations, to plural personal/professional narratives to, multiple and often contradictory ways of understanding, a training can become a catalyst for transformative behavioural change.

Future research should explore whether the four conditions for liminal spaces are indeed good guiding principles for dilemma trainings. In the extended framework of Hauser (2020), presented in Table 2 of this working paper, a liminal space can trigger experiential learning because the discourse is not only about espoused behaviour and about experiences highlighted by the trainer. Instead, it is a discursive space where it is possible to voice and to reflect on own real experiences. Moreover, these shared stories by trainees might inspire other participants to respond to it or to relate to it. Without formally assigning mentor roles to people, real- time tutoring can occur from any participant in the liminal space. The conversations in a liminal space can guide trainees to recalibrate their behavioural judgement and intent. Hence, liminal space set the scene for social learning. Seeing training in the context of a liminal space might thus be a promising way to integrate the three channels of formal, social and experiential learning.

To inspire others to further investigate the potential of the liminal lens for dilemma trainings, I conclude this working paper with a metaphor. A dilemma training that draws on the principles of liminality resembles like a coffee break at work. Drinking coffee together is often a first action in an approach to connect to the other. It is an invitation to interact without people having a common agenda setting. Instead, the discussion unfolds at the scene. Sturdy et al. (2006) has shown that business meals can be a game-changer for top managers because it allows them to talk in more informal ways with diverse constituents. In the light of flattening organisations, it is time to research whether similar dynamics also work in other parts of the organisation; especially in dilemma trainings.

REFERENCE

Biegelman, M. T., & Biegelman, D. R. (2010). *Foreign Corrupt Practices Act compliance guidebook: protecting your organisation from bribery and corruption.* John Wiley & Sons.

Burnes, B. (2004), Kurt Lewin and the Planned Approach to Change: A Re-appraisal. *Journal of Management Studies*, 41: 977-1002. https://doi.org/10.1111/j.1467-6486.2004.00463.x

Cassin, R. L. (2022) Do trainees overrate their compliance knowledge? https://fcpablog.com/2022/12/21/do-trainees-overrate-their-compliance-knowledge/)

Concannon, M., & Nordberg, D. (2018). Boards strategizing in liminal spaces: Process and practice, formal and informal. *European Management Journal*, 36(1), 71-82. https://doi.org/10.1016/j.emj.2017.03.008

Dixon, G. & Overton, L. (2017) Solving the compliance conundrum. Essential data-driven insights for ethics and compliance professionals. In-focus report. SAI global & TowardsMaturity

Gartner, Inc. (2022) Gartner Predicts 50% Reduction in Annual Compliance Training by 2025 https://www.gartner.com/en/newsroom/press-releases/2022-03-15-gartner-predicts-50-percent-reduction-in-annual-compliance-training-by-2025

Hauser, C. (2020). From preaching to behavioral change: Fostering ethics and compliance learning in the workplace. *Journal of Business Ethics*, 162(4), 835-855. https://doi.org/10.1007/s10551-019-04364-9

Johnson, S. J., Blackman, D. A., & Buick, F. (2018). The 70: 20: 10 framework and the transfer of learning. *Human Resource Development Quarterly*, 29(4), 383-402. https://doi.org/10.1002/hrdq.21330

Kirkpatrick, D., & Kirkpatrick, J. (2005). *Transferring learning to behavior: Using the four levels to improve performance.* Berrett-Koehler Publishers.

Lanzara, D. (2021) Compliance Training in the Digital Era. *Tijdschrift voor Compliance*, June 2021 (3) 165-169 https://denhollander.info/artikel/16730

Scaratti, G., Fregnan, E., & Ivaldi, S. (2021). The training setting as a social and liminal space for professional hybridization. *Frontiers in Psychology*, 12, 6039. https://doi.org/10.3389/fpsyg.2021.804008

Silic, M., & Lowry, P. B. (2020). Using design-science based gamification to improve organisational security training and compliance. *Journal of Management Information Systems*, 37(1), 129-161. https://doi.org/10.1080/07421222.2019.1705512

Simons, R. (1995). Control in an Age of Empowerment. *Harvard Business Review*, 85, 55-62. https://hbr.org/1995/03/control-in-an-age-of-empowerment

Sturdy, A., Schwarz, M., & Spicer, A. (2006). Guess who's coming to dinner? Structures and uses of liminality in strategic management consultancy. *Human relations*, 59(7), 929-960. https://doi.org/10.1177/00187267060675

Vries, de H. (2017). An integrated approach for understanding health behavior; the I-change model as an example. Psychology and Behavioral Science International Journal, 2(2):555585., 2(2), 555-585. https://doi.org/10.19080/pbsij.2.2

Zaeemdar, S. (2017). Coaching as a liminal space: Exploring the use of theatre in management training and development. In Black, K., Warhurst, R., & Corlett, S. (Eds.). (2017). *Identity as a Foundation for Human Resource Development* (pp. 179-192). Routledge. https://doi.org/10.4324/9781315671482

DEVELOPING CITIZENSHIP SKILLS THROUGH CULTURAL HERITAGE AND SOCIAL MEDIA NETWORKS

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ABSTRACT

This paper presents the outcomes of a project carried out with Cesano Boscone (Milan, Italy) students (6th-7th grade), consistent with the National Operational Programme, For School - Competences and Learning Environments, 2014-2020 (MIUR), on citizenship education in an intercultural and interdisciplinary perspective, with a focus on an aware use of social networks. The project was evaluated using the "fourth generation" approach, activating a reflexive comparison between participants. The perception of the project's educational impact shows a coherent relationship between the objectives that guided the design work and the learning outcomes that emerge from the analysis of the classroom activities. The results of the content analysis of the conversations with children highlighted the effectiveness of the educational alliance between teachers and educators and the assumption of a reflective attitude towards their own practices. The first identified learning outcome is a responsibility towards a common heritage, a second outcome is a greater awareness of the potential and risks of the digital environment, a third point underlined by the students is the ability to interact in a group, understanding different points of view, valuing one's own and others' skills, contributing to common learning and implementing collective activities.

[7] Authors' contributions: paragraphs 1, 2 and 4.4 Claudia Fredella; paragraphs 2, 3 and 4.1 Sofia Bosatelli; paragraphs 4.2 and 4.3 Germana Mosconi.

1 FRAMEWORK

The project focuses - heritage education and digital citizenship - emerged from an analysis of the context's needs and had been addressed under the umbrella of the citizenship education in its transdisciplinary dimension and strongly anchored to the territory and to "socially vivid" matters (Balibar, 2012; Legardez, 2017).
Digital competence is one of the Key Competences for Lifelong Learning first defined at European level in 2006 that, as stated in and update of the Council Recommendation in 2018, «involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking»[8], definition recently updated in the *DigComp 2.2: Digital Competence Framework for Citizens* (Vuorikari, Kluzer & Punie, 2022). In 2015, the *Paris Declaration* of the European Ministers of Education reaffirmed the need to increase the development of critical thinking and digital literacy, and the subsequent 2018 Recommendation of the European Parliament again emphasises «the commitment of Member States to promote common values, enhance critical thinking and media literacy, inclusive education and intercultural dialogue» (Art. 9).
In the *Council Recommendation on Key Competences for Lifelong Learning* (Official Journal of the European Union, 2018/C, 189/1) intercultural skills underpin all key competences and there is an explicit mention of the need to promote awareness of the richness intrinsic to cultural diversity. In investigating the concepts of 'identity' and 'belonging', as well as the dynamics of the development of critical thinking, an indispensable component is the consideration of the 'gaze of the other', with whom we share a specific social context, and which commits us to the reasoned and reasonable construction of a common sense, a consensus (Fredella, 2022, p. 25).
In Italy the global citizenship topic has been taken up at the national level by the *National Council for Development Cooperation* (CNCS), which in June 2017 set up a working group tasked with developing the *National Strategy for Global Citizenship Education* (ECG)[9]. The document was built through a participatory process involving dozens of actors at local, national and international levels, with the aim of developing a multi-year Action Plan that promotes ECG practices in formal, non-formal education. The analysis stems from the awareness that the complexity of modern societies faces citizens with challenges that are constantly changing and to address them citizens need knowledge, attitudes and skills to build a sustainable, equitable and inclusive world (SDG 4[10]).

[8] https://op.europa.eu/en/publication-detail/-/publication/297a33c8-a1f3-11e9-9d01-01aa75ed71a1/language-en
[9] https://www.info-cooperazione.it/wp-content/uploads/2018/02/Strategia-ECG.pdf
[10] https://www.sdg4education2030.org/the-goal

Starting from the assumption that in order to deal with citizenship education a fundamental prerequisite is the creation, in the classroom and at school, of a democratic space, it was decided to adopt a *Student Voice* perspective (Grion & De Vecchi, 2014) to give voice to students, with the aim of achieving the dimension that Santerini (2010) defines as deliberative citizenship, which is embodied in a process that includes decision-making, participation and cooperation; these three attitudes enable individuals to relate to their living environment as active members and to experience being co-citizens (Audigier, 2002).

Belonging to the community and building a plural identity are also closely linked to the dialogue with cultural heritage that enables pupils to develop transversal citizenship skills, also in an intercultural perspective, preventing stereotypes and prejudices (Bortolotti et al., 2008).

In Italy, the *National Digital School Plan* emphasises how digital technologies can be «an active agent of the deep social, cultural, political and economic changes taking place» (MIUR, 2017, p. 6) and foster the development of critical thinking, make people responsible to the community and support relationships oriented towards mutual trust and reciprocity (Rivoltella, 2021; Rivoltella & Rossi, 2019).

The topic of Digital Citizenship is one of the three milestones of Law 92/2019 for the introduction of the teaching of Civic Education in which is highlighted the right to be informed about the risks of the digital environment and is established the "Council of the Rights and Duties of the Digital Child and Adolescent" (Di Genova & Fredella, 2022).

Starting from the awareness of the need to reorient the educational paradigms of digital competences, adapting them to the new social and socio-technical complexity (Marinelli, 2020), the aim of the project was to introduce the Media Literacy education (Jenkins 2010, pp. 79-90) to tackle the topic of the competences needed to make students digitally aware citizens. The questions addressed, avoiding the simplification of the *American Academic of Pediatrics* completely centred on the parameter of screen time, focused on growing a knowledge on complex social practices, based on the principles of *ethos challenge* and *transparency problem*, given the young age of the students (Jenkins, 2010, Colombo, 2020).

The issue of inhabiting digital environments became even more urgent given that the project started in February 2021, a time still heavily influenced by the Covid-19 pandemic prevention measures. In fact, the first phase of the project took place when schools were closed, and trainers and classes therefore initially met online.

It is therefore expected that the digital environment becomes a shared social space (Boccia Artieri, 2012) where to build "paths of integration, participation and relationship with the complex and multiform surrounding reality" (Perfetti, 2015, p. 135). From this perspective, the theme of cultural heritage opens up the search for a sense of belonging to the territory and the community that inhabits it, and a reflection on a collective good to be valorised, shared and communicated (Mascheroni, 2009) also through digital tools. At the same time responsibility towards the heritage itself could be promoted through an idea of digital citizenship "declined in terms of dialogue and encounter" (Perfetti, 2015, p.131). The encounter with cultural heritage

has also made it possible to leave, albeit virtually, the walls of the school, working at the same time from a local and global perspective, going beyond the "educational" vocation of media education (Fabbri & Soriani, 2021, p. 61), entering into non-formal contexts.

2 THE PROJECT

The project, consistent with the orientation of the National Operational Programme, *For School - Competences and Learning Environments* (2014-2020) of the Ministry of Education, Universities and Research - aimed to form competent and responsible citizens in a modern, connected and interdependent society intended to promote:
- the development of a feeling of belonging to a broad, democratic and inclusive community, starting from an interdependence of political, economic, environmental, social and cultural dimensions, between local and global levels;
- in-depth exploration of citizenship education in an intercultural perspective, with a specific focus on heritage education in connection with a more aware use of digital tools and social networks.

The project involved: three primary school classes (6th grade) and three lowe secondary school classes (7th grade) of the Alessandrini School and Da Vinci School of Cesano Boscone (Milan) classes of the IC Alessandrini and IC Da Vinci in Cesano Boscone (Milan) to work on continuity between the different school stages[11]; Primary and first grade secondary school teachers; Parents of the students; Working group composed of: 1 supervisor and project coordinator, 6 pedagogist-trainers, 1 psychologist, 1 Professional Advanced Counselor and 1 documentalist.
The research design included: 5 meetings with classes on heritage issues and the use of social networks, planning meetings between teachers and teacher-trainers, supervised group meetings, a training course for parents and 3 meetings open to the public.
In this paper we will focus on the results of the activities carried out in two classrooms, a 6th and a 7th grade.
The design of the path proposed to the students was based on a context needs analysis (Nigris, Balconi & Zecca, 2019), shared between trainers and teachers, that highlighted within the schools' social environment problems such as troubled relationships among the student, isolation, and difficulties in sharing the rules of democratic coexistence.
In fact, the need to work on the theme of digital citizenship had arisen from teachers concerned about episodes of cyberbullying among students. The connection with the theme of cultural heritage therefore emerged collectively as a framework for

[11]In Italy compulsory education starts at six years of age and lasts for 10 years divided in: 5 grades of Primary school (elementary) - from 6 to 11 years, compulsory; 3 grades of Lower secondary school (middle school) - 11 to 14 years, compulsory; 5 grades of Secondary school (high school) from 14 to 19 years (compulsory up to 16 years).

addressing the dimensions of building an inclusive community in which students could develop a sense of responsibility for the common good and move consciously within a shared digital space.
Moreover, the students were involved in the ongoing activities redesign from a bottom-up perspective, with the intent of building a shared collective identity and to promote a sense of responsibility towards the territory's memory and heritage. Coordination meetings between teachers and trainers were held to plan, analyse and share results of classroom activities with students.
Linking heritage knowledge, protection and education on an aware use of social networks was the challenge, accompanied by a strong transdisciplinary approach. The activities (Table 1) were carried out using the cooperative-learning methodology, which also supported the development of relational skills (Negri, 2007).

First activity **What is cultural heritage?**	•After viewing a series of images, the students, divided into two groups, are asked to define what the photos presented have in common. Discussion and agreement on a first definition of heritage.
Second activity **Our heritage**	•Students were asked to add a photo/image on a Padlet or bring in an item that would represent their own heritage. Discussion and sharing of ideas and emotions.
Third activity **What are social networks and how do we use them?**	•Group discussion about knowledge and use of social networks. Structuring an interview to conduct with parents.
Fourth activity **What we want to share?**	•Review of parents' interviews and reflection on what the class wants to share on social network. Group work to choose topics and languages.
Fifth activity **Digital content creation**	•Viewing the work done and discussing dissemination methods and strategies.Creation of a Facebook group shared by the two schools. (Posting content through parents and teachers' profiles).

Tab. 1 Classrooms activity programme.

In the first meeting the students were challenged to investigate the idea of heritage itself through the observation of a series of images previously selected by the group of trainers as representative of the complexity and plurality of interpretations of the notion of cultural heritage: from internationally renowned artworks to gastronomic traditions, from landscapes to local handicraft products. In order to help students to recognise a heritage also close to their own experience and to build a connection between the different images - without value judgements or hierarchical scales - were also included pictures of places in the municipality of Cesano Boscone, such as gardens, the skate park, the library, historical buildings and characteristic landscapes of the surrounding countryside.

The students, actively involved and protagonists in their learning process, were then asked to choose which heritage (tangible and intangible) had to be valued and shared in order to maintain an anchorage in their sensitivities, and communicated it through a variety of languages (art, music, theatre, videotelling, storytelling...).

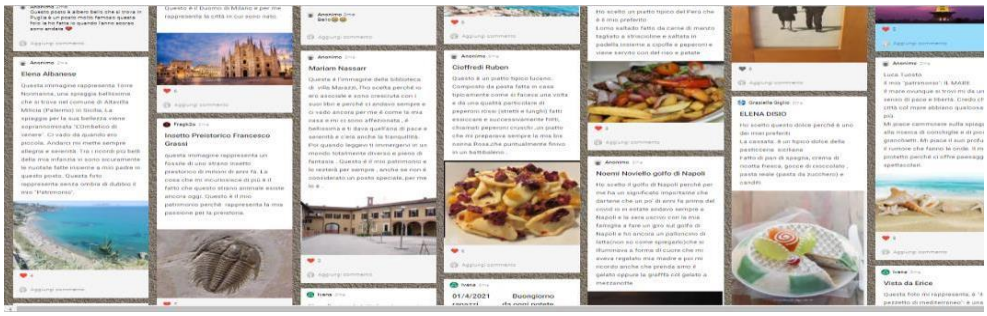

Fig. 1 The students' heritage.

Through words, images, objects and even living people (someone decided to bring their grandfather, he connected via video conference) the children told what heritage means to them, something they cherish. As we will see in section 4 from the discussions with the students, an idea of heritage emerges which refers to family ties and memories experienced with friends and family. Some students recounted episodes related to their origins and asked to show the class a landscape from a trip to their country of origin or an object dear to them.
In subsequent activities, students were asked to explain their idea of heritage in order to co-construct heritage as a common good and towards a community dimension.
After sharing the common heritage, thoughts were given on how to communicate this content through the use of social networks.
The children were asked to think about what content to convey and how, and there was much discussion about the content, how to communicate it and whether or not to communicate it. There were many ideas including videos, animated presentations, songs, audio, photos, images, so the products created were then put on a Facebook group shared by the two schools (posting content through parents and teachers' profiles) with the aim of disseminating their content and meaning within a wider community.
Thanks to these shared discussions, it was possible to intertwine several times the two macro-themes that guided the project: heritage and social media networks.

Fig. 2 Key words, goals and tools to design the heritage communication plan (Dashboard sketch in the 6th grade class).

A central aspect of this project was the alliance that was created between teachers and trainers, even though there was a common design for the whole team, trainers and teachers continually recalibrated their actions according to emerging issues, to respond to the specific needs of that specific class.

3 RESEARCH METHODOLOGY

The qualitative study is situated within the ecological paradigm, the purpose was to give an account of the phenomenon's complexity and to "preserve the other's spoken word" (Mortari, 2010, p. 25). The project has been monitored and evaluated using the participatory (Bezzi, 2010) and "fourth generation" evaluation approach (Guba & Lincoln, 1989), which directly involved: educators, teachers and students. The study aimed at enhancing the subjectivity of the participants, activating a reflexive comparison between them and providing useful evidence for the redesigning of similar actions.

The monitoring and evaluation action was carried out following the three dimensions of the training device: (i) students' learning with regard to the development of transversal citizenship skills; (ii) the changes on a larger scale perceived by the various stakeholders (students, trainers, teachers); (iii) the elements of effectiveness and criticality of the project perceived by the stakeholders. The following objectives were pursued: identification of the students' areas of learning; identification of the areas of change perceived by the various stakeholders and exploration of the elements of greater effectiveness and criticality of the training device.

The work was divided into seven stages (a) initial analysis of the training device; (b) monitoring through the supervision meetings with the working group (1 supervisor and project coordinator, 6 trainers, 1 psychologist, 1 Professional Advanced Counselor and 1 documentalist); (c) monitoring through the meetings between

trainers and teachers and through the trainers' logbooks; d) conduction of two focus groups with the teachers; e) selection of the documentation, systematising and analysing the data aimed at an initial interpretation for the drafting of monitoring and reporting reports; f) integrated analysis of the data collected; g) final elaboration of the research report. The instruments used for data collection (Tab.2) refer to a qualitative paradigm (Trinchero, 2002).

Participants	Objectives	Tools
Students	Identification of learning transversal areas (citizenship competences). Exploration of elements of most effective and critical elements of the training device.	Audio recording and transcription of the meetings, observations, analysis of the products produced in the classes.
Teachers	Identification of the areas of change perceived by teachers (on and about students). Exploration of the most effective and critical elements of the training device.	Focus groups; analysis of themes that emerged in the monitoring meetings.
Pedagogist-trainers	Identification of the areas of change perceived by pedagogist-trainers (on and about the different subjects). Exploration of the most effective and critical elements of the training device.	WhatsApp vocals, Diary; analysis of themes that emerged in the monitoring meetings with the working group.

Tab. 2 Research tools and objectives.

With the aim of collecting instant considerations, impressions and evaluations that made it possible, at a later stage, to return to the activity carried out and analyse it on the basis of these notes (Agosti, 2006; Pastori, 2017), both the diary, a documentation tool with a reflective slant, and an informal tool, i.e. an immediate report via a voice message sent in a purpose-made whatsapp group, were used by the trainers. This new tool facilitated discussion within the group and often facilitated rapid re-design, moreover, the transcribed text allowed a critical look that enriched the reflections collected in the logbooks/diary. The working group meetings, which

took place in an atmosphere of mutual listening and non-judgmental acceptance, made it possible to create a space for exchange and reflection (Mortari, 2009a) and triggered a process of re-framing, i.e. a change of perspective with respect to the reported topics (Mezirow, 1990). The meetings with the students were recorded and transcribed with the aim of activating a discussion between the various participants. It was also necessary in order to access the perspective of the students and their world of meanings and interactions (with teachers and trainers) to implement participant observation understood as peripheral participation (Corsaro, 2003; James, 1996): sharing everyday life, observing with curiosity and discretion, waiting to be hosted and welcomed in order to ask questions or hold conversations. Two central methodological aspects were found in this project to access the student world and the promotion of participation (Mortari, 2009b). In addition, the analyses of the products, the outcome of the paths in the various classes (drawings, texts, presentations, videos) were considered. In this context we will focus on students' activities through the conversations analysis, carried out according to the qualitative method of content analysis (Krippendorff, 2004) with a coding system inspired by the constructivist approach of Grounded Theory (Charmaz, 2006). In a first phase, labels adhered to the text, following an analytical process of "naming" the data (Tarozzi, 2008, p. 84) and then grouped into categories representing the different identified units of meaning. A key aspect of the process has been intersubjectivity between the researchers who, coding the texts first separately then comparing them with each other, have gradually redefined the coding system. have been gradually redefining the coding system.

QUOTATIONS	LABEL	CATEGORY
Unlike Youtube, where they make videos, on twitch there are videos, but they are broadcast in that minute there, in that second there	knowledge of social media	Awarness of potential and risks of the digital environment
I can keep in touch with my distant relatives and talk to them	how and why I use them	
[on Facebook] I get in touch with people I don't know and then something bad came out and I told my mum and then I deleted it [my profile]	relationship with parents	
I learned how to work together and we shared desires	share thoughts and desires	Ability to interact in group
I got to know new things about my classmates and their origins, i.e. a typical food I didn't know	acquaintance with classmates	
The winter homework space in Cesano Boscone it was nice because you could see the snow from the windows and in some days they sold roasted chestnuts,	belonging to the local community	Belonging to a community
The dervish dance is from my country [Syria], so I like it a lot, because I used to do it when there were celebrations	cultural traditions of country of origin	
You think it is a picture, instead it's much more and it belongs to everyone	heritage knowledge	Responsibility towards a common heritage
I think we also learnt how to be careful with heritage and how to protect it	heritage protection	

Tab. 3 Coding system.

4 CONTENT ANALYSIS AND RESULTS

After the labelling phase, we gathered the labels identifying four main categories described above (Tab. 3), related to the learning goals of the project connected with the development of citizenship transversal skills:
1. Greater awareness of the potential and risks of the digital environment;
2. The ability to interact in a group, understanding different points of view;
3. Belonging to a community;
4. A sense of responsibility towards a common heritage.

4.1 Greater awareness of the potential and risks of the digital environment

The first category identified refers to student's awareness of the potential and risks of the digital environment. It includes three labels "knowledge of social media", "how and why I use them" and "relationship with parents". During the meetings, the students demonstrated detailed knowledge of a wide range of social media networks, even the less common ones. Moreover, they were able not only to describe the purpose of social and the main features, but also to make comparisons between different social media ("With likee you can make videos like tiktok"; "Unlike Youtube, where they make videos, on twitch they are videos, but they are broadcast in that minute there, in that second there").
The students demonstrated their competence and explained to the group (including the teachers and researchers) the specific features of social media networks.
The second sub-theme included how and why they use social media networks and it was clear that the students were perfectly aware of how to use them.
During the meeting we reflected together on the potentials and risks of the social digital media and as a result it proved extremely important to make use of some orientation metaphors (e.g. "It's as if you were three years old and you were alone in New York traffic, you don't know the risks, you don't know the orientation signs in traffic. What do you do? Do you go alone or do you let an adult guide you?").
Thanks to orientation metaphors they reflected about, not only the capabilities ("I can use social media to make other people understand what heritage is"; "I can keep in touch with my distant relatives and talk to them"), but also the risks and the need to be responsible for what they write. In fact the children reported "I learnt the importance of privacy" "I learnt that you have to use social media. You have to put your mind on it"; "You have to be responsible, you can't just write what pops into your head").
Finally, the analysis of the data reveals the relationship with parents in a twofold aspect: on the one hand, we note the intervention of parents when children had negative experiences ("I get people I don't know and then something bad came out and I told my mum and then I deleted it"), on the other hand we note an intention to

build an alliance with their children towards using social media networks properly ("Sometimes I get a post with my mum on her profile and we decide together what to write").

4.2 The ability to interact in a group, understanding different points of view

The second category refers to quotations related to the ability to interact in a group and to feel part of it in order to share meaningful learning experiences. It includes two labels: "share thoughts and desires" and "acquaintance with the classmates".

During the meeting, the class group took on the appearance of a "space of democracy" in which learners experienced processes of decision-making, participation and cooperation (Santerini, 2010) that enabled them to learn to work in groups, to make others' representations their own and to share questions, their possible answers and desires ("I learned how to work together and we shared desires"). Expressing their own ideas and embracing those of their classmates allowed the learners to experience a dimension of listening and respecting the different points of view that emerged during class discussion and expand their knowledge ("the others said it inspired tranquillity to them and Michael said he would go wild on the Dolomites").

Cooperation is a fundamental aspect in the social and moral growth of learners and in the processes of knowledge construction (Negri, 2007, p. 210). When children have the opportunity to work in groups guided by adults capable of exercising a mediating role, they learn more easily to argue their points of view and at the same time to exercise critical and flexible thinking that leads them to modify their initial assumptions in order to co-construct new knowledge. In this case, the co-construction of knowledge required the contribution of the whole group of learners and was based on a process of explication and negotiation of meanings (ibidem, 2007) about the concept of heritage, about the experience the students had about it and about the possibility of using digital and social network tools to spread it responsibly. They were thus able to discover worlds and cultures unknown to them and broaden their mental horizons by processing and making others' experiences their own ("I got to know new things about my classmates their origins, a typical food I didn't know").

4.3 Belonging to a community

The third category reports students' quotations related to their sense of community. It includes two labels: "belonging to the local community" and "cultural tradition of cultural origin".

Through the pictures proposed by the trainers, the students shared a sense of belonging to the Cesano Boscone community. They were able to recognise and remember the places they used to attend before the Covid-19 pandemic: the parks

where they went to play, the square, the cinema; places that have aroused in them memories of experiences lived with friends or family members; places, thus, where they have recognised themselves as subjects belonging to the same community ("we used to go to all these places in Cesano Boscone"), places in which they have intertwined meaningful relationships and lived interesting experiences ("the winter homework space in Cesano Boscone was nice because you could see the snow from the windows and some days they sold roasted chestnuts, we bought them and ate them together'"); and, finally, places that have a history, like the one told by the grandfather of a student, native of Cesano Boscone who narrated his personal and family history intertwining it with that of the city.

Knowledge of both material and intangible heritage and local and global heritage through the photographs presented by the trainers enabled the students to develop an intercultural perspective by countering stereotypes and prejudices (Bortolotti et al., 2008). In some cases, the pictures enabled some students to recognize the cultural traditions of their country of origin and share them with classmates ("The dervish dance is from my country [Siria], so I like it a lot, because I used to do it when there were celebrations").

4.4 A sense of responsibility towards a common heritage

The last category includes quotations related to the definition of heritage itself that students had developed during the project implementation.

As we've already shown, students faced the concept of cultural heritage through the observation of some pictures first, then describing and drawing their own heritage, sharing their beloved places, in Cesano and around the world, and finally comparing them during conversations in the classroom with those of their schoolmates and their teachers.

Their first ideas of heritage were connected to experiences, memories, emotions, and aspirations, and i.e., objects with sentimental value, linked with family history as typical dishes or holiday places. It emerged that cultural heritage for most of them has a private character and it belongs to their personal sphere.

They had then been supported in building a shared idea of heritage, to co-construct heritage as a common good, towards a community dimension ("I learnt what heritage is, you think it is a picture, instead it's much more and it belongs to everyone"). It has been a fundamental process on one hand to go further the idea of tangible towards the idea of intangible heritage ("It is also a habit. This habit could become heritage") – some of them state i.e. that friendship is a common heritage – and on the other hand to assume the awareness that heritage has to be "protected" ("I think we also learnt how to be careful with heritage and how to protect it"). This awareness led us to the concept of responsibility towards cultural heritage, as a legacy to be preserved and transmitted to future generations.

One of the 6th grade classes had written, with the supervision of the music teacher, what they named "The heritage rap" that goes "*il patrimonio culturale è qualcosa che ti prende, più lo guardi e più vale, non si compra e non si vende*" [cultural heritage is something that grabs you, the more you look at it, the more it is worth, it cannot be bought or sold].

5 CONCLUSIONS

Main successful factors relate to a participatory and shared design, between teachers and trainers, of the path proposed to the classes, based on a context needs analysis (Nigris, Balconi & Zecca, 2019) to address "socially vivid matters" (Legardez, 2007) within the schools' social environment. The activities have been redesigned with the student voice contribution (Grion & De Vecchi, 2014) that supported the idea of heritage as a vehicle to promote a sense of community belonging and responsibility towards the heritage itself (Bortolotti et al., 2008).

The students first built an idea of heritage linked to their experiences and feelings, and also shared it with their peers, and then decided to communicate it through a variety of languages they were familiar with.

In addition, addressing students from different cultural backgrounds, the project approaches heritage from an intercultural perspective, enhancing their own culture and traditions and putting them in dialogue with others.

The project has promoted transversal citizenship skills in the pupils involved, and in particular:

- students' digital skills through the acquisition of awareness of the potential and risks of digital tools and media;
- intercultural competences;
- responsibility towards a shared heritage;
- interpersonal skills;
- acquisition of disciplinary knowledge.

The perception of the project's educational impact shows a coherent relationship between the objectives that guided the design work and the learning outcomes that emerge from the analysis of the classroom activities.

As the teachers' focus group analysis highlighted, the project also supported the teachers' professional development, mainly reflexivity about their own teaching practice, class management and listening skills, inclusion and teamwork (Fredella, Bosatelli & Mosconi, 2022).

Research follow-up will compare these initial results with the analysis of the tools used by trainers and of the focus groups with teachers, in order to provide an evaluation from different viewpoints and an overall, multi-perspective picture of the project.

REFERENCES

Agosti, A. (2006). *Gruppo di lavoro e lavoro di gruppo. Aspetti pedagogici e didattici.* Milano: FrancoAngeli.

Audigier, F. (2002). Concetti di base e competenze-chiave per l'Educazione alla Cittadinanza Democratica. *Scuola &Città, 1*, 156-182.

Balibar, É. (2012). *Cittadinanza*. Torino: Bollati Boringhieri.

Bezzi, C. (2010). *Il nuovo disegno della ricerca valutativa*. Milano: FrancoAngeli.

Boccia Artieri, G. (2012). *Stati di connessione. Pubblici, cittadini e consumatori nella (Social) Network Society*. Milano: FrancoAngeli.

Bortolotti, A., Calidoni, M., Mascheroni, S., & Mattozzi, I. (2008). *Per l'educazione al patrimonio culturale. 22 tesi*. Milano: FrancoAngeli.

Charmaz, K. (2016). The Power of Constructivist Grounded Theory for Critical Inquiry. *Qualitative Inquiry, 23(*1), 34-45. https://doi.org/10.1177/1077800416657105

Colombo, M.E. (2020). *Musei e cultura digitale: fra narrativa, pratiche e testimonianze.* Milano: Editrice Bibliografica.

Corsaro, W.A. (2003). *Le culture dei bambini*. Bologna: Il Mulino.

Di Genova, N., & Fredella, C. (2022). Citizenship Education as a Vehicle for Social Equity: An Analysis of Law 92/2019. *Formazione & insegnamento, 20*(1), 651-663.

Fabbri, M., & Soriani, A. (2021). Le sfide della scuola in una società complessa. Educare alla cittadinanza digitale per la costruzione di una cultura della democrazia. *PEDAGOGIA OGGI*, *19*(2), 54-63.

Fredella, C. (2022). *Educazione alla cittadinanza e didattica della storia. Territorio e patrimonio culturale per formare al futuro*. Junior.

Fredella, C., Bosatelli, S., & Mosconi, G. (2022) , Citizenship education in the age of social networks: participatory evaluation and teachers' professional development, *RicercAzione*, *14*, vol. 2.

Guba, E.G., & Lincoln, Y.S. (1989). *Fourth generation evaluation*. Newbury Park, CA: Sage.

Grion, V., & De Vecchi, G. (2014). Il ruolo di bambini e bambine nei processi d'insegnamento-apprendimento: Student Voice e leadership educativa condivisa. *Educational reflective practices*, *1*, 30-46.

James, A. (1996). Learning to be friends: Methodological lessons from participant observation among English schoolchildren. *Childhood, 3*(3), 313-330.

Jenkis, H. (2010). *Culture partecipative e competenze digitali. Media education per il XXI secolo*. Milano: Guerini.

Krippendorff, K. (2004). *Content Analysis: An Introduction to Its Methodology* (2nd ed.). Thousand Oaks, CA, Sage.

Legardez, A. (2017). Propositions pour une modélisation des processus de didactisation sur des Questions Socialement Vives. *Sisyphus*, 1-22.

Marinelli, A. (2021). Educare alla cittadinanza digitale nell'era della platform society. *Scuola democratica*, *12*(speciale), 121-133.

Mascheroni, S. (2009). Educazione al patrimonio culturale e cittadinanza europea nel contesto italiano in dialogo con l'Europa. In R.M. Avila, B. Borghi, I. Mattozzi (a cura di), *L'educazione alla cittadinanza europea e la formazione degli insegnanti. Un progetto educativo per "la strategia di Lisbona"*, (pp. 363-372). Bologna: Patròn Editore.

Mezirow, J. (1990). *Fostering critical reflection in adulthood*. San Francisco: Jossey-Bass.

Mortari, L. (2009a). *Ricercare e riflettere: la formazione del docente professionista*. Roma: Carocci.

Mortari L. (a cura di) (2009b). *La ricerca per i bambini*. Milano: Mondadori Università.

Mortari, L. (a cura di) (2010). *Dire la pratica. La cultura del fare scuola*. Milano: Bruno Mondadori.

MIUR, (2017). *Piano Nazionale Scuola Digitale*.

Negri, S. C (2008). Il lavoro di gruppo nella didattica. In E. Nigris, S. C. Negri, F. Zuccoli (a cura di), *Esperienza e didattica. Le metodologie attive*, (pp. 209-247). Roma: Carocci.

Nigris, E., Balconi, B., & Zecca, L. (2019). *Dalla progettazione alla valutazione didattica*. Torino: Pearson.

Pastori, G. (2017). *In ricerca. Prospettive e strumenti per educatori e insegnanti*. Parma: Spaggiari-Junior.

Perfetti, S. (2015). Nuovi Media e Cittadinanza Digitale. La scuola del ventunesimo secolo come luogo per la democrazia. *Ricerche di Pedagogia e Didattica – Journal of Theories and Research in Education*, *10*(2), 131-143.

Rivoltella, P.C. & Rossi, P.G. (a cura di) (2019). *Tecnologie per l'educazione*. Milano-Torino: Pearson.

Rivoltella, P.C. (2021). *La Scala e il tempio. Metodi e strumenti per costruire comunità con le tecnologie*. Milano: FrancoAngeli.

Santerini, M. (2010). *La scuola della cittadinanza*. Roma-Bari: Laterza.

Tarozzi, M. (2008). *Che cos'è la grounded theory*. Roma: Carocci.

Trinchero, R. (2002). *Manuale di ricerca educativa*. Milano: FrancoAngeli.

Vuorikari, R., Kluzer, S. & Punie, Y. (2022). *DigComp 2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills and attitudes*. Publications Office of the European Union.

DOES THE EARTH NEED A DOCTOR? STIMULATING THINKING SKILLS ABOUT SUSTAINABILITY THROUGH PHILOSOPHICAL DIALOGUE

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ABSTRACT

Education for Sustainable Development (ESD) is playing an increasingly prominent role in curricula. Although many sustainability issues are inherently linked to science and technology, attention to ESD is in Flanders far from a well-trodden path. In the ongoing "Ecozoo"-project, a teaching method is developed following the principles of design-based research, in co-creation with primary and secondary schools as well as teacher training programs. The goal is to stimulate implementation of ESD among (student) teachers and to increase their didactic skills to address it. We focus upon three competences central in thinking about sustainability: system thinking (holism, thinking from a large framework), value thinking (pluralism, questioning one's own value framework), and action thinking (sustainability attitude development). As sustainability issues do not have unequivocal answers, the method relies on philosophical teaching methods to let 10- to 14-year-old pupils think about sustainability. Observations and teacher interviews suggest that this teaching method is promising and stimulates explicit system, value and action thinking. The safe space that is created by allowing multiple perspectives stimulates creative and critical thinking. However, the approach poses some challenges, such as the shift from the teachers' role as a knowledge authority to conversation moderator.

INTRODUCTION

Education for Sustainable Development (ESD) has the goal to strengthen students' ability to cope with sustainability issues, such as climate change or reduced biodiversity (UNESCO, 2020). By impulse of the United Nations (UN, 2012), ESD is playing an increasingly prominent role in curricula in primary and secondary education (e.g., Flemish Parliament, 2011). Although many sustainability issues are inherently linked to school subjects such as science, opportunities to work on ESD in the classroom are often yet to be seized. Overall, teachers indicate difficulties with implementing the complex concept of ESD in their class practice (Borg et al., 2013). In addition, sustainability questions are complicated real-world problems often lacking unambiguous answers, leading to challenges for teachers. An approach focusing on philosophical dialogue about ESD is promising, as this didactic approach can help students explore different perspectives on ambiguous topics (De Schrijver et al., 2018).

In this study, a teaching method is developed to stimulate the ESD competences of 10- to 14-year-olds. As a response to the perceived complexity of the concept, we focus on three of the key competences of ESD that have emerged from the literature: system thinking, value development, and sustainability attitude development. To deal with the lack of clear answers, the teaching method is inspired by philosophical dialogue, as traditional top-down monological teaching approaches appear to be insufficient to deal with ESD issues (Marcussen et al., 2021). Philosophical dialogue, in which children search for answers under the guidance of a moderator, seems promising to promote student's skills with scientific reasoning (Osborne, 2010).

THEORETICAL BACKGROUND

System, value, and action thinking

Three key competences within ESD are system thinking, value development and sustainability attitude development (Boeve-de Pauw et al., 2015). In line with the term system thinking, we coined the latter two competences respectively value thinking and action thinking.

(I) *System thinking* includes the ability to distinguish variables in a system, determine relationships between variables, and estimate the uncertainty of prediction and to differentiate causes and effects (Riess & Mischo, 2010). System thinking requires to holistically analyse a problem and think in a larger context (Turner et al., 2003). System thinking is not easy and has to be explicitly cultivated (Hung, 2008).

(II) *Value thinking* refers to developing, researching, and questioning your own value framework with regard to sustainability in a conscious and reasoned way. Value thinking also includes being able to question certainties and identifying other individuals' beliefs (Boeve-de Pauw et al., 2015). Thus, central is the recognition and acknowledgement of multiperspectivity (e.g., De Kraker and Lansu, 2007). Sustainability issues are called 'wicked' as values influence the problem definition and solution (Remington-Doucette et al., 2013). Integrating multiple perspectives into one's viewpoint is primordial in sustainability literacy (UNESCO, 2020).

(III) *Action thinking* entails the reflection about one's actions and attitudes towards environmental and sustainability issues, as well as the effort someone would make to change behaviour (Wilson, 2014). Action thinking involves the identification of possible solutions, the recognition of barriers to change, and how much one is willing to change to overcome these barriers.

A dialogical teaching method

In a philosophical dialogue, students explore philosophical questions together in a group under the guidance of a moderator (Brenifier, 2004). In this 'community of inquiry', students try to find possible answers for which there are no unambiguous answers (Lipman, 2003). The creation of doubt leads to research, questioning, and argumentation (McGuiness, 2000).
Therefore, an approach with attention to dialogue and philosophizing seems to be a promising path to work on ESD, and the three key ESD-competences in particular. More specifically, philosophizing allows children to research multiple perspectives on complex questions (Lipman, 1991), to explore their own views and attitudes about the environment (Dombayci, 2014) and to expose value conflicts at the intersection of people, society and technology (De Schrijver et al., 2015; Sprod, 2001).

RESEARCH QUESTIONS

The following research questions guide our study:

RQ1: Which *design principles* must the method meet to stimulate ESD skills by engaging in philosophical dialogue, in particular students' system, value, and action thinking?

RQ2: What is the *attitude of teachers* regarding the teaching method?

RQ3: To what extent does the method influence students' *system, value, and action thinking*?

RESEARCH DESIGN

Design

The project deploys an *Educational Design Research* (EDR) methodology (Plomp & Nieveen, 2010) to develop the Ecozoo-teaching method. In subsequent cycles, the didactic material will be developed, tested, evaluated and adjusted to create a well-founded practice-oriented methodology. The feasibility and usability of the material are evaluated, and theoretical insights about this intervention are explored (McKenney and Reeves, 2021). After interviewing experts in the field of ESD and dialogical teaching methods, two parallel studies are performed to develop the teaching method. In the first study, the method is tested in classes (n=24) in primary and secondary education via two (2022-2023) or three (2021-2022) sessions by a professional researcher-moderator. After these sessions and a specific workshop for teachers, the teacher-moderator implements the learning materials in class. A parallel, second study is also performed in teacher training programs to develop the teaching method (this data will not be used and thus described in this paper). We performed *Directed Content Analysis* (Hsieh & Shannon, 2005) on field notes collected by the researcher-moderator and semi-structured teacher interviews (n=17) executed by another researcher, to answer the research questions. The research culminates in a toolkit for teachers and guidelines for stimulating ESD among 10-14 year-olds.

RESULTS

Design criteria

The field notes and interviews during tryouts have led to a list of seven design principles that guided the development of the learning method. With regard to the design principles (RQ1), the method should:

(a) Generate argumentation in pupils through dialogue and philosophical exercises. Prompts such as thought experiments or classification exercises can help to create doubt in students and let students provide arguments for their ideas.

(b) Shed light on multiple perspectives on the same problem. Open questions are key to attain this goal.

(c) Create an open, safe context that allows students to express and explore different values.

(d) Stimulate (the combination of) system, value, and action thinking among students. This means learning material and reflection questions needs to be developed scaffolding students' thinking skills. A dialogic approach where students engage in conversations about the sustainability questions helps students to expose their thinking process.

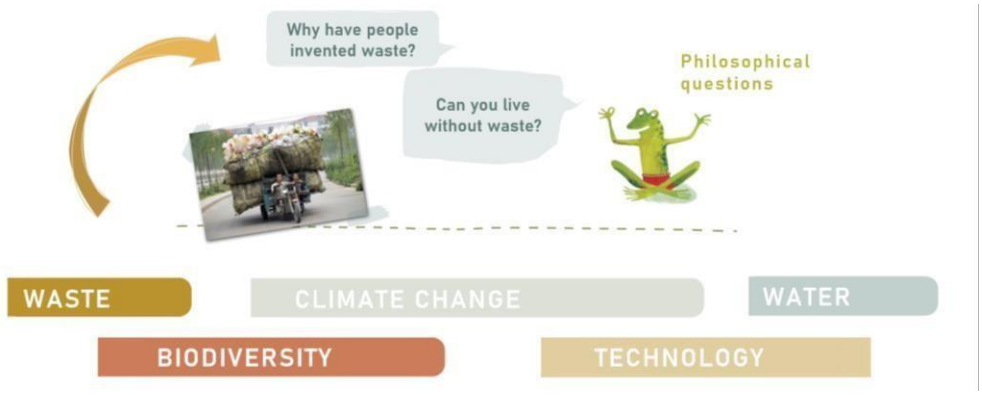
(e) Include a set of exercises that vary in level of difficulty, for both students and teachers. Teachers who are less experienced in guiding a dialogue should also be able to apply the teaching method.

(f) Train teachers in dialogue techniques.

Development of the teaching method

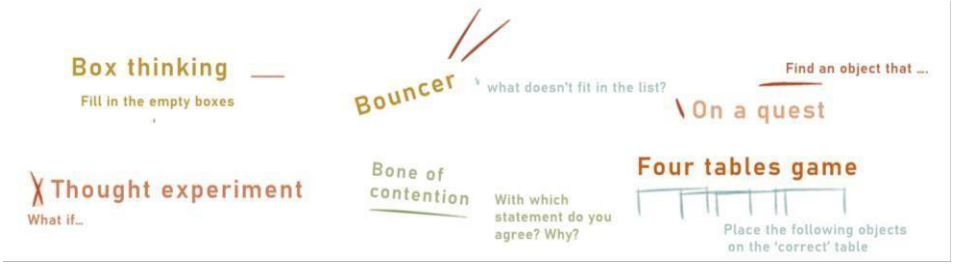
The design criteria led to the development of philosophical questions in five (climate, biodiversity, water, waste, and technology) themes (see Figure 1).

Figure 1. The five themes within ESD of the Ecozoo-method (incl. Examples of philosophical questions)



In addition, we developed more than 15 types of learning activities based on dialogue, to also appeal to teachers who have to expertise in philosophical dialogue. In Figure 2, some types of learning activities are listed, such as 'thought experiments or 'on a quest'.

Figure 2. Some types of learning activities



Although the exercises differ on certain parameter, such as mode of communication (oral-written), position (sitting or standing) and context (in the classroom or outside), they all form the stimuli to start a dialogue with the class group. In Figure 3, 4 and 5, three examples of learning activities in different themes are illustrated. These learning activities were adapted in reaction to the try-outs. For example, exercises that make the thinking visible particularly led to higher student engagement in the dialogues. For example, two opposing quotes (e.g., see figure 3) are put on the other sides of a line and each student stands according his agreement with these quotes. The moderator asks some students to argue their position, meanwhile the other students may change position when their opinion is adjusted. In this way, all students can 'see' the thinking of each other by taking positions in space.

Figure 3. Example of the learning activity 'bone of contention' on water

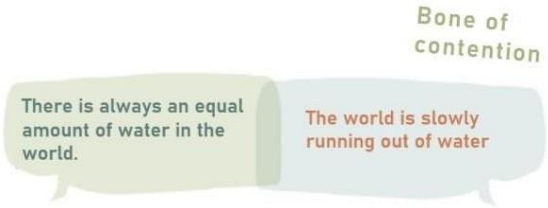


Figure 4. Example of the learning activity ’on a quest’ on waste

Figure 5. Example of the learning activity ’box thinking’ to stimulate system thinking about biodiversity

Box thinking

What is the consequence for	you	The people	nature	general happiness
half of the animals and plants become extinct				
animals get the right to vote				
All landscapes become the same				
Viruses become extinct				

Teachers’ attitudes

With regard to the teachers’ attitudes (**RQ2**), teachers find the material activating and visually appealing. The approach challenges traditional teaching methods, and students especially like the safe space that is created by allowing multiple perspectives. Teachers saw the benefits of reducing their speaking time and act as a moderator in the classroom

Often the solutions do not come from the children but are rather imposed. By philosophizing with EcoZoo, we create children who learn to 'see' problems themselves and who can come up with creative and critical solutions.

– Primary school teacher

However, teachers don't always have it easy with their shifting role from knowledge authority to moderator, especially when the dialogue is characterized by off-topic conversations, a lack of flow, or logical fallacies. Insufficient language skills of students are regularly stated as a challenge for implementation, however, philosophizing also turns out to be an empowering approach to get these children to talk.

Teachers acknowledge how philosophical questions stimulated students' thinking? When the researcher-moderator gave an Ecozoo-session, teachers were highly enthusiastic. However, when their role shifted from the spectator to the moderator, most teachers experienced a low sense of self-efficacy when the philosophical questions were used. The hands-on philosophical exercises tend to empower the teacher more in using dialogical teaching methods to stimulate ESD.

System, value and action thinking through the EcoZoo

With regard to RQ2, teacher interviews suggest the method results in learning gains and strengthens substantive involvement for sustainability. Students identify problems themselves and come up with creative solutions and arguments (bottom-up).

Teachers indicate that system thinking surface, as is illustrated by the quote below:

"*That [one exercise] caused certain obvious walls to crumble in their own heads. Looking from a different perspective was encouraged…first look from your own perspective and then from a world perspective."*

- Teacher 8th grade

The theme of sustainability, however, is complex and poses challenges for this age group to map all relationships.

Teachers also identified a positive impact of value thinking in class.

"I found the conversation about marrying robots surprisingly rich because they went deeper than I would have thought. For example, because several children start talking about programming. You cannot program love and loving. That is a good example of value thinking."

- Teacher 5th grade

And multiperspectivity, which is key in ESD, also seem to be stimulated, as the researcher-moderator wrote down a quote of a student who expressed what she learned that lesson:

[I learned] That everyone has a different opinion and not always the same. And that many fellow students are smarter than I thought.

– 6th grader

In addition, teachers also acknowledged how the EcoZoo-method is more able to lead to action thinking than more traditional approaches in school, as exemplified by this quote:

We needed a new approach. [For example,] The yearly project week on waste, we keep trying the same things. Actions around lunch boxes or garbage on the playground. [Imposed] from the school, from top to bottom. […] while you want to create a movement in the heads of the children themselves. There was a lot of enthusiasm among the children [during the EcoZoo session].

- *Teacher 6th grade*

However, socially desirable answers were common in some themes (e.g., climate change), making teachers questioning if arguments will be turned into action.

DISCUSSION

Under the impulse of the UN (2015), ESD is playing an increasingly prominent role in attainment targets and curricula. Preparing young people to conduct discussions about waste, energy, or food, and understand how values like affordability, health, and fairness play a role, is becoming more urgent by the day. Sustainability issues crystallize at the intersection of economic, social, scientific and technological fields, which can be out of the comfort zone for many teachers (Borg et al., 2013). This innovative practice-oriented research project wants to provide teachers with sufficient, hands-on tools, so they can seize the opportunities and respond to these social issues.

How can you learn students and teachers to deal with these ‘sticky’ questions? In this project, we aim attention at the stimulation of students’ critical thinking on ESD, with a focus on system, value, and action thinking (Boeve-De Pauw et al., 2015). Bringing philosophical dialogue into the classroom seems promising to stimulate ESD competences. In co-creation with experts and (student-) teachers, the process of gradually adapting and fine-tuning the didactic approach has led to the Ecozoo-method, including philosophical questions, philosophical learning activities, and conversation tips for teachers.

> Dialogue is perceived as a successful instrument to think with students about sustainability. The approach is less ‘schooly’ and teachers indicate how key

competences in ESD are trained. Students learn how to see problems and possible solutions themselves – instead of being handed to them. The safe context created in philosophical dialogue stimulates creative and critical thinking. Students perceive the context as safe because the focus is not on giving the 'right' answer to a question, but on expressing and exploring possible argumentations. However, sometimes this philosophical approach also leads to confusion or doubt among students, which teachers want to 'fix'. Teachers indicate the struggle of staying in the role of moderator during the exercise and not switching to their more familiar role of knowledge authority (which would threaten the 'safe' context). Therefore, a challenge for teacher education is to introduce a questioning and inquiring attitude throughout the training. In addition, teachers express a certain unease during Ecozoo-lessons, because they experience a sense of diminished control. Nevertheless, the sustainability challenges that our societies face call for teachers to deal with 'uncertainty'. We advise that teacher training programs should not only focus on a top-down transfer of knowledge with regard to sustainability, but include how a dialogical approach can benefit students' insights and learning in ESD.

The method also poses some challenges. With a focus on stimulating students thinking, one can pose the question 'Is critical thinking enough for ESD?'. Many teachers coupled Ecozoo-exercises afterwards with top-down lessons in which they tailored the lesson to students' knowledge gaps or preconceptions that came across during the dialogues. In addition, a challenge still lies in how we can measure critical thinking about sustainability, whether it is to investigate this learning outcome as a researcher, or to evaluate it as a teacher. In this paper, we focused on teacher perceptions of the impact of Ecozoo on the ESD-competences of students, but a next step is planned by analysing dialogues of students and categorising different thought movements.

REFERENCES

Boeve-de Pauw, J.; Gericke, N.; Olsson, D.; Berglund, T. The Effectiveness of Education for Sustainable Development. Sustainability 2015, 7, 15693–15717.

Borg, C., Gericke, N., Höglund, H. O., & Bergman, E. (2014). Subject-and experience-bound differences in teachers' conceptual understanding of sustainable development. *Environmental Education Research*, *20*(4), 526-551.

Brenifier, O. (2004) A quick glance at the Lipman method, Paris: Diotime - l'Agora.

De Kraker, J., & Lansu, A. (2007). Competences and competence-based learning for sustainable development.

De Schrijver, J., Cornelissen, E., Van de Keere, K., Vervaet, S., Vandebeek, C. (2015) Weten over weten: nature of science in het wetenschapsonderwijs. Jaarboek van de biologie, VOB.

De Schrijver, J., De Poorter, J. , Cornelissen, E. Anthone, R. (2018). Can a rabbit be a scientist? Pilot study on the introduction of philosophical dialogues in Flemish science classes. I: J. García, F; Duthie, E. y Robles, R. (Ed.). Parecidos de familia. Propuestas actuales en Filosofía para Niños / Family ressemblances.Current proposals in Philosophy for Children. Madrid. Anaya. 2018. 614 p.

Dombayci (2014) Teaching of environmental ethics: caring thinking. Journal of Environmental Protection and Ecology 15 (3): 1404–1421

Flemish Parliament (2011). Vlaamse strategie duurzame ontwikkeling. https://docs.vlaamsparlement.be/docs/stukken/2010-2011/g1132-1.pdf

Hung, W. (2008), "*Enhancing systems-thinking skills with modeling*", *British Journal of Educational Technology*, Vol. 39 No. 6, pp. 1099-1120.

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative health research*, *15*(9), 1277-1288.

Lipman, M. (1991) Rediscovering the Vygotsky Trail. Inquiry: Critical Thinking Across the Disciplines 7(2): 14-16.

Lipman, M. (2003). Thinking in education (2nd ed.). Cambridge: Cambridge University Press.

Marcussen, E. H., Weiss, M., & Helskog, G. H. (2021). How Philosophizing the Dialogos Way Can Promote Education for Sustainable Development. *Teacher Education in the 21st Century-Emerging Skills for a Changing World*.

McGuiness, C (2000) Acts: a methodology for teaching thinking across the curriculum. Teaching Thinking, 2, pp. 1-21.

McKenney, S., & Reeves, T. C. (2021). Educational design research: portraying, conducting, and enhancing productive scholarship. *Medical Education*, *55*(1), 82-92.

Mercer, N., Howe, C. (2012). Explaining the Dialogic Process of Teaching and Learning: The Value and Potential of Sociocultural Theory. *Learning, Culture and Social Interaction.* 1, 12-21.

Osborne, J. (2010), Arguing to learn in science: The role of collaborative, critical discourse. Science, 328(5977), 463-466.

Plomp, T., Nieveen, N. (2007) An introduction to educational design research. Netzodruk, Enschede.

Remington-Doucette, S. M., Hiller Connell, K. Y., Armstrong, C. M., & Musgrove, S. L. (2013). Assessing sustainability education in a transdisciplinary undergraduate course focused on real-world problem solving: A case for disciplinary grounding. *International Journal of Sustainability in Higher Education*, *14*(4), 404-433.

Riess, W. & Mischo, C. (2010) Promoting Systems Thinking through Biology Lessons, International Journal of Science Education, 32:6, 705-725.

Sprod, T. (2001). Philosophical Discussion in Moral Education. London: Routledge

Turner, B.L., Kasperson, R.E., Matson, P.A., McCarthy, J.J., Corell, R.W., Christe nsen, L., Eckley, N., Kasperson, J.X., Luers, A., Martello, M.L., Polsky, C., P ulsipher, A. and Schiller, A. (2003), "*A framework for vulnerability analysis in sustainability science*", *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 100 No. 14, pp. 8074-8079.

Unesco (2020) *Education for sustainable development: a roadmap*. Unesco: France. UNESCO: Paris, France; pp. 1–68.

United Nations (2015). https://sustainabledevelopment.un.org/post2015/transformingourworld

Wilson, C. R. (2014). Measuring the Effectiveness of Education for Sustainable Development Interventions for Effecting Change in Knowledge, Attitude and Behaviors toward Sustainable Development. (Doctoral dissertation). Retrieved from http://scholarcommons.sc.edu/etd/ 2690

GUIDELINE FOR AN EFFECTIVE DIGITAL PEDAGOGICAL SETUP: A FIRST SERVICE

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ABSTRACT

This paper presents a theoretical perspective on instructional quality of self-guided e-learning modules for in-service teachers. The goal is to translate classroom-based guidelines into fully digital environments. We want to achieve this as we integrate concepts of teaching quality and epistemic approaches in order to find higher-order components of a digital pedagogical design. In addition, we will present an operationalization of how the components can be used to evaluate digital learning modules. After a review of teaching quality research and ideas to translate classroom-practice to digital learning we re-aligned practical advice with educational-psychological knowledge and incorporated digital didactical views in a qualitative coding framework. In a consensual expert coding procedure we developed semantic maps and found five dimensions of high quality digital self-learning environments: Learner activation and competence orientation, Information transmission and presentation, responsiveness and communication of the system, Prompts toward student attention, and Strategies. The dimensions can be categorized in "engagers", which include basic requirements to achieve a good quality level and "accelerators", which will improve the learning efficacy of the learning environment.

INTRODUCTION

Whenever adults use a self-guided digital language training programme they are brought to a virtual environment that was developed by programing experts. But it is hard to find out how the tool has been influenced by a pedagogy to learn or an andragogy to provide adults with a motivating learning experience. When you enter a MOOC (Massive Open Online Course) for, it happens that you end up as a passive recipient (Margaryan et al., 2015a). To our knowledge, only few digital tools use instructional quality as developmental guideline. This is why we want to address quality components of tomorrow's self-guided (online) learning.

Technologically supported self-guided learning has already been posited by Skinner (1958) and Keller (1968) who proposed that good learning with a machine can be achieved if the system allows for individualized learning and active work on the subject together with immediate feedbacks and responses from the machine in order to evaluate the level of mastery and progress (as cited by Blair & Shawler, 2020). More recent conceptions incorporate similar ideas of pedagogy and quality standards within technical systems (Frydenberg, 2002; Brown & Voltz, 2005; Laanpere et al., 2014), but still most researchers rely on an entirely classroom-based conception of pedagogy.

It has become intuitive that terms like *constructivist learning* refer to a school classroom pedagogy. Yet, learning theories and learning epistemologies such as experiential or problem-based learning; constructivism, or cognitivism are fully applicable to adult learners (König, 1986; Wittpoth, 2003; Belanger, 2011).

Similarily, classroom-based learning needs to be transferred to a digital age. Traditional instruction often refers to the didactic triangle, or pedagogical triangle. Teaching consists of subject, teacher and learner. The three elements of teaching are interrelated (Reinmann, 2020). The role of the teacher is to define the subject matter by setting objectives and the material to be covered. The learners' role is to engage with the subject matter, to understand it and to learn it. Communication between the learners and the teacher plays an important role. The teacher's task is to support the learners in their learning and understanding (Reusser, 2009).

In adult online self-guided learning environments, one needs to address the same phenomena (subject, teacher, learner), but what do we need to consider if the content is just digital, if the teacher is a machine or if the learner is an adult person? In this paper we try to leverage regular classroom-based instructional knowledge and transfer it to adult online self-guided learning environments.

APPROACHES TO LEARNING AND INSTRUCTION

Traditional Classroom Teaching

In a cognitivist-constructivist perspective, learning means activating individual, active knowledge construction through learning opportunities. Within an active-constructive process, competencies can be fostered in learners on the basis of complex, realistic and challenging problems by working on them interactively and completing them in a self-responsible manner. Thus, the involvement of the learners as well as the design of the learning opportunities and their quality play an important role, such as the clarity of the task, the objectives, the competence development levels, etc. (Van Merrienboer & Paas, 2003). Another aspect of effective learning support is the consideration of motivational variables in the learning process. Making the learning object interesting and showing its relevance in a comprehensible context increases active information integration (Tulodziecki et al., 2004). The variables clarity, goal reference, interestingness, and relevance can thus contribute to that knowledge being used in an active-productive way. In this context instructional quality comes into play.

Instructional quality equals the extent to which skills and information are taught in a way that students can learn them easily. Instructional quality predominantly correlates with the curricular quality and the concrete instructional design (Slavin, 1997 in Helmke & Schrader, 2008). Widely received answers to the question of how to design good instruction is provided by several authors.

a) Helmke (2006, 2009), outlines a opportunity-use model of instruction and registers ten quality criteria: Classroom management, clarity and structure,

consolidation and summary, cognitive activation, motivation, classroom climate conducive to learning, student orientation, competence orientation, fit of instructional methods to student level, variety of offers.

b) Meyer (2003, 2021) proposes ten practical aspects of high quality instruction: Clear structuring of the lessons, high proportion of real learning time, climate conducive to learning, clarity of intentions, meaningful communication, variety of methods, individual support, intelligent practice, transparent performance expectations, prepared learning environment.

These dominant views on instructional quality criteria can be complemented by the suggestions that were made by John Hattie (Hattie, 2009) who predominantly highlights the positive effect of direct instruction as opposed to constructivist approaches (Hattie in Terhart, 2011, p. 431). This idea is not to be seen as a counterpart to a constructivist view on learning. Moreso, direct instruction can be one method to achieve effective learning. Other methods can be problem-based learning, discovery learning or inquiry-based learning. Altogether, all these methods can be enclosed into a constructivist learning theory (Koch, 2017).

Adult Education

In terms of constructivist approaches to knowledge acquisition, adults should also be granted learning as a process that is constructive, interactive-dialogical, understanding-oriented, ideally self-regulated and problem-oriented (Reusser, 2009). Thus, the pedagogy and quality criteria of school-based learning need to be transferred to adult educational contexts. However, adult-oriented pedagogy must take into account specifics and characteristics of adult learners.

School learning differs from adult learning in particular in that adults learn situationally, cooperatively, and in the context of their activities and one needs to account for the adults' life experience, cognitive abilities and motivation to learn (Knowles, 1979; Resnick, 1989) . This learning is also understood to be deep, rather than broad, in order to be practically or professionally meaningful and to develop expertise in the adult learner (Bransford et al., 1999; Gruber & Harteis, 2008). An additional difference is the importance of being allowed to bring in one's own reflexivity and self-direction into the learning process (Gruber & Harteis, 2008).

Therefore, in adult education, an individual orientation and the accompanying support of self-direction processes serve to help learners set their personal learning goals and individually metacognitively evaluate, coordinate, and organize their learning progress; teaching efforts are thus organized bottom-up. A participant orientation, a needs orientation, and an action orientation as central aspects in the design of learning settings of adult-oriented continuing education (Gruber & Harteis, 2008) in combination with the well-considered, normative integration of learning goals thus corresponds to a top-down bottom-up approach that combines needs, values, goals, and wants and provides strategically constructive learning opportunities.

Regarding the promotion of self-directed learning processes, according to the above, adults can be classified as normal learners for whom pedagogical-psychological learning theories can apply.

Blended Learning Perspective

Considering the didactic triangle, there are five aspects that need to be taken into account when designing learning environments: content, tasks, tools, communication and assessment (Petko, 2010). Online, the didactic triangle expands the possibilities of implementing teaching-learning opportunities. Each level can take place in virtual or physical space (Petko, 2010). Places where the learner-teacher relation can take place can be either physical or virtual. The places are clearly marked with an "address". In virtual space, the address is a URL. Online, the learner-teacher level only arises when both know and perceive each other (Spendrin, 2018).

Blended learning, for example, brings these two worlds together. It combines learning in a physical place with learning in a virtual place to get the benefits of both learning environments (Azizan, 2010). It promises more flexible, timely and continuous learning (Rasheed et al., 2020).

In self-guided digital learning environments, the teacher is completely absent at the time when the learners complete the course. Perceiving each other, as Spendrin (2018) suggests, is nearly impossible. But fully online settings for learning seem to work, even if sometimes criticized (ex. MOOCs) (Margaryan et al., 2015b).

Jahnke's idea of Digital Didactical Design in Cross Action Spaces implements digitality as a pedagogical (i. e. didactical) design that allows to connect the location of learning and the environment of learning. While the traditional classroom seems independent from digital or online learning environments, the Cross Action Spaces do not share a distinct border between virtuality and reality. Thus. In such a learning experience, the task of designing a learning environment becomes more complex, for the teacher in particular. Therefore, besides pedagogical methodology, also digital and technological teacher competences need to be reconsidered. Key aspects in the formation of a Digital Didactical Design learning experience are the learning goals, learning activities, process-based assessment, social relationships and the implementation of digital technologies as mind tools (Jahnke, 2015; Jahnke et al., 2017). In particular, Jahnke picks up the idea that learning activity can be aligned on an active-passive continuum that has direct instruction as the most passive student activation and self-guided learning as the most active process. This is very much in line with the idea that constructive learning includes many methods including direct instruction and discovery learning (Koch, 2017). Furthermore, a well-reflected implementation of technologies in combination with pedagogical methodology (c. f. Hutchison & Woodward, 2014) is essential for a powerful setup of the Digital Didactical Design environment.

Digital Learning Perspective

As there are no clear cut definitions of e-learning, online learning or distance learning (Moore et al., 2011) we will here refer to digital learning which is defined as "any type of learning that is facilitated by technology or by instructional practice that makes effective use of technology" (Kumar Basak et al., 2018, p. 194) and includes e-learning, online learning, mobile learning or distance learning.

One can view online learning as an alternative to on-site learning, is completely web-based and takes different forms of modalities. It can include graphics, video, discussion forums, animations, text presentations etc. The learner is free to do the course whenever and wherever he or she wants. The course can take place with or without an instructor or, if an instructor implements e-learning, it is possible that it has video lectures (Kumar Basak et al., 2018).

Al-Fraihat and colleagues (2020) evaluated the success of an e-learning system. The success of an e-learning environment is related to system quality, service quality, information quality, perceived satisfaction, use, and perceived benefits. The result of the study proposes a multi-dimensional model to evaluate digital learning environments. Each component is subdivided into subcategories (see Figure 1). The success criteria (Technical System Quality; Information Quality, Service Quality, Educational System Quality, Support System Quality, Learner Quality and Instructor Quality) each have an influence on the usefulness, the benefit, the perceived usefulness and/or the perceived satisfaction. Quality is perceived with a set of criteria. According to Al-Fraihat and colleagues (2020) a quality system should be reliable, easy to use, available, but also give the possibility to learn in different ways, to interact with peers, to foster learning etc. The quality system also considers legal and ethical aspects. The different criteria are all listed in Figure 1. Cidral and colleagues (2018) have shown that adding opportunities for collaboration between learners increases usage and perceived satisfaction. Diversity in assessments is also to be encouraged as well as a positive teacher attitude towards e-learning. Both have a positive impact on increasing learner satisfaction.

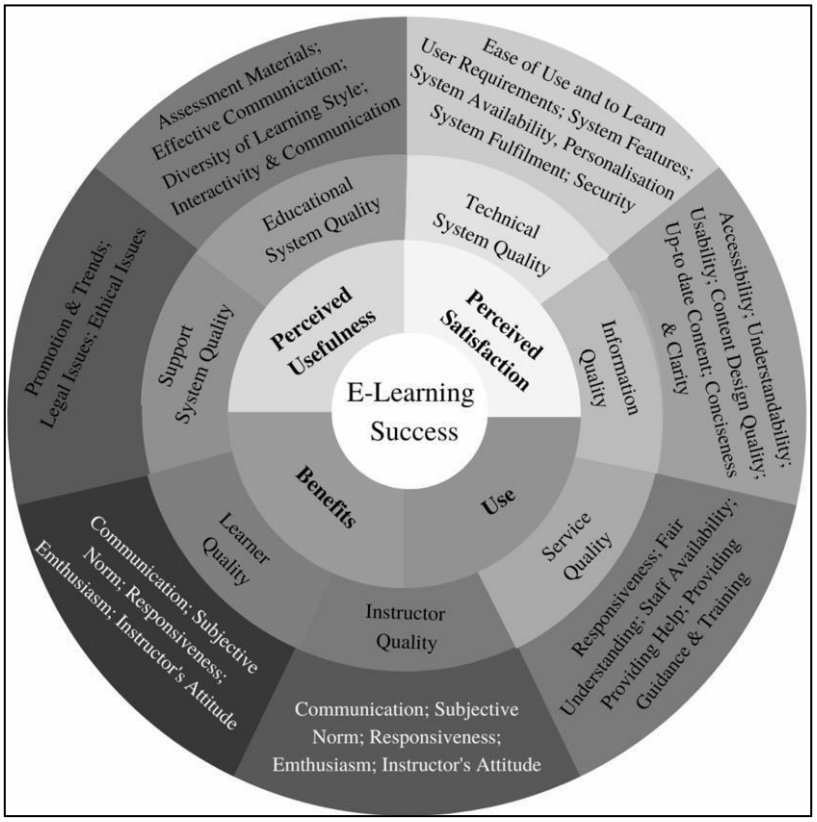

Figure 2: Multidimensional Conceptual Model for Evaluating E-learning System Success by Al-Fraihat et al. (2020)

To provide the most optimal learning support, Mayer (2020) investigated the best way to present a content through multimedia. The aim was to facilitate the learner's task by reducing unnecessary cognitive processing load and to promote the ease of understanding of the material (generative processing). Mayer assumes that people use two channels receive information: A visual-pictorial channel and an audio-verbal channel. The other assumption is the limited working memory capacity of the human being to process information at a given moment. The third assumption Mayer (2020) relies on is that of active information processing. These three assumptions lead to three criteria for optimised information reception and processing in terms of learning in an e-learning context:

1. Reducing extraneous processing with coherence by removing unnecessary elements, by signaling the important information, redundancy in narration and graphics, spatial contiguity, and temporal contiguity.

2. Managing essential processing with segmenting the information, pre-training (e. g. explaining the main definitions) and by using other modalities than only text
3. Fostering generative processing with personalization of the learning units, using a human voice (ex. it's easier to learn from informal, conversational voices and text), by choosing images that contribute to comprehension

GOALS AND RESEARCH QUESTION

From the above we formulate two goals for our study presented here: 1) transfer face-to-face and blended learning approaches to an entirely self-guided digital learning environment; 2) add to groundwork for quality criteria in self-guided digital learning tools in the field of professional development in adult learners.

These goals include two aspects which are rarely explained in the field of self-guided learning: a) facilitate quality learning without a human facilitator, and b) apply well-known teaching principles to adult learners. Therefore, the research question is "How can instructional quality criteria from traditional instruction, blended learning, e-learning and adult education be combined to form evaluation criteria for self-guided adult online learning environments?"

METHODS

Methodologically, we set up three milestones that build up on each other: Starting with an indicator extraction process, we went on with clustering the review results, and last applied the results to multiple self-guided online learning environments.

A. Indicator extraction process

As one takes a look at literature on classroom-based teaching quality one finds plenty of publications that refer to meta-studies and use indicators from those meta-studies. Finally, we performed a multivariate regression analysis

In our extraction process we went through five steps to collect data:

1. Evaluate of expert opinions about what is important in the development of a self-guided learning module for adults.
2. Search for research on meta studies about classroom teaching quality (Junker et al., 2005; Hattie, 2009; Helmke, 2017; Meyer, 2021).
3. Define constructivism as a universal pedagogical design (Koch, 2017).
4. Add quality criteria developed for a digitalized pedagogy (Jahnke, 2015) and for e-learning (Mayer, 2017; Cidral et al., 2018; Al-Fraihat et al., 2020).

B. Clustering review results

Two experts in the field of education and digitalization extracted and evaluated quality indicators and semantically correlated them. The resulting map was sent to another group of experts who submitted potential changes. It was made clear that the map - because of the semantic approach - may look different depending on the people working on it. The first draft was accepted. The map was then collapsed into analytic components and applicable indicators were designed. Their applicability was tested in seven online learning environments by two independent coders.

C. Application of indicators

All indicators were applied to online self-guided learning environments. The environments were selected on a random content basis. The most important criterion was unrestricted access to the platform. We decided to choose five platforms for adult learners and one platform for school children. All platforms were rated by two independent coders from the field of digital education, both working at universities of teacher education.

RESULTS

In the first literature review steps we found that both, constructive and direct instruction seem to be alternative ways of effective teaching (see section on traditional classroom teaching). Also, the dominant literature on teaching quality criteria (Helmke & Meyer) were found to be heavily overlapping. Both authors seem to agree that intelligent practice, consolidation, assurance, competency orientation, fit of instructional methods to student level, individual support, variation of offers, variety of methods, clarity of content, structuring and a climate conducive to learning are essential aspects of high-quality instruction. Criteria that were specific to Helmke are: Classroom management, activation, motivation and student orientation; Meyer-specific are: Transparent performance expectations, prepared learning environment, meaningful communication and high proportion of real learning time.

In the second step we reviewed indicators with reference to Koch's (2017) idea that constructivism can be seen as an overarching view on the learning process that includes direct instruction as well as self-guided learning processes. 13 additional indicators of constructivist learning were found: Students solve application problems in groups, respond situationally to current questions of everyday life, support inquiry-based learning, choose topics that correspond to the diversity of the students, discuss own solutions, discover own solutions, inquire and use the ideas of the students, respond situationally to current questions of everyday life, let the pupils experiment, connect everyday life and topics in class, assessing individual ability and adapting tasks, select tasks for concept expansion, support development of confidence in own learning.

The review of Jahnke (2015) found that the author emphasizes to develop general criteria specific to a learning or training goal that allow to evaluate the needs, potentials and adequacy of technology use. Jahnke positions her idea of instruction at the border of digitality and regular classroom teaching and proposes a technology-enhanced idea of instruction. She highlights the importance of communication, coordination and cooperation possibilities for successful learning scenarios. Furthermore, she proposes to respect the implementation of eight additional factors: intended learning outcome, process-based assessment and reflections, social relations, learning activities, technology support, desinging of and for engaged learning (e. g. show problem, then text, then collaboration), give clear structure and

consider scientific models that deal with teacher competences (TPACK, DPACK, TPACK+D etc.).

Within the context of multimedia and e-learning we considered the works of Mayer (2017), Cidral et al. (2018) and Al-Fraihat et al. (2020). In sum, we found 14 additional indicators that are directly relevant when it comes to the design of multimedia learning environments: Time behaviour, ressource behaviour, accessing shared data, learning progress, other learners and teachers, multimedia principle, quality of collaboration, information and system, instructor attitude, and learner interaction with others, diversity in assessment, effective communication, interactivity and communication, assessment of material, diversity of learning activities and information quality.

With all indicators found in the literature we moved on to compare and merge similar or overlapping ideas. Next we tried to align the indicators within semantic clusters.

In the process of clustering the reviewed indicators, we found five components of high stake quality criteria for online self-guided learning environments (see figure 1): Learner activation and competence orientation, Information transmission and presentation, responsiveness and communication of the system, Prompts toward student attention, and Strategies. The dimensions can be categorized in “engagers”, i.e. basic requirements to achieve a good quality level, and “accelerators”, which may improve the learning efficacy. The resulting guidelines include 72 indicators, all together. The number of indicators can be seen in Figure 2. A detailed list can be downloaded via the link in the appendix section at end of this paper.

The next step was to check the usability of the guidelines. Two independent coders applied the guidelines to seven freely accessible online learning environments. Each indicator was coded either “existent” or “not existent” in an event-based manner, i. e. neither the amount of appearances nor the quality played a role. There were no missings in the dataset, Cohen’s Kappas (κ) for the environments (E) were moderate to strong (McHugh, 2012): E1: κ= .74, E2: κ= .63, E3: κ= .85, E4: κ= .81, E5: κ= .79, E6: κ= .71, E7: κ= .76.

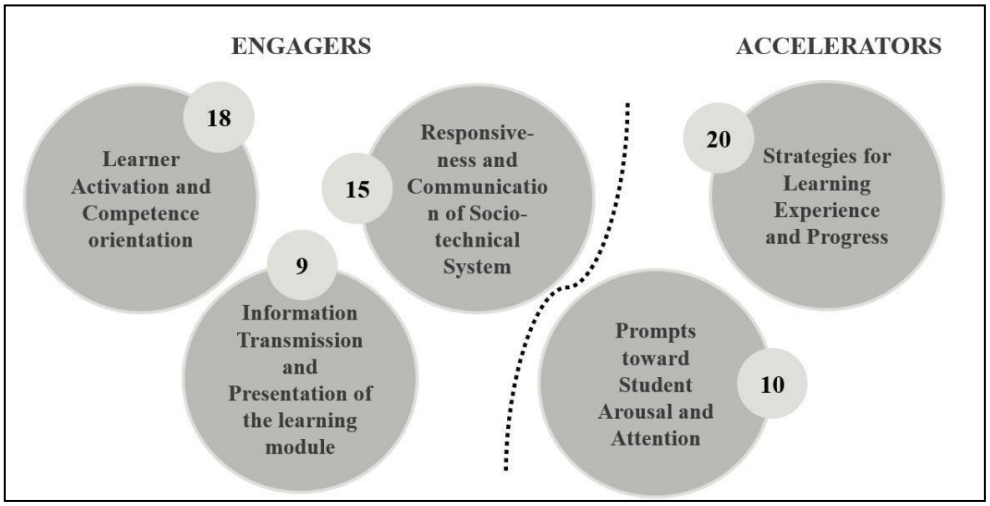

Figure 2: Components and number of indicators of quality learning experience in e-learning, number of indicators indicated in small circles

CONCLUSION

Summary

The objective of this contribution is to add a foundation of quality components of self-guided digital learning environments in the field of professional development of adult learners. Traditional classroom-based teaching quality criteria were used as a starting point to find a base line for general quality criteria in online learning scenarios. Then the criteria collection moved forward to literature that resembles blended-learning ideas and finally reviewed suggestions from the field of multimedia learning. From all fields indicators for good quality learning were extracted and aligned in a semantic clustering process.

The coding of the approaches revealed five components (learner activation and competence orientation, information transmission and presentation of the learning module, responsiveness and communication of socio-technical system, prompts toward student arousal and attention, strategies for learning experience and progress)

that can be clustered in two higher-order groups: “engagers” and “accelerators”. “Engagers” intend to obtain a proper digital pedagogical base-line setup that is practically and pragmatically satisfying for the user. “Accelerators” may leverage the learning experience and add to the learning efficacy. The engagers-accelerator dichotomy provides a basis for the construction of self-guided modules to facilitate high quality and deep learning for adult learners. It also offers a chance to transfer the indicators to a usable guideline. The test of the guideline showed adequate inter-rater reliability, so it is easy to use, but still needs additional clearity that lead to higher reliability values. The next step will be to create practical guideline profiles for self-guided learning environments that allow to evaluate their learning value.

Practical relevance

The indicators as well as the idea of engagers and accelerators may serve programmers and developers as a guideline to produce effective adult learning systems. Also, the indicators may be used as post-hoc evaluation criteria to improve existing platforms. As they are very clear and directly address specific qualities, they can be used by non-pedagogical developers as well.

Limitations

The literature is not a systematic review, but rather an informed selection. Despite the strong educational research focus, we still need to implement a larger variety of international standards in our framework. Also, our primary data coding was semantic and consensual which makes it less objective in terms of reproduction. Last, we do not have large data, yet. We were able to check the guideline’s usability with independent coders, but still large-scale usability data are needed.

REFERENCES

Al-Fraihat, D., Joy, M., Masa'deh, R., & Sinclair, J. (2020). Evaluating E-learning systems success: An empirical study. *Computers in Human Behavior*, *102*, 67–86. https://doi.org/10.1016/j.chb.2019.08.004

Belanger, P. (2011). *Theories in Adult Learning and Education.* Budrich.

Blair, B. J., & Shawler, L. A. (2020). Developing and Implementing Emergent Responding Training Systems With Available and Low-Cost Computer-Based Learning Tools: Some Best Practices and a Tutorial. *Behavior Analysis in Practice*, *13*(2), 509–520. https://doi.org/10.1007/s40617-019-00405-x

Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.). (1999). *How people learn: Brain, mind, experience, and school.* National Academy Press.

Brown, A. R., & Voltz, B. D. (2005). Elements of effective e-learning design. *The International Review of Research in Open and Distributed Learning*, *6*(1), 1–10.

Cidral, W. A., Oliveira, T., Di Felice, M., & Aparicio, M. (2018). E-learning success determinants: Brazilian empirical study. *Computers & Education*, *122*, 273–290. https://doi.org/10.1016/j.compedu.2017.12.001

Frydenberg, J. (2002). Quality Standards in eLearning: A matrix of analysis. *The International Review of Research in Open and Distributed Learning*, *3*(2). https://doi.org/10.19173/irrodl.v3i2.109

Gruber, H., & Harteis, C. (2008). Lernen und Lehren im Erwachsenenalter. In A. Renkl (Ed.), *Lehrbuch Pädagogische Psychologie* (pp. 205–261). Huber.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement.* Routledge.

Helmke, A. (2006). Was wissen wir über guten Unterricht? Über die Rückbesinnung auf den Unterricht als dem «Kerngeschäft» von Schule. *Pädagogik*, *58*, 42–45. Helmke, A. (2009). *Unterrichtsqualität und Lehrerprofessionalität. Diagnose, Evaluation und Verbesserung des Unterrichts.* Kallmeyer.

Helmke, A. (2017). *Unterrichtsqualität und Lehrerprofessionalität. Diagnose, Evaluation und Verbesserung des Unterrichts.* Kallmeyer.

Helmke, A., & Schrader, F. W. (2008). Merkmale der Unterrichtsqualität: Potenzial, Reichweite und Grenzen. *Seminar*, *3*, 17–47.

Hutchison, A., & Woodward, L. (2014). A planning cycle for integrating digital technology into literacy instruction. *The Reading Teacher*, *67*(6), 455–464.

Jahnke, I. (2015). *Digital Didactical Designs: Teaching and Learning in CrossActionSpaces*. Routledge. https://doi.org/10.4324/9781315681702

Jahnke, I., Bergström, P., Mårell-Olsson, E., Häll, L., & Kumar, S. (2017). Digital Didactical Designs as research framework: IPad integration in Nordic schools. *Computers & Education*, *113*, 1–15. https://doi.org/10.1016/j.compedu.2017.05.006

Junker, B. W., Weisberg, Y., Matsumura, L. C., Crosson, A., Wolf, M., Levison, A., & Resnick, L. (2005). *Overview of the instructional quality assessment*. Regents of the University of California.

Keller, F. S. (1968). Good-bye, teacher... *Journal of Applied Behavior Analysis*, *1*(1), 79–89. PubMed. https://doi.org/10.1901/jaba.1968.1-79

Knowles, M. (1979). *The Adult Learner: A Neglected Species.* (2nd ed.). GPC.

Koch, A. F. (2017). Where is the link between direct, minimally guided and constructivist instruction? A new integrated model of constructivist teaching. *EAPRIL Conference Proceedings 2016.*, *3*, 40–50.

König, J. (1986). Zur Bedeutung erwachsenenpädagogischer Grundsätze für die Lehrerbildung. *Beiträge Zur Lehrerbildung*, *4*(3), 196–214.

Kumar Basak, S., Wotto, M., & Bélanger, P. (2018). E-learning, M-learning and D-learning: Conceptual definition and comparative analysis. *E-Learning and Digital Media*, *15*(4), 191–216. https://doi.org/10.1177/2042753018785180

Laanpere, M., Pata, K., Normak, P., & Põldoja, H. (2014). Pedagogy-driven design of digital learning ecosystems. *Computer Science and Information Systems*, *11*(1), 419–442. https://doi.org/10.2298/CSIS121204015L

Margaryan, A., Bianco, M., & Littlejohn, A. (2015a). Instructional quality of Massive Open Online Courses (MOOCs). *Computers & Education*, *80*, 77–83. https://doi.org/10.1016/j.compedu.2014.08.005

Margaryan, A., Bianco, M., & Littlejohn, A. (2015b). Instructional quality of Massive Open Online Courses (MOOCs). *Computers & Education*, *80*, 77–83. https://doi.org/10.1016/j.compedu.2014.08.005

Mayer, R. E. (2017). Using multimedia for e-learning. *Journal of Computer Assisted Learning*, *33*(5), 403–423. https://doi.org/10.1111/jcal.12197

Meyer, H. (2003). Zehn Merkmale guten Unterrichts. *Empirische Befunde Und Didaktische Ratschläge. Pädagogik*, *10*, 36–43.

Meyer, H. (2021). *Was ist guter Unterricht?* (15. Auflage). Cornelsen.

Moore, J. L., Dickson-Deane, C., & Galyen, K. (2011). e-Learning, online learning, and distance learning environments: Are they the same? *The Internet and Higher Education*, *14*(2), 129–135.
https://doi.org/10.1016/j.iheduc.2010.10.001

Petko, D. (2010). Lernplattformen, E-Learning und Blended Learning in Schulen. In *D.* Petko (Ed.), *Lernplattformen in Schulen: Ansätze für E-Learning und Blended Learning in Präsenzklassen* (pp. 9–27). VS Verlag für Sozialwissenschaften. https://doi.org/10.1007/978-3-531-92299-7_1

Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: A systematic review. *Computers & Education*, *144*, 103701. https://doi.org/10.1016/j.compedu.2019.103701

Reinmann, G. (2020). Forschungsnahes Lehren und Lernen an Hochschulen in der Denkfigur des didaktischen Dreiecks. In M. Brinkmann (Ed.), *Forschendes Lernen: Pädagogische Studien zur Konjunktur eines hochschuldidaktischen Konzepts* (pp. 39–59). Springer Fachmedien. https://doi.org/10.1007/978-3-658-28173-1_3

Resnick, L. B. (Ed.). (1989). *Knowing, learning and instruction: Essays in honor of Robert Glaser*. Erlbaum.

Reusser, K. (2009). Von der Bildungs- und Unterrichtsforschung zur Unterrichtsentwicklung—Probleme, Strategien, Werkzeuge und Bedingungen. *Beiträge Zur Lehrerbildung*, *27*(3), 295–312.

Skinner, B. F. (1958). Teaching Machines. *Science*, *128*(3330), 969–977. JSTOR.

Spendrin, K. (2018). Charakteristika online-medialer Räume als Lehr-Lern-Räume des E-Learning – raumsoziologische Kategorien und exemplarische Beschreibung eines Blended-Learning-Tutoriums. In M. Pietraß, J. Fromme, P. Grell, & T. Hug (Eds.), *Jahrbuch Medienpädagogik 14: Der digitale Raum—Medienpädagogische Untersuchungen und Perspektiven* (pp. 197–214). Springer Fachmedien. https://doi.org/10.1007/978-3-658-19839-8_11

Terhart, E. (2011). Has John Hattie really found the holy grail of research on teaching? An extended review of Visible Learning. *Journal of Curriculum Studies*, *43*(3), 425–438.

Tulodziecki, G., Herzig, B., & Blömeke, S. (2004). *Gestaltung von Unterricht. Eine Einführung in die Didaktik.* Klinkhardt.

Van Merrienboer, J. J. G., & Paas, F. (2003). Powerful learning and the many faces of instructional design: Toward a framework for the design of powerful learning environments. In E. De Corte, L. Verschaffel, N. Entwistle, & J. J. G. Van Merriënboer (Eds.), *Powerful learning environments: Unravelling basic components and dimensions.* (pp. 3–20). Erli-Pergamon.

Wittpoth, J. (2003). *Einführung in die Erwachsenenbildung*. Budrich.

APPENDIX

All indicators and how they are related to the dimensions or "engagers"/ "accelerators" can be downloaded here:

https://drive.switch.ch/index.php/s/oAfo0rjx9IrdV2Z

MEETING NEEDS: A MODEL FOR WRITERS' GROUP SUSTAINABILITY

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ABSTRACT

Writers' groups have been found to offer many potential benefits to academic writers at all levels. A problem facing those who want to start up writers' groups however, is that there is no standard recipe for how a group should function: writers' groups can exist in many shapes, colours and sizes. While this lack of absolutes offers adaptability, the lack of a precise 'how-to' can mean that not all writers' groups function as well as hoped. Some groups might prosper for years, while others that begin with a great deal of enthusiasm, might quickly die out. To examine the question of what makes writers' groups sustainable, or not, audio recordings from writing retreats, writers' logs from PhD students in the natural science, individual correspondence, and focus group recordings were used. Reasons group members specifically gave for continuing in their writers' groups, or deciding to leave, were isolated and analysed. The results suggest that if group members' needs are being met, the groups will flourish (for as long as members need them); on the other hand, if members' needs are not being met, members will leave, and the group will likely fizzle out. Four categories of needs were identified: logistical needs; purpose/procedural needs; safety needs, and the need for mutual *support. Using the results of the analysis and an existing model for starting writers' groups, a model for sustainable writers' groups was derived. The model is being tested and adapted; a preliminary evaluation suggests that it may function well as a flexible recipe for setting up writers' groups that are more likely to flourish than fizzle.*

WRITERS' GROUPS: BENEFICIAL TO WRITERS, BUT HARD TO KNOW HOW TO DO 'EM

There is by now a substantial body of research indicating that writers' groups offer many potential benefits for academic writers of all levels. People "writ[ing] in social spaces" (Murray 2014), whether in writers' groups or on writing retreats, have long been conceptualized as communities of practice, which have been found to, among other things, provide emotional safety for community members (Badenhorst et al., 2019; Thesen, 2014), and open a space for critical reflection (Haas et al, 2020; Kaufhold & Yencken, 2021). Writers' group members find that they have increased output, fewer feelings of isolation, and better written products (Aitchison & Guerin, 2014; Elbow, 1998; Kornhaber et al., 2016). As the benefits are becoming increasingly well-known, writers' groups and retreats should, and are, becoming increasingly mainstream (Murray, 2009; Déri et al., 2022).

No One-Size-Fits-All Writers' Group: A double-edged sword

While there has been plentiful research revealing the benefits of writers' groups, and while there has thus far been none indicating that writers' groups pose drawbacks to writers, a known problem is that writers' groups can exist in so many shapes and sizes that there is no one set recipe for establishing and maintaining a group that will work for everyone. While this lack of an absolute offers the advantages of flexibility and adaptability, it can also mean that people who want to initiate their own groups might run into trouble if they are 1) at a loss regarding where and how to start, or 2) if they set up a group that might not function in a sustainable way.

In an earlier attempt to address the first problem (knowing how to get started), a "Pick & Mix" model was developed (Haas 2014). This model put forth the myriad ways writers' groups could vary, and suggested that if writers

a) *knew* that there was no *one* recipe they had to follow, and they
b) knew about the many different elements that could be mixed together, as it suited them, and they
c) tried out a few of those elements so they could experience what it was they wanted, they could then set up custom writers' groups that suited them, resting assured that they were not 'doing it wrong'.

After several years of using the Pick-n-Mix model to help PhD writers successfully *set up* their own writers' groups, but subsequently watching some of these groups quickly fizzle out, while others flourished for years, it became apparent that while this approach might help with some of the barriers to getting a writers' group started, it did not seem to satisfactorily address issues of sustainability.

WHY DO SOME WRITERS' GROUPS FLOURISH WHILE OTHERS FIZZLE?

Since 2009, I have run my Writer Development (WD) course for a mixture of master's students, PhD students, post-docs, and faculty members. The WD courses are "guided writing retreats"[12] that offer writing time interspersed with writing workshops. One of the workshops is devoted to helping delegates set up their own writers' groups. They set up and participate in these groups as part of the course requirements or recommendations (requirements for students; recommendations for faculty members). Following Girgensohn (2010) It is required or recommended that participants meet in groups (either virtually or in-person) at least twice, for at least two hours each time.

As was hoped, many of the writers' groups continued to function well beyond the minimum 4-hour course requirement. Some have been lasting years after the course has been finished, consistently recruiting new members as older members completed their theses and moved on. However, there were some groups that did die out after they had put in the compulsory (or recommended) four hours of writers' group time. While there were more groups that continued on than died out, it is still relevant to know what factors contribute to the difference. Answers were sought in data that had been accumulating for 15+ years of social-writing-related work. In the spring of 2020, Covid 19 provided the gift of time necessary to examine data that had long lain dormant.

[12] A "guided writing retreat" is the name I give to a retreat that uses Murray and Newton's (2009) "structured retreat" but also includes writing workshops.

The Informants: Voices from writers writing together

In addition to the WD courses described above, I have been leading or been a "start-up leader" (Haas 2014) for writers' groups of undergraduates, master's students, PhD students and faculty members since 2002. The data used in this study have come, with permission, from all of these sources. Some of the participants of the writers' groups and retreats kept writers' logs, which include reflections and general thoughts about writing and writers' groups. Explicit permission was given by 1432 writers for their writers' logs to be used for research-related purposes. In addition to the reflective writing from participants, audio-recordings of group discussions in writers' groups, and on retreats, as well as the debriefs at the ends of the writing retreats were considered. While explicit permission was given from all participants for all audio recordings, there were a few participants who were uncomfortable that the recordings be used for research, or other times when permission was not specifically sought to use the recordings for research-related purposes. These recordings were eliminated. Along with the logs and audio recordings, I consulted my own notes taken during writers' group meetings and on retreats. A focus group was formed of eight people who had been part of a writers' group where four people stayed, and four people left the group. Finally, if there was permission to do so, I considered emails from writers who sometimes send spontaneous thoughts and reflections. Thus, the data collected from research writers in social writing situations include:

- reflective logs from 1432 research writers
- audio recordings of meetings from 25 writers' groups
- my own notes from 86 Writer Development courses
- audio recordings of group discussions and debriefs from 59 WD courses or other retreats
- an audio-recording of a focus group that met to specifically discuss why they chose to stay or leave a writers' group they had been involved in

The ± 2500 writers who have generously agreed to allow others to learn from their insights and thoughts have come from a wide range of disciplines, from nine different universities in six different countries.

Data Analysis

To treat the data openly, without any pre-determined categories, an inductive approach to qualitative content analysis was taken, using Cho and Lee's (2014, p.15) overview as a rough guide. Data were reduced by going through writers' logs, recordings, emails, and notes, and isolating anything that was related to the functioning of writers' groups—more specifically anything that gave indication or insight into why someone had decided to attend writers' group meetings, or to skip them; to continue being a member of the writers' group, or to drop out. Each discrete extract was entered (transcribed or copied) into separate lines on a spreadsheet, and subsequently categorised through several rounds of coding.

RESULTS

The results of the analysis suggested a deceptively simple answer: people stay in writers' groups because their needs are being met; they leave writers' groups when their needs are not being met. In this section, this obvious answer will be nuanced by introducing four different categories of needs that were identified, and then suggesting an adaptation to the original pick-n-mix model.

If members' needs are met, the group is more likely to flourish

The needs of writers in groups could be separated into four categories: logistical needs, safety needs, purpose and procedural needs, and the need for mutual support. Each of these will be discussed in turn, with relevant extracts from the data used as examples.

Logistical needs

On a very basic level, if people are involved in a writers' group that is logistically suitable, they are more likely to stay in the group. Logistics include day of the week, time of day, location of meetings, length of meetings, etc. Simply put, if it is *relatively* convenient, in an already busy life, for someone to attend a writers' group, they will be more likely to attend than if it takes effort to get to the writers' group.

This works on the same principle as the advice to join a gym on the way home from work rather than one in the opposite direction of home: we are more likely to do something we know is good for us (but takes effort) if we don't have to make a lot of extra effort just to get started.

Easy logistics can work to keep people who *do* want to attend group meetings going to meetings: "I really liked going to the writers' group. I think it was important that I didn't have to commute though. If I'd had to bike 30 minutes for a 2-hour meeting [like some of the others did], I probably wouldn't have gone, even though I know it's helpful". Easy logistics can also tip the balance for people who are less committed as well: "I didn't usually really feel like going to the writers' group, but it was right there next to my office, so I decided to go anyway, and I was always glad I did."

If the logistics get complicated, or too inconvenient, it can cause people who might otherwise be committed to drop out; "I really liked the writers' group, and I was always efficient there. But it was always held on a really busy day of the week, so I couldn't make it work". Inconvenient logistics also helped people who were more undecided make the decision *not* to go: "Yeah, the writers' group might be a good idea, but I didn't want to make the commitment to go across town for it. Plus it was in the morning. I thought I could be more efficient with my time if I stayed in the office on my own schedule".

Safety Needs

Writers' group members also need to feel safe in their groups. Feelings of safety, or unsafety, can be emotional, physical, or academic.

Academic writing is a high-stakes activity, and writers can often feel vulnerable and in need of emotional safety. There were data suggesting that emotional safety was the very thing that kept some writers in their groups; on the other hand, there were also instances showing that writers left groups because they had felt "bullied" by other members who criticised their research, or their writing.

Physical safety did not come up as often as emotional safety, but there were groups working in cities where potential physical danger was a reality, and thus they needed to consider it. A different kind of physical safety was presented by the covid-19 pandemic: when the lockdown measures lifted, and groups started meeting in person again, some writers left their groups because they did not like that other members did not take the safety measures (masks and distancing, for example) as seriously as other members would have liked.

It has fortunately not happened very often, but there two cases where writers were afraid that fellow group members were plagiarising their work: "I talked about this in my writers' group, and then I find [someone else from the group] presenting [my idea] to [our supervisor]". Sadly, academic safety needs to be considered as well.

Purpose and Procedural Needs

Members need to be in writers' groups that do what they need writers' groups to do. While there is a wide range of activities that can go on in writers' groups (please see Haas, 2014 and Déri et al., 2022 for overviews), writers' group purposes and activities can be broken down into to writing (writing in the company of other writers), reading (reading each others' work, for example) and talking (giving feedback, goal-setting, discussions on writing processes, social chat, etc). For a writers' group to flourish, these needs should align.

If, for example, the main purpose of a group is to get a lot of writing done (increase written output), their procedures/activities would most likely largely consist of actual writing time. If the purpose of the group, on the other hand, is to improve the quality of the written work of members, the procedures/activities would probably fall more into reading each others' texts and giving feedback on it. Writers' groups can quickly fall apart if there is a mis-alignment of these purposes and procedures. If, for example, some group members want to give and receive feedback on texts, and other members need to use the time to get their writing done, the writers' group will probably not last very long (unless the needs are stated explicitly and two groups are formed instead of one).

Even if the purpose are generally agreed upon, if there is a mis-alignment of how this is done, members might leave. One member of the focus group explained that

while she really loved the writing group, their decision to write in 45-minute time-slots simply did not work for her, as she needed at least 60 mintues of focused writing time with each writing session.

The Need for Mutual *Support*

The last need that was uncovered in the analysis is the need for all writers in the group to feel (and be) supported. In order for writers' groups to function well and be sustainable, everyone needs to be getting the support they need, and the kind of support they need. Support needs include emotional support, support with text quality, process support, support in staying focused and being productive, support with accountability and goal-setting, etc. In order for writers' groups to be sustainable, they need function in a balanced way in which *everyone* is receiving as well as giving support.

Some writers chose to leave their groups because they felt there were other members who often asked for help, but were not available to offer support in return. An example is group members asking for feedback on their texts several times, but always being too busy to give feedback on others' texts. Another example is a group member who dominated writers' group conversation time with tales of their own writing woes, but would not be available to lend support to other group members when they needed it.

Updated Pick-n-Mix model for sustainable writers' groups

With the uncovering of the different categories of needs, it became clear that simply knowing that writers' groups can vary, and how they can vary is not enough for running a writers' group that will last. Below is presented an updated version of a previously-used procedure for starting writers' groups. The new Pick-n-Mix model incorporates the old one, but adds to it, taking into consideration that in order for writers' groups to be sustainable, members' various needs must be met. The first three steps are the same as the old model; steps 4 and 5 are adjusted to accommodate what we now know about writers' needs in groups.

This procedure has been used on the Writer Development courses, where 10-15 PhD students have been on retreat together, and thus have a pool of prospective co-group members. Adaptations could be made for starting groups in different situations.

1. *Understand that there's no one best way to do a writers' group*
   The first step of the old model is transferred to the new, as it is still relevant: knowing that there is no one way to do a writers' group can reassure those just starting out that they are not going to mess things up.

2. *Know what's available (get to know the pick &mix)*
   The original Pick & Mix (Haas, 2014) offers an overview of the myriad ways writers' groups can vary (leadership, membership, logistics, activities, etc). Having this bigger picture can help new members start to think of what constellation of qualities might be suitable for themselves.

3. *Try out a few different writers' group activities*
   Giving some of the different activities a try (goal-setting, writing together, giving feedback, etc) will help ensure that members get to know what it is that they prefer, rather than relying on knee-jerk reactions when they see the possibilities in print.

4. *Think carefully about what you need/prefer*
   After getting an overview of what is available, and trying out a few different things, members can then start thinking carefully about what it is that they need from a writers' group. All needs, logistical, safety, purpose and procedural, and support needs should all be carefully considered. How much and what kind of support is needed should also be explicitly addressed.

5. *Make needs and preferences known*
   Once members have at least an initial understanding of what they themselves need, in order for writers' groups to be sustainable, the needs should be communicated to other potential group members. To facilitate this, it is good to keep in mind that expressing needs to a group might not always be very easy, especially if individual members' needs are perceived to go against others' needs (for example, even if one member is aware that they want to

give and receive feedback as part of writers' group activities, they might be hesitant to express this because they think it goes against other group members' wishes. A safe space for honesty needs to be established in order of this part to be effective.

6. *Group up according to preferences, or negotiate (or both)*
   Once all prospective group members' needs are known and discussed, it is a good idea, if there are enough people, to form groups according to compatible preferences. While there will never be large groups of people who are exactly compatible on all the different possibilities, starting with logistical needs/preferences, moving on to purpose/procedural needs and negotiating from there seems to work.

7. *Make the purposes and procedures explicit*
   Once the preferences and needs are known, and some compatible grouping and/or negotiation has been done, it is a good idea to make the purposes and procedures of the group explicit. Write them down. It does not need to be long or complicated, but formalising this, even minimally, not only clarifies in everyone's mind what exactly they are doing, but it can also serve as a starting point for updating, re-forming, or re-negotiating the purposes and procedures, if and when a bit of a group refresh is necessary (step 9).

8. *Establish a start-up commitment*
   It can happen that people start out thinking writers' groups are a really good idea, do all the work of getting one set up, and then having their lives get in the way, so they never actually end up meeting. As part of forming a group, establishing an initial commitment (like the 2 x 2hr commitment on the WD course) can help get the momentum going, after which it is easier to *keep* going.

9. *Re-assess periodically, and re-form if necessary*
   If the group continues for a long time, and especially if new members enter the group, while some members leave, so that the group has a different composition than it did when it was set up, it is good to re-assess, and re-form (repeat steps 1-7 with current group members). Even if membership has not shifted, members' needs might have shifted. Re-examining these, re-

negotiating, re-stating and re-establishing needs, purposes and procedures will make sure that the group does not grow stagnant. This activity can also breath new life into a group that has just been running on the old operating procedures without anyone really thinking much about it.

This new model has been being adapted and adjusted for three years, and so far it seems that it may be a useful way to guide writers into setting up groups that will last as long as they need them. I am reluctant to make any solid claims at this point, however, as not only have not enough data been collected, but also two of the three years were covid years. Further research is needed.

REFERENCES

Aitchison, C., & Guerin, C. (2014). Writing groups for doctoral education and beyond: Innovations in practice and theory. Routledge.

Badenhorst, C., Pickett, S., and Hoben, J. (2019). Writing wild: Writing partnerships that fly. In N. Simmons & A. Singh (Eds.), Critical collaborative communities: Academic writing partnerships, groups, and retreats (pp. 121–135). Brill Sense.

Cho, J. Y., & Lee, E. H. (2014). Reducing confusion about grounded theory and qualitative content analysis: Similarities and differences. Qualitative report, 19(32).

Déri, C. E., Tremblay-Wragg, É. & Mathiew-C, S. (2022). Academic Writing Groups in Higher Education: History and State of Play. International Journal of Higher Education, 11(1), 85-99.

Elbow, P. (1998). Writing without teachers. Oxford University Press.

Girgensohn, K. (2010) Keynote address at EATAW conference. Limerick, Ireland

Haas, S. (2014). Pick-n-Mix: A typology of writers' groups in use. In Writing groups for doctoral education and beyond (pp. 30-48). Routledge.

Haas, S., De Soete, A., & Ulstein, G. (2020). Zooming through Covid: Fostering safe communities of critical reflection via online writers' group interaction. DOUBLE HELIX (HAMDEN), 8.

Kaufhold, K., & Yencken, D. E. (2021). Writing Groups as Dialogic Spaces: Negotiating Multiple Normative Perspectives . Journal of Academic Writing, 11(1), 1–15. https://doi.org/10.18552/joaw.v11i1.748

Kornhaber, R., Cross, M., Betihavas, V., & Bridgman, H. (2016). The benefits and challenges of academic writing retreats: An integrative review. Higher Education Research & Development, 35, 1210–1227.

Murray, R., & Newton, M. (2009). Writing retreat as structured intervention: margin or mainstream?. Higher Education Research & Development, 28(5), 541-553.

Murray, R. (2014). Writing in social spaces: A social processes approach to academic writing. Routledge.

LEARNING TO UNDERSTAND DIGITALITY? A MOTIVATIONAL STUDENT PERSPECTIVE ON WHAT IS TAUGHT AT SCHOOL

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ABSTRACT

Digital technology is widely used as an instrument to facilitate learning in an alternative modality. Also, digital education is dominated by competence models for educators and learners. Through a competence focus content is widely neglected in studies that deal with learning and instruction. In this research I investigate what is taught in school that is related to digitalization with reference to technology and engineering understanding and analyze how the topics are perceived by students in terms of interest. I used data from an engineering education study and re-analyzed the quantitative evaluation design with a digital focus. Results show that digital technology is rarely taught as a topic in primary and lower-secondary school, and students show a moderate interest in the topics that were given in the questionnaire. The students were more interested in content that is related to technics and less interested in socio-technical topics. Despite the limitations of having pre-selected items for digital topics, this study may help practitioners and researchers to build instructional scenarios which can be useful in a teaching toward the understanding of technology.

INTRODUCTION

These days school education is very busy in terms of digitalisation. The current agendas include digital professional competences of teachers in schools, the digital transformation of classrooms, or the implementation of digital education in the school curriculum. Besides these developments there is also a growing interest in interdisciplinary learning, predominantly because digital learning is not restricted to a single subject, but it can be interpreted as a second dimension to access content information.

THEORY

To date most basic digital student competences are addressed in subjects that include media and informatics education or computer science (Stopar & Bartol, 2019). Other subjects like the languages, mathematics, the sciences etc. rely on the basic usage competences of the students to work with technological devices (c. f. European Commission. Joint Research Centre, 2017) and implement digital learning in terms of alternate modalities to access a topic. This means that instead of reading a text, an internet video is watched; or instead of doing an experiment, a digital animation is explored (Zinn, 2019). In this context of digital learning, which includes e-learning, online learning, mobile learning and distance learning as well (Hoppe et al., 2003; Moore et al., 2011; Kumar Basak et al., 2018) plenty of research has been conducted of how to pedagogically use devices and platforms. Something that has not yet been on the plate is the question of what school students learn about why the devices work.

In this paper I want to address this question and ask what is actually taught in school in terms of digitalization and digital competences. While research has been interested in the relationships of digital technology usage, digital learning and learning conditions (Lin & Ha, 2009; Wild & Schulze Heuling, 2020), few is known about the practical side of instruction. I see one reason in the competence-orientation of research and practice models (c.f. Levano-Francia et al., 2019) that leads to a skill orientation without the need of content. Students and teachers are supposed to be/ get equipped to live and work in a digital world (Gródek-Szostak et al., 2021). This perspective makes it harder for teachers to translate a competence into a teachable topic (Pettersson, 2018) and it is often the case that teachers avoid disliked topics or emphasize topics they feel confident about or introduce topics the teacher is interested in.

The selection of topics that are taught and their correlation with teacher self-confidence has been a popular research topic in the sciences. It can be shown that teachers find reasons to avoid certain topics or implement topics if they share a private interest or hobby (Peschel & Koch, 2014; Haselhofer et al., 2017; Koch et al., 2018). Besides these internal reasons, also external reasons, e. g. a topic that is considered too complex to learn for students, play an essential role in the non-implementation of leaning content. This external factor is often seen in classrooms with small children, but it has been found that this reasoning is more likely to a false belief or a lack of methodological competence (Krämer et al., 2012; Koch et al., 2018; Flowerday & Schraw, 2000), which again is an internal factor.

The problem of *choice of content* is an issue in content free curricula. In Switzerland, where the data for this paper were collected, a competence-oriented curriculum has been introduced for kindergarten, primary school and lower-secondary school since 2010. The term curriculum only refers to the guidelines for teachers about what is taught in school. The competence-oriented curriculum does not prescribe teachers what content needs to be taught, it rather states competences that need to be addressed, achieved and assessed. In this context, teachers are fairly free to choose whatever content they want to initiate a competence development process in the children. Teachers may use textbooks and reproduce the pre-defined and elaborated content, but there is no obligation to do so.

In this exploratory paper I ask: "What is taught in school that is related to digitalisation with reference to technology and engineering understanding? How are the topics perceived by students in terms of interest?"

METHOD

Data acquisition

To approach the question what is being taught in school that is related to digitalization in technology and engineering, I conducted a secondary analysis of a larger Swiss data set that was collected in the project "Factors of Success in Technical Education". In a questionnaire, school students were asked about what they what they were taught in school and how interested they were.

I selected items that dealt with digital topics from the full list of 79 items. Examples are given in Table 2. The item selection process was based on a work definition of digitality as anything that is non-analogue and associated with artificial and/ or virtual entities or digital data transmission. Therefore, learning how to build an LED was not considered a digital content, but knowing about infra-red light was, because it can be used to transmit data between devices. Altogether, 12 items (15%) were used for the analyses.

Table 2: Examples of selected and non-selected items

Selected item	**Not selected item**
We learnt…	*We learnt…*
how to produce computer animations	how to draw an electric loop
how the smartphone changed our communication	how technology helps with food supply
what infra-red light can be used for	how to build an LED
what computer boards are made of	what to consider in wood work

All items were rated on a 1 to 5 point scale (1= did not appear in school at all --- 5= appeared in school very often) in a retrospective way. The students rated the identical items with reference to their interest again on a 1 to 5 scale (1= not interest at all --- 5= very high interest). This method allows the students to rate each single item twice and in the analysis the difference between the ratings can be computed. The difference expresses the extent of satisfaction or motivation (Haire et al., 1966; Scheffer & Kuhl, 2006; Rosenstiel, 2010). 259 school students answered the questionnaire (31 grades 1 – 6, primary school, age 6 – 12 years; 228 grades 7 – 9, lower-secondary school, age 12 – 15 years).

ANALYSES

Content-oriented item combinations were explored using a principal component analysis with varimax rotation on the content items. There was no attempt to psychometrically scale the items, the results were only used to structure the item

contents and to find out how the students relate the contents to eachother (i. e. component analysis, not factor analysis). I provide details on component loadings, scale means, reliabilities and item-scale correlations in the appendix.

As the items are not scaled all descriptive results and analyses of variance (ANOVA) were first conducted with the manifest items (single item indicator analysis).

In a second step, the items were aggregated based on the results of the principal component analysis on the content items in order to evaluate generalized differences (aggregated data analysis).

All data analyses were conducted with IBM SPSS 25. I could not account for students clustered in classes by teachers, because the data do not have an indicator for clustered data.

RESULTS

Single item indicator analysis

The principal component analysis suggested a two-component structure that differentiates between technical basics and socio-technological aspects (see **Error! Reference source not found.** in the appendix). The items "What to consider in data telecommunication" and "How telephone technology works" showed similar loadings on both components and thus could not be clearly assigned to either of the components. I decided to leave it in the context of the socio-technological aspect, because in the context of socio-technology technics is explicitly related to social practices and usage.

There were no statistically significant differences between the school grades by item perspective. That is, the content items were rated similarly by primary and lower-secondary school students; the same was found for the interest. This result indicates that the ratings are independent of age and school grade and can be further analysed without consideration of demographic backgrounds.

Table 3 shows all items as separated by the two components and the descriptive statistics for the full sample by perspective (content/ interest). In all items the school students rated the content lower than their interest in the content. This shows that the students have an interest in the topics, but they rarely see the topics in their school education. The most prominent topic in school seems to be "How to remote control with a computer" (AM= 2.30), which might be related to ICT education or robotics. Remote controls and robotics also are of most interest (AM= 3.45/ 3.39), followed by the production of computer animations.

Table 3: Item ratings by perspective and by component

	Item	**$N_{Content / Interest}$**	**Perspective**	
			Content	**Interest**
			AM (SD)	**AM (SD)**
Technical aspect	How to build a robot	374 / 361	1.56 (.97)	3.39 (1.48)
	What infra-red light can be used for	379 / 355	1.55 (.95)	2.66 (1.59)
	How computer interfaces work	367 / 345	1.53 (.97)	2.59 (1.39)
	What computer boards are made of	368 / 345	1.46 (.96)	2.62 (1.46)
	How to program traffic lights	374 / 359	1.48 (.97)	2.75 (1.42)
	Why we can listen to music on CDs	369 / 350	1.67 (1.13)	2.73 (1.35)
	How to remote control with a computer	379 / 360	2.30 (1.22)	3.45 (1.33)
	How to produce computer animations	375 / 356	1.87 (1.12)	3.23 (1.43)
	Component	332	1.73 (.85)	2.91 (1.08)

Sociotechnical aspect	What needs a smartphone addresses	364 / 348	1.84 (1.16)	2.69 (1.34)
	How the smartphone changed the way we communicate	367 / 352	1.81 (1.10)	2.71 (1.37)
	How telephone technology works	371 / 346	1.75 (1.00)	2.83 (1.28)
	What to consider in data telecommunication	366 / 340	1.58 (1.01)	2.57 (1.33)
	Component	349	1.78 (.90)	2.69 (1.08)

Note: Component values derived from the PCA on content items

With reference to the components, there is an almost equal indication of technical and sociotechnical contents, but a large difference between the interest in technical (AM= 2.91) and sociotechnical issues (AM= 2.69). In the combination of content and interest by component, the technical aspects show a stronger difference with a trend of non-motivation (1.73 vs. 2.91) as compared with the sociotechnical aspects (1.78 vs. 2.69). A more detailed analysis is provided in the aggregated data analysis section below.

The difference between content in school and student interested was statistically significant: Global inner subject effect F= 4.86 (12, 136), p= .000. All single pairwise comparisons were statistically significant on a level between p= [.000 ; .004], the most striking difference is found in the item “how to build a robot” with an effect size d=1.12 and “how to produce computer animations” (d= .94). All details of the analysis are given below in Table 4. Four examples are visualized in Figure 3, all other items can be found in the appendix, Figure 4.

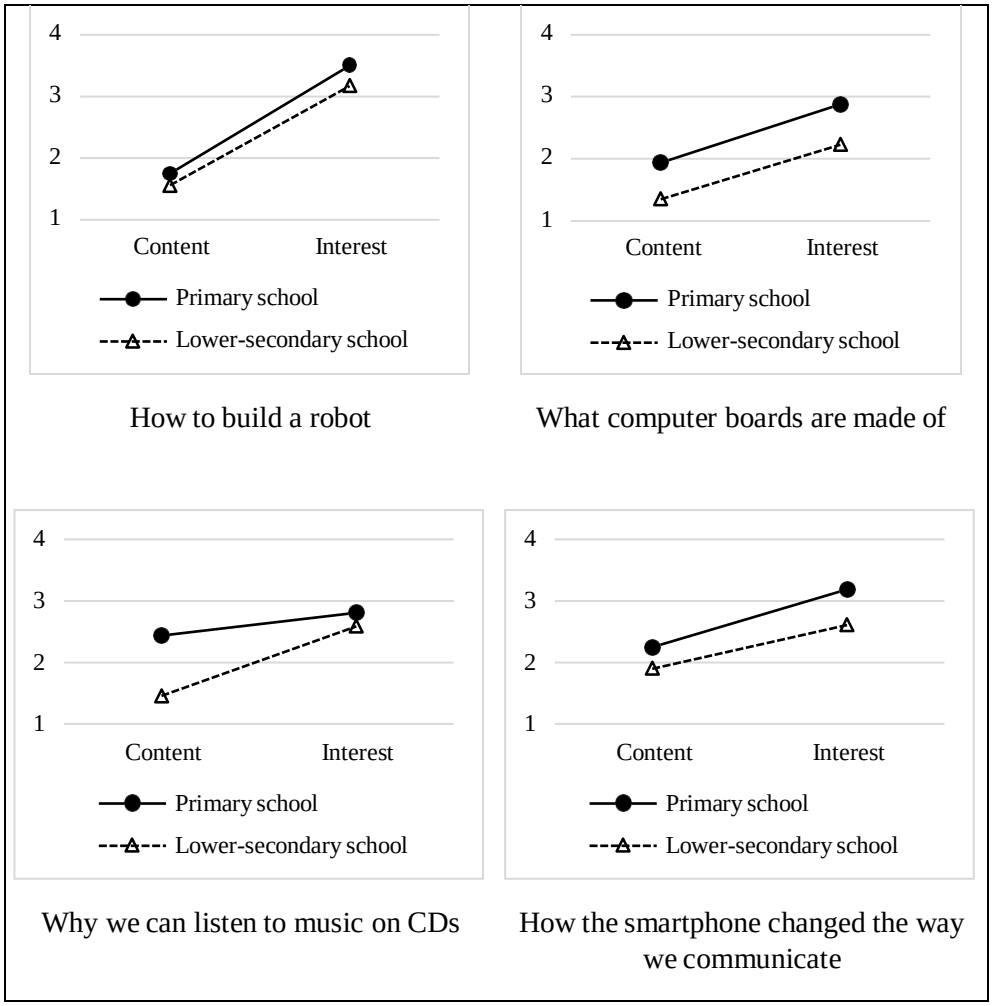


Figure 3: Differences of perspective x grade (examples)

Table 4: ANOVA results by item (separated by component)

Item	**ANOVA result**
How to build a robot	F(1,147)= 46.75, p= .000, η^2=.24, d= 1.12
What infra-red light can be used for	F(1,147)= 21.01, p= .000, η2=.13, d= .77
How computer interfaces work	F(1,147)= 19.77, p= .000, η2=.12, d= .74
What computer boards are made of	F(1,147)= 20.07, p= .000, η2=.12, d= .74
How to program traffic lights	F(1,147)= 14.19, p= .000, η2=.09, d= .63
Why we can listen to music on CDs	F(1,147)= 10.43, p= .002, η2=.07, d= .55
How to remote control with a computer	F(1,147)= 21.83, p= .000, η2=.13, d= .77
How to produce computer animations	F(1,147)= 31.95, p= .000, η2=.18, d= .94
What needs a smartphone addresses	F(1,147)= 8.59, p= .004, η2=.06, d= .51
How the smartphone changed the way we communicate	F(1,147)= 14.84, p= .000, η2=.09, d= 0.63
How telephone technology works	F(1,147)= 17.94, p= .000, η2=.11, d= .70
What to consider in data telecommunication	F(1,147)= 12.60, p= .001, η2=.08, d= .59

Aggregated data analysis

I ran a principal component analysis over all items based on the content ratings. With this one gets an impression on how students categorise the item content. A two-component solution was found. Component one indicates technical aspects of digital contents, e. g. what computer boards are made of (8 items, 49% of variance, N= 332, α= .86, AM= 1.73, SD= .85); component two summarises socio-technical aspects like "what needs a smartphone address" (4 items, N= 349, α= .83, AM= 1.78, SD= .90); for all items see Table 3.

The content structure was transferred to the interest items. The two analogue components showed the following properties: technical aspects (8 items, N= 332, α= .86, AM= 2.80, SD= .99); sociotechnical aspects (4 items, N= 332, α= .86, AM= 2.57, SD= 1.08).[13]

There were no statistically significant differences between primary and lower-secondary students ($p > .05$). A paired t-test between the two components showed a non-significant difference between technical and socio-technical aspects with reference to the content rating. The interest in technical aspects was higher as compared to the interest in socio-technics ($t(357)= 6.792$, $p< .001$).

Comparisons between content and interest were statistically significant and interest was higher that content for both components: $AM_{Diff(tech)}= 1.09$, $t(373)= 15.999$, $p< .001$; $AM_{diff(sociotech)}= .81$, $t(353)= 11.697$, $p< .001$).

DISCUSSION

In this study we tried to evaluate digital-oriented topics that are taught in school. We see this investigation as an important tool to optimize school education in and for a

[13] I also ran a separate exploratory principal component analysis of the interest items to explore their structure. The results are given in the appendix in Table 6.

digitalized world. The results indicate that digital topics are rarely taught in primary and lower-secondary school, yet the students show moderate interest in the topics.

In terms of student interest the results indicate most interest in topics that can be accessed in an active, creative process, e. g. how to bulid a robot, how to remote control with a computer and to produce computer animations. There might also be a socio-technological explanation for these interests, because these technologies dominate todays (social) media and technological developments.

Particularly, the technical aspects component comparisons indicate that technical aspects are implemented in a non-motivating way in school education, because the difference between implementation and interest is higher than the difference in the sociotechnical aspects. With reference to content learning and future STEM/ digitalization expertise, this result needs particular consideration, especially in the organisation of pre-service teacher education and teacher further education in primary and lower-secondary school.

This result should be interpreted with respect to the limitations of this study. One issue is the item selection. All items were pre-formulated and therefore do not take the school reality into account. A second drawback is the small sample and that we could not take clustered data in account. Besides these limitations, it is important to see what topics could be interesting for students and worth moving into a teaching. This could be a pedagogical starting point to initiate practice scenarios that help teachers to implement the topic.

REFERENCES

European Commission. Joint Research Centre. (2017). *European framework for the digital competence of educators :DigCompEdu*. Publications Office. https://data.europa.eu/doi/10.2760/178382

Flowerday, T., & Schraw, G. (2000). Teacher beliefs about instructional choice: A phenomenological study. *Journal of Educational Psychology*, *92*(4), 634.

Gródek-Szostak, Z., Suder, M., Piechaczek, A., & Siguencia, L. O. (2021). Assessment and Comparison of Digital Competences in Education for Selected European Countries. *European Research Studies*, *24*, 348–361.

Haire, M., Ghiselli, E. E., & Porter, L. W. (1966). *Managerial Thinking: An International Study*. Wiley.

Haselhofer, M., Koch, A. F., Delaney, S., Zimmermann, J., Kruse, S., & Labudde, P. (2017). *Ich würde Technik unterrichten, wenn…- Korrelate einer Einbindung von technikorientierten Inhalten aus Sicht angehender Lehrpersonen* [Poster].

Hoppe, H. U., Joiner, R., Milrad, M., & Sharples, M. (2003). Wireless and Mobile Technologies in Education: Guest editorial. *Journal of Computer Assisted Learning*, *19*(3), 255–259. https://doi.org/10.1046/j.0266-4909.2003.00027.x

Koch, A. F., Keller, J., Dunjic, A., Kruse, S., & Haselhofer, M. (2018). Prerequisites And Obstacles In Technology Instruction: Pre-service Teachers' Perspectives. In O. Finlayson, E. McLoughlin, S. Erduran, & P. Childs (Eds.), *Electronic Proceedings of the ESERA 2017 Conference. Research, Practice and Collaboration in Science Education* (pp. 1692–1698). Dublin City University.

Krämer, P., Nessler, S., & Schlüter, K. (2012). Probleme und Schwierigkeiten Lehramtsstudierender mit der Methode des Forschenden Lernens. *Erkenntnisweg Biologiedidaktik*, *11*, 21–35.

Kumar Basak, S., Wotto, M., & Bélanger, P. (2018). E-learning, M-learning and D-learning: Conceptual definition and comparative analysis. *E-Learning and Digital Media*, *15*(4), 191–216. https://doi.org/10.1177/2042753018785180

Levano-Francia, L., Sanchez Diaz, S., Guillén-Aparicio, P., Tello-Cabello, S., Herrera-Paico, N., & Collantes-Inga, Z. (2019). Digital Competences and Education. *Propósitos y Representaciones*, *7*(2).
https://doi.org/10.20511/pyr2019.v7n2.329

Lin, C., & Ha, L. (2009). Subcultures and Use of Communication Information Technology in Higher Education Institutions. *The Journal of Higher Education*, *80*(5), 564–590. https://doi.org/10.1080/00221546.2009.11779032

Moore, J. L., Dickson-Deane, C., & Galyen, K. (2011). e-Learning, online learning, and distance learning environments: Are they the same? *The Internet and Higher Education*, *14*(2), 129–135. https://doi.org/10.1016/j.iheduc.2010.10.001

Peschel, M., & Koch, A. F. (2014). Lehrertypen — Typisch Lehrer? Clusterungsversuche im Projekt SUN. In S. Bernholt (Ed.),

Naturwissenschaftliche Bildung zwischen Science- und Fachunterricht, Gesellschaft für Didaktik der Chemie und Physik (GDCP), Jahrestagung in München 2013. (Vol. 34, pp. 216–218). Institut für die Pädagogik der Naturwissenschaften und Mathematik.

Pettersson, F. (2018). On the issues of digital competence in educational contexts – a review of literature. *Education and Information Technologies*, *23*(3), 1005–1021. https://doi.org/10.1007/s10639-017-9649-3

Rosenstiel, L. v. (2010). *Motivation im Betrieb. Mit Fallstudien aus der Praxis.* (11th ed.). Rosenberger Fachverlag.

Scheffer, D., & Kuhl, J. (2006). *Erfolgreich motivieren. Mitarbeiterpersönlichkeit und Motivationstechniken.* Hogrefe.

Stopar, K., & Bartol, T. (2019). Digital competences, computer skills and information literacy in secondary education: Mapping and visualization of trends and concepts. *Scientometrics*, *118*(2), 479–498. https://doi.org/10.1007/s11192-018-2990-5

Wild, S., & Schulze Heuling, L. (2020). How do the digital competences of students in vocational schools differ from those of students in cooperative higher education institutions in Germany? *Empirical Research in Vocational Education and Training*, *12*(1), 5. https://doi.org/10.1186/s40461-020-00091-y

Zinn, B. (2019). Editorial: Teaching and learning between virtuality and reality. *Journal of Technical Education*, *7*(1), 1–15. https://doi.org/10.48513/JOTED.V7I1.181

APPENDIX

Table 5: Overview on principal component analysis of content perspective and scaling values

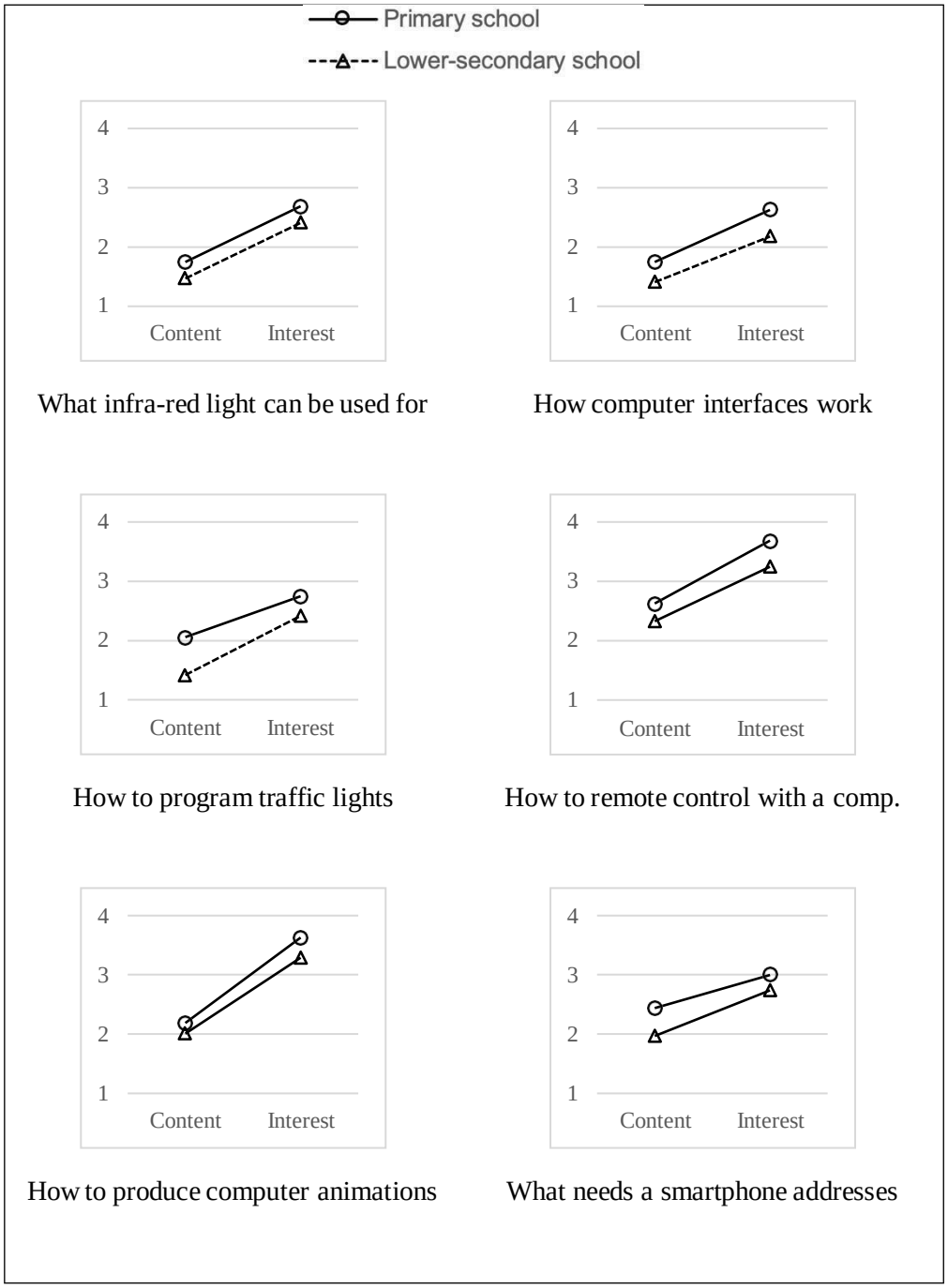
Item	h^2	a Comp. 1	a Comp. 2	r(it)	Scale summary
How to build a robot	.58	.75		.63	
What infra-red light can be used for	.57	.73		.63	
How computer interfaces work	.63	.69	.41	.68	
What computer boards are made of	.63	.67	.42	.72	
How to program traffic lights	.58	.62	.45	.67	N= 332, α= .86, AM= 1.73, SD= .85
Why we can listen to music on CDs	.52	.60	.39	.62	
How to remote control with a computer	.34	.58		.44	
How to produce computer animations	.41	.58		.56	
What needs a smartphone addresses	.79		.88	.71	
How the smartphone changed the way we communicate	.74		.83	.72	N= 349, α= .83, AM= 1.78, SD= .90
How telephone technology works	.61	.37	.69	.64	
What to consider in data telecommunication	.58	.53	.54	.57	
Variance explained		48.85%	9.23%		

Notes: Exploratory principal component analysis, Kaiser criterion, Varimax rotation, Loadings a <.32 suppressed

Table 6: Overview on principal component analysis of interest perspective and scaling values

Item	h^2	a Comp. 1	a Comp. 2	r(it)	Scale summary
How to build a robot	.53	.70		.67	
What infra-red light can be used for	.54	.70		.51	
How computer interfaces work	.72	.82		.74	
What computer boards are made of	.75	.86		.72	N= 309,
How to program traffic lights	.61	.63	.47	.70	α= .88,
Why we can listen to music on CDs	.57	.57	.49	.62	AM= 2.91, SD= 1.08
How to remote control with a computer	.57	.71		.68	
How to produce computer animations	.41	.49	.41	.58	
What needs a smartphone addresses	.83		.89	.69	
How the smartphone changed the way we communicate	.85		.90	.70	N= 326, α= .83,
How telephone technology works	.59	.57	.52	.65	AM= 2.69, SD= 1.08
What to consider in data telecommunication	.69	.78		.56	
Variance explained		53.51%	10.37%		

Notes: Exploratory principal component analysis, Kaiser criterion, Varimax rotation, Loadings a <.32 suppressed


Primary school
Lower-secondary school
4
3
2
1
Content
Interest
What infra-red light can be used for
How computer interfaces work
How to program traffic lights
How to remote control with a comp.
How to produce computer animations
What needs a smartphone addresses

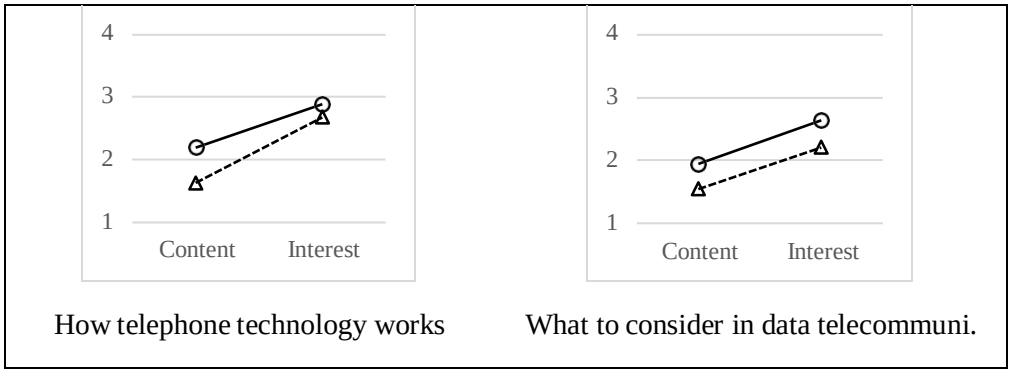


Figure 4: Differences of perspective x grade (all items except examples in the text)

STEM TEACHERS VS "TROUBLEMAKER" STUDENTS: A VIEW BEYOND CLASSROOM MANAGEMENT

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ABSTRACT

A "Troublemaker" student is often defined as one "whose conduct is consistently at odds with normal school discipline". However, not all researchers deem troublemaking behaviors as bad. A more humanistic definition describes "troublemakers" as canary in a cage believing that they are students who explore the free mind and want to develop themselves in different ways. Yet, little research has been conducted on this phenomenon. In our research study, we adopt a positive psychology perspective grounded in asset-based pedagogical frameworks and ask for a typology of "troublemakers" from a teacher's perspective. In a qualitative research design we conducted semi-structured interviews with six individual teachers to explore the phenomenon of "troublemakers".

Teachers hold common and shared conceptions of troublemakers, their beliefs are fairly strong, and there is a discrepancy about valued attributes of STEM and attributes of troublemakers. Teachers showed positive and negative expectations of "troublemaker" success in STEM. The variation may be explained by their teaching experience, pedagogical attitudes, humanistic values and attribution of success. The attribution of success also seems to relate with the stability of being a "troublemaker" as a stable and trait-like characteristic they assigned to their students correlated with learning processes and not with teaching processes.

INTRODUCTION

In the US, we value innovation, creativity, we value "thinking outside the box", "pushing boundaries", "challenging paradigms" and "coming up with new solutions" - particularly in STEM education (Hart Research Associates, 2015). And yet when we see these behaviors in our youngsters, we get scared and try to shut it down (Ripley, 2016). Kids will defy; the ones who can make productive use of it will become successful and productive members of society and push boundaries within constraints. But teachers often value *compliant originality* and conforming behavior (Beghetto, 2010). A large number of students who are defiant, ill-adept and don't like school drop out, disengage and lose interest because of negative classroom management styles like the isolated chair or suspension due to what the teacher interprets as misbehavior (Lewis et al., 2008). From this perspective there is a clash between valued STEM attributes and what is considered a good student. Defiance, disturbance, and misbehavior in general are serious issues in every-day schooling: It stresses students and teachers (Kulinna, 2007; Aloe et al., 2014; Aldrup et al., 2018) and distressed teachers are more likely to interpret misbehavior (Herman et al., 2018). What is more, most disciplinary management styles lead to impeded learning or negative student-teacher relationships (Goodboy et al., 2018). Research has also shown that students of color or Underrepresented Minorities (URMs) are disproportionately more likely to be suspended and labeled "troublemakers" by their teachers, and thus suffer negative outcomes; however, school and teacher variables to address this issue have been widely neglected in research (Fenning & Rose, 2007; Tajalli & Garba, 2014; Townsend, 2000). In order, to increase URMs participation in schooling and STEM in particular, research needs to address and try to better understand the nature of these disparities. When and why are students believed "troublemakers" by teachers and how does *troublemaker* status and teacher behavior impact students?

INTENTIONS OF STUDY

The aim of the proposed study is to broaden participation in the under-accessed group of "troublemakers" (URMs or any other student), evaluate teachers' beliefs about characteristics of "troublemakers" in classrooms (instructional belief) vs characteristics of innovation in STEM (professional belief) and to investigate teacher

attributions of student behavior (attributional belief) on "troublemakers" in elementary schools and every STEM discipline. By knowing about instructional, professional and attributional beliefs of teachers, we can differentially address the problem of inclusion and participation of underrepresented minorities in ethnically diverse STEM education beyond behavioral management approaches: It allows to better understand the cause of "troublemaking" as perceived by the teacher and opens new paths to implement a culture of STEM innovation that connects school and STEM professionalism and adds to building a stronger STEM workforce development. In addition to the priority aim of broadening participation via *improved instructional beliefs & practices and student outcomes such as wellbeing and engagement* the project wants to *build on teachers' capacity to customize instructional approaches* by means of empathic and instructional support which is essential in improving STEM learning environments and examine the influence of these instructional approaches on students' trust to teachers.

Although broadening participation in STEM is of high relevance, researchers have not yet put an eye on elementary schools. In this study we combine broadening participation, improvement of STEM learning environments and wellbeing at elementary school on teacher and student level in an exploratory approach that evaluates the potential effect of socio-emotional STEM education. Here, we ask for teacher beliefs, evaluate instructional access points for future interventions and oversee problematic issues in students that initiates future research and professional development and, from a broader impact perspective, support the future STEM workforce.

We claim that teacher beliefs about characteristics of "troublemakers", attribution and handling situations are changeable. We do not know about the effects of change in "troublemaker" situations, yet, so we intend to study the phenomenonlogical situation at present. In our conception of instructional interaction we ask teachers to anticipate student wellbeing and inclusion as a potential outcome and try alternative instructional methods. Also, we want to study teacher beliefs, student-teacher relationships and students' trust to teachers, engagement, and wellbeing/ inclusion.

Based on this multi-perspective view on teacher and student perceived behavior we want to find dimensions of instruction that support a more inclusive and valuing classroom atmosphere. With this knowledge we intend to add to the notion of in practice teacher beliefs vs. professional beliefs vs. attributional beliefs, student

emotions and the student-teacher relationship, and student outcomes including teacher trust, engagement, and wellbeing. Besides understanding the "troublemaker", in future we intend to build up on that knowledge and develop strong instructional interventions in order to improve teacher education, professional development, and classroom climate. From a student perspective we envision a more integrative environment that not only includes understanding, empathy, and improved student-teacher relationships, but also points to unique and individual creativity of students.

THEORY

Dealing with "troublemakers" and misbehavior

Behavioral classroom management tries to prevent "trouble" or, if this is not achieved, "troublemakers" get disciplined in some way, e. g. suspension from class or school (Little & Akin-Little, 2008). Not only have in- or out-of-school suspensions proven to be ineffective in terms of behavior change, they also lead to a deficit of instruction for students, and are immoderately applied to Non-White children, especially African Americans (Townsend, 2000; Blomberg, 2003). In this section we want to elaborate on particularities of classroom management and their consequences on the teachers, the students and on the teacher-student relationship.

Instructional practices and increased students' learning and outcomes

A longitudinal study done by Finn et al. (2008) shows that misbehavior is equally distributed among ethnicities, but male students misbehaving more often than girls. Yet, misbehavior is not a soft factor as a lack of motivation, but rather subject to negative physical consequences that teachers react on, e.g. having to sit on an isolated chair or suspension in order to re-establish obedience and respect. Teacher mostly react to misbehavior in a patterned way: proactively if positive student behavior occurs, negatively if misbehavior occurs (Baker, 1999; Clunies-Ross et al., 2008). Disciplinary consequences of student misbehavior can have plenty of side and aftereffects. Lewis et al. (2008) found in an international study that, from all

students' point of view, punishment of misbehavior increased the students' negative attitude toward the teacher and distracted students from concentration during learning tasks. The correlation between punishment and justification, i. e. the teacher was right in doing so, was close to zero. When teachers discussed the misbehavior and negotiated for better behavior the students' negative attitude decreased, even more so when the teacher just recognized the misbehavior without any consequences. This indicates that punitive consequences may negatively affect the student-teacher relationship and impedes general learning processes even in students that behave well. From these results Lewis et al. (2008) conclude that classrooms need more student-teacher interactions, classrooms should provide an environment the students can have a feeling of belonging to, especially "for students at risk and more challenging students" (p. 721).

Aggressive, controlling teacher reactions to misbehavior had the highest association with negativity toward the teacher and distraction. The study interprets that aggressive acts, including classroom or school suspension, impose high levels of stress to the students and this could lead to higher absenteeism or even increased smoking or alcohol consumption. On the long run, "disengagement from schooling, frequent referrals out of class and absence or exclusion from school have a significant impact on future opportunities for education or access to employment" (Lewis et al., 2008, p. 722). What is more, aggressive/ reactive teacher replies also relate positively to high teacher stress (Clunies-Ross et al., 2008).

Although there seems to be an equal distribution of misbehavior between ethnicities, the practice in dealing with disruptive students seems to bring about ethnic disparities and drift towards suspending Black male students over-proportionally (Townsend, 2000; Blomberg, 2003; Hinojosa, 2008; Tajalli & Garba, 2014; Losen et al., 2015). Reports show that suspension generally does not change anything, it has more disadvantages than advantages. Losen et al. (2015) report that suspension may result in an achievement decline up to a full grade point and is often followed by delinquency or school dropout. The authors show, on the long run suspension rates increased from 1972 to 2011 from 3 to 7% in White children, from 3 to 7% in Hispanic children, and 6 to 16% in Black children. In addition, in 2012, black children and children with disabilities had the highest suspension rates, followed by Latino and American Indian children. After reviewing several studies on the effect of the-odd-kid-out policies in schools (The studies are: Gonzalez Redondo, 2002; Fabelo et al., 2011; Perry & Morris, 2014; Skiba et al., 2014), Losen et al. (2015) conclude that there is no positive effect of suspension: "Together these findings

dispel as myth the common assertion that you must kick out the bad students so the good students can learn" (p. 9) In a nutshell: If there is a discipline gap, there will also be an achievement gap and increased socio-economic costs. The most negatively affected groups are underrepresented minorities, such as racial-ethnic minorities or students with disabilities.

If one adopts the view that a classroom can be an inclusive community of practice and equal participation, one needs to understand each individual's contribution and uniqueness on both sides, the teacher and the the student side. This means that a teacher controlling environment is less effective than a person-oriented appreciation of the problem-behavior (Tulley & Chiu, 1995). Okonofua, Paunesku, and Walton (2016) found that mutual understanding outperforms disciplinary acts. In their study three experiments show that mathematics teachers trained in empathy were more successful in terms of misbehavior management and had more motivated and respectful students than teachers in the control groups. Teachers trained in empathy also showed improved student-teacher relationships, especially with at-risk students. In this study, empathy was defined as "valuing and understanding students' experiences and negative feelings that give rise to misbehavior" (Okonofua et al., 2016, p. 5221). Mutual understanding of the nature of behavior and its intention can help to improve the whole classroom environment. Understanding and belief transmission/ transformation should be addressed to improve classroom climate, teacher effectiveness and student motivation. Thus, research needs to investigate beliefs about social interactions, beliefs the nature of behavior and beliefs about the other person's beliefs (Roth & Bowen, 1995; Bru, 2006; Hinojosa, 2008; Cothran et al., 2009; Pane, 2010).

Groups that are underrepresented and underprivileged in STEM

In this section we want to show that URM students are not the only underprivileged group in elementary STEM education, but ethnic achievement gaps are already clearly visible and can have an impact on future career pathways. We opt for more research in elementary schools in order to keep an unbiased flow through the educational system and transition to the labor market.

In a survey on college students' preparedness for work in STEM-oriented fields, only 25% of potential employers graded an adequate level in innovation, creativity, and critical thinking (Hart Research Associates, 2015). Mostly, research draws on improving the diversity and inclusion of underrepresented minorities in the STEM workforce and therefore studies frequently consider higher education students (e. g. George et al., 2001; Hurtado et al., 2010; Whittaker & Montgomery, 2012; Fakayode et al., 2014; Allen-Ramdial & Campbell, 2014). This is, because STEM components are differentiated in highschool or college, so systematic approaches to improve URM participation are possible, whereas in elementary school the focus is on general participation and ability grouping, especially in math and science (Syed et al., 2011). In other words, at elementary school level not only URMs are affected by low achievement chances, but also students that share other characteristics, e. g. misbehaving students or any other students with a low socio-economic status (SES), coming from a poor neighborhood or attending schools with poor school quality or being located in a rural area (Hansen, 2014). It has been found that achievement gaps between Black and White students appear as early as on elementary level and even in kindergarten and initiate learning disengagement (Quinn, 2015; Reardon, 2008; Strambler & Weinstein, 2010). Reardon & Galindo (2009) also found the gap in math and reading between White and Hispanic elementary students.

In our research we particularly address the instructional level and draw on student-teacher relationships. Especially from a relationship perspective negative teacher feedback is associated with learning disengagement in Black and Latinx elementary students (Strambler & Weinstein, 2010), and it has also been found that teachers hold stereotypical beliefs on maths ability, mostly in favor of White and Asian students in comparison to URM students. Also, our focus is not only on broadening STEM participation of URM students, but also of misbehaving students that miss instructional time and therefore are underprivileged in STEM education.

If one considers the pedagogical experience, the feedback and the stereotyping of teachers as variables, the first thing to look at should be the teacher beliefs, which guide their instruction and classroom management.

Instruction beyond classroom management

In the prevention of trouble or disciplinary consequences a lot of research on behavioral classroom management has been conducted and plenty of educational interventions have been implemented that draw on improving teacher classroom management skills. In most approaches "troublemakers" are subject in education to conformity in order to keep the flow of instruction. Yet, conformity may undermine the "troublemaker's" unique characteristics such as out-of-the-box thinking or questioning traditional opinions or being innovative (which are genuinely positive characteristics in the field of STEM innovation). In terms of motivation, self-determination theorists Deci and Ryan also posit that: "By learning what to do to get rewards and by doing just what the teacher wants, children can become overachievers, but they will fail to develop the capacity to transform their learning into flexible, useful cognitive structures. They will memorize well, but they will not develop their capacity to think creatively" (Deci & Ryan, 1990, p. 246f.). Imagine the following situation:

> You are a teacher doing STEM education and you want the students to find out how many drops of water fit onto a penny. Every student in class has got a pipette and a penny and they should note down how many drops they expect and how many they could fit in several attempts. One student is not following the experiment's rules but keeps sputtering water through the classroom. From a behavioral management point of view a gentle redirection of the behavior could be one solution. If this does not work another option could be an isolated desk (Savage & Savage, 2010). Yet, a third option could be seen in understanding that the kid is more interested in testing the physical law of pressure or mechanics of liquids. In order to address the curiosity of the kid you now let the child document the experiment and explain why his/ her experiment is also interesting.

From this perspective "troublemakers" can be seen valuable and be integrated as an asset to the classroom; a perspective that has not been addressed from research in detail. In our conception successful integration of "troublemakers" first relies on the teacher's belief in the value of the "troublemaker", which has not been subject to thorough research either.

One psychological outcome related to student-teacher relationships that we believe is particularly important for STEM education and URM students is teacher trust. Interpersonal trust is an important part of any relationship and students' trust of teachers is a variable impacted by individual differences, but also impacted by students' social contexts. Relationships involving trust include the risk of harm or betrayal, as recognised by the trustor (Rousseau et al., 2004), and trust is important when individuals are in interdependent relationships, relying on one another to achieve their goals. Trust is particularly relevant in contexts in which an asymmetric power relationship exists, placing the individual with less power in a greater position of dependence on authority. Such relationships are evident in schools, where student outcomes are dependent on evaluation by instructors. Teacher trust involves a student's trust toward his/her teacher, as evidenced by a student's perception that instructors embody benevolence, honesty, reliability, openness, and competence.

RESEARCH QUESTION AND OBJECTIVES

In our research we want to address the complex relationship of teacher beliefs, teacher trust and the teacher-student relationship, student engagement, and the wellbeing of teachers and students in the context of "troublemaking" misbehavior. Although teacher wellbeing is an important field of research, in this study we want to focus on teacher beliefs on the cause of misbehavior and the nature of "troublemakers" in order to get a basic understanding of the teacher perspective and its impact on students.

We want to add new perspectives on instruction, behavior and student/teacher wellbeing. In order to achieve this we aim to evaluate teachers' beliefs about characteristics of "troublemakers" in classrooms, characteristics of innovation in STEM and to investigate teacher attributions of student behavior. By knowing about instructional, professional and attributional beliefs of teachers, we can propose a working definition of "troublemakers" and differentially address the problem of inclusion in STEM education beyond behavioral management approaches: It allows to better understand the cause of "troublemaking" as perceived by the teacher and opens new paths to implement a culture of STEM innovation that connects school and adds to building a stronger STEM workforce development. In addition to improved instructional beliefs & practices and student outcomes such as wellbeing

and engagement the project wants to build on teachers' capacity to customize instructional approaches by means of empathic and instructional support which is essential in improving STEM learning environments and examine the influence of these instructional approaches on students' trust of teachers.

We focus on elementary school STEM, because 1) In elementary school student-teacher relationships may affect both teacher and student wellbeing and engagement generally (and not only subject specifically); 2) STEM subjects are taught in an integrative way. 3) Research indicates a very high stress level and least developed coping mechanism amongst elementary teachers particularly crucial at a time when students begin to shape their peer status and foundations for future student-teacher relationships (Herman et al., 2018; Henricsson & Rydell, 2004; Adler, Kless, & Adler, 1992).

We combine participation, improvement of STEM learning environments and wellbeing at elementary school on the teacher and the student level in a qualitative research framework: We address the teacher perspective (e.g. What are teacher beliefs and attributes about STEM as a profession vs "troublemaker" students' and their nature of achievement in STEM fields and the interaction of students and teachers (e. g. How do "trouble" situations change when teachers try to handle problematic situations differently?).

METHODOLOGY, METHODS AND SAMPLE

In the first phase we conducted semi-structured interviews with teachers to assess their perception and treatment of "troublemakers". In the interviews, we want to address the teachers' understanding of "troublemakers" and give the opportunity to reflect on their STEM instruction.

ANALYSES AND RESULTS

At the date of the paper submission, six interviews have been conducted and analyzed. First results indicate that teachers seem to have a prototypical view on disruptive students as "troublemakers": they are those who disrupt the flow of learning, i. e. "troublemakers" are disciplined when fellow students are hindered in their regular learning activities as perceived by the teacher. In terms of perspective taking this indicates a stronger mental association of the teacher toward the "good" students. Preliminary results also point to a learner centered view of the teacher, because often teachers refer to disrupted learning as opposed to disrupted teaching.

In one case, the teacher gave an example where she was able to re-interpret the student misbehavior and used the student competency as an asset in the instructional process: The student was very knowledgeable in STEM and challenged the teacher often in regular class sessions. One day, the teacher introduced a problem-based self-learning scenario and the "troublemaker" was asked to serve as a specialist consultant for the teacher and students, a method that turned out well for all, the teacher, the class, and the student.

DISCUSSION

The positive re-interpretation of "trouble" behavior and implementing the student as an active participant in the instructional process shows that understanding, perspective taking and establishing a common basis of interaction and collaboration can have a positive effect on the student and his/her "troublemaking". This effect may be extended to a teacher perspective: This means that understanding is not only a matter of cultural synchronization. Teacher instructional beliefs and competences need to be addressed as well. Pane (2010) puts forward the idea that conflicts between teachers and students and exclusionary methods as a result are not consequences of the number of incidents, but a consequence of the interactional expectations. In Pane's view, culturally grounded conflicts are best addressed from a socio-cultural perspective that allows to negotiate about situational interpretations in order to clarify them without the one view dominating the other.

We want to extent this view on culture by what we call the biography of culture (or socialization). If we understand that behavior and instruction are governed by biography, beliefs and contextual factors, we can start to understand these factors and approach teaching and learning from individualistic prerequisites and move classrooms towards inclusive communities of practice and equal participation. One just needs to understand each individual's contribution and uniqueness on both sides, the teacher and the student side.

REFERENCES

Aldrup, K., Klusmann, U., Lüdtke, O., Göllner, R., & Trautwein, U. (2018). Student misbehavior and teacher well-being: Testing the mediating role of the teacher-student relationship. *Learning and Instruction*, *58*, 126–136. https://doi.org/10.1016/j.learninstruc.2018.05.006

Allen-Ramdial, S.-A. A., & Campbell, A. G. (2014). Reimagining the pipeline: Advancing STEM diversity, persistence, and success. *BioScience*, *64*(7), 612–618.

Aloe, A. M., Shisler, S. M., Norris, B. D., Nickerson, A. B., & Rinker, T. W. (2014). A multivariate meta-analysis of student misbehavior and teacher burnout. *Educational Research Review*, *12*, 30–44.
https://doi.org/10.1016/j.edurev.2014.05.003

Baker, J. A. (1999). Teacher-Student Interaction in Urban At-Risk Classrooms: Differential Behavior, Relationship Quality, and Student Satisfaction with School. *The Elementary School Journal*, *100*(1), 57–70.

Beghetto, R. A. (2010). Creativity in the Classroom. In J. C. Kaufman & R. J. Sternberg (Eds.), *The Cambridge Handbook of Creativity* (pp. 447–466). CUP.

Blomberg, N. (2003). Effective Discipline for Misbehavior: In-School versus Out-of-School Suspension. *Concept*, *27*.

Bru, E. (2006). Factors associated with disruptive behaviour in the classroom. *Scandinavian Journal of Educational Research*, *50*(1), 23–43.

Clunies-Ross, P., Little, E., & Kienhuis, M. (2008). Self-reported and actual use of proactive and reactive classroom management strategies and their relationship with teacher stress and student behaviour. *Educational Psychology*, *28*(6), 693–710. https://doi.org/10.1080/01443410802206700

Cothran, D. J., Kulinna, P. H., & Garrahy, D. A. (2009). Attributions for and consequences of student misbehavior. *Physical Education and Sport Pedagogy*, *14*(2), 155–167. https://doi.org/10.1080/17408980701712148

Deci, E. L., & Ryan, R. M. (1990). *Intrinsic Motivation and Self-Determination in Human Behavior.* (3rd ed.). Plenum Press.

Fabelo, T., Thompson, M. D., Plotkin, M., Carmichael, D., Marchbanks, M. P., & Booth, E. A. (2011). *Breaking schools' rules: A statewide study of how school discipline relates to students' success and juvenile justice involvement*. Council of State Governments Justice Center.

Fakayode, S. O., Yakubu, M., Adeyeye, O. M., Pollard, D. A., & Mohammed, A. K. (2014). Promoting Undergraduate STEM Education at a Historically Black College and University through Research Experience. *Journal of Chemical Education*, *91*(5), 662–665. https://doi.org/10.1021/ed400482b

Fenning, P., & Rose, J. (2007). Overrepresentation of African American Students in Exclusionary Discipline The Role of School Policy. *Urban Education*, *42*(6), 536–559. https://doi.org/10.1177/0042085907305039

Finn, J. D., Fish, R. M., & Scott, L. A. (2008). Educational Sequelae of High School Misbehavior. *The Journal of Educational Research*, *101*(5), 259–274. https://doi.org/10.3200/JOER.101.5.259-274

George, Y. S., Neale, D. S., Van Horne, V., & Malcolm, S. M. (2001). *In pursuit of a diverse science, technology, engineering, and mathematics workforce*. American Association for the Advancement of Science.

Gonzalez Redondo, F. A. (2002). On the historical nature of mathematics and the teaching of mathematics. *Arbor-Ciencia Pensamiento Y Cultura*, *173*(681), 203–332.

Goodboy, A. K., Bolkan, S., & Baker, J. P. (2018). Instructor misbehaviors impede students' cognitive learning: Testing the causal assumption. *Communication Education*, *67*(3), 308–329. https://doi.org/10.1080/03634523.2018.1465192

Hansen, M. (2014). Characteristics of Schools Successful in STEM: Evidence from Two States' Longitudinal Data. *The Journal of Educational Research*, *107*(5), 374–391. https://doi.org/10.1080/00220671.2013.823364

Hart Research Associates. (2015). *Falling Short? College Learning and Career Success*. Hart Research Associates.

Herman, K. C., Hickmon-Rosa, J., & Reinke, W. M. (2018). Empirically Derived Profiles of Teacher Stress, Burnout, Self-Efficacy, and Coping and Associated Student Outcomes. *Journal of Positive Behavior Interventions*, *20*(2), 90–100. https://doi.org/10.1177/1098300717732066

Hinojosa, M. S. (2008). Black-Whithe Differences In School Suspension: Effect Of Student Beliefs About Teachers. *Sociological Spectrum*, *28*(2), 175–193. https://doi.org/10.1080/02732170701796429

Hurtado, S., Newman, C. B., Tran, M. C., & Chang, M. J. (2010). Improving the rate of success for underrepresented racial minorities in STEM fields: Insights from a national project. *New Directions for Institutional Research*, *2010*(148), 5–15.

Kulinna, P. H. (2007). Teachers' attributions and strategies for student misbehavior. *The Journal of Classroom Interaction*, *42*(2), 21–30.

Lewis, R., Romi, S., Katz, Y. J., & Qui, X. (2008). Students' reaction to classroom discipline in Australia, Israel, and China. *Teaching and Teacher Education*, *24*(3), 715–724. https://doi.org/10.1016/j.tate.2007.05.003

Little, S. G., & Akin-Little, A. (2008). Psychology's contributions to classroom management. *Psychology in the Schools*, *45*(3), 227–234. https://doi.org/10.1002/pits.20293

Losen, D., Hodson, C., Keith, M. A., Morrison, K., & Belway, S. (2015). *Are We Closing The School Discipline Gap?* The Center For Civil Rights Remedies.

Okonofua, J. A., Paunesku, D., & Walton, G. M. (2016). Brief intervention to encourage empathic discipline cuts suspension rates in half among adolescents. *Proceedings of the National Academy of Sciences*, *113*(19), 5221. https://doi.org/10.1073/pnas.1523698113

Pane, D. M. (2010). Viewing classroom discipline as negotiable social interaction: A communities of practice perspective. *Anthropological Perspectives on Learning and Teaching: Legitimate Peripheral Participation Revisited*, *26*(1), 87–97. https://doi.org/10.1016/j.tate.2009.05.002

Perry, B. L., & Morris, E. W. (2014). Suspending Progress: Collateral Consequences of Exclusionary Punishment in Public Schools. *American Sociological Review*, *79*(6), 1067–1087. https://doi.org/10.1177/0003122414556308

Quinn, D. M. (2015). Kindergarten Black–White Test Score Gaps: Re-examining the Roles of Socioeconomic Status and School Quality with New Data. *Sociology of Education*, *88*(2), 120–139. https://doi.org/10.1177/0038040715573027

Reardon, S. F. (2008). Thirteen ways of looking at the black-white test score gap. *Stanford Institute for Research on Education Policy & Practice, Working Paper*, *8*.

Reardon, S. F., & Galindo, C. (2009). The Hispanic-White Achievement Gap in Math and Reading in the Elementary Grades. *American Educational Research Journal*, *46*(3), 853–891. https://doi.org/10.3102/0002831209333184

Ripley, A. (2016). How America Outlawed Adolescence. *The Atlantic*, *November*, 26p.

Roth, W., & Bowen, M. (1995). Knowing and Interacting: A Study of Culture, Practices, and Resources in a Grade 8 Open-Inquiry Science Classroom Guided by a Cognitive Apprenticeship Metaphor. *Cognition and Instruction*, *13*(1), 73–128.

Rousseau, R., Tremblay, S., & Breton, R. (2004). Defining and Modeling Situation Awareness: A Critical Review. In S. Banbury & S. Tremblay (Eds.), *A Cognitive Approach to Situation Awareness: Theory and Application.* (pp. 3–21). Ashgate.

Skiba, R. J., Chung, C.-G., Trachok, M., Baker, T. L., Sheya, A., & Hughes, R. L. (2014). Parsing Disciplinary Disproportionality: Contributions of Infraction, Student, and School Characteristics to Out-of-School Suspension

and Expulsion. *American Educational Research Journal*, *51*(4), 640–670. https://doi.org/10.3102/0002831214541670

Strambler, M. J., & Weinstein, R. S. (2010). Psychological disengagement in elementary school among ethnic minority students. *Journal of Applied Developmental Psychology*, *31*(2), 155–165. https://doi.org/10.1016/j.appdev.2009.11.006

Syed, M., Azmitia, M., & Cooper, C. R. (2011). Identity and Academic Success among Underrepresented Ethnic Minorities: An Interdisciplinary Review and Integration. *Journal of Social Issues*, *67*(3), 442–468. https://doi.org/10.1111/j.1540-4560.2011.01709.x

Tajalli, H., & Garba, H. A. (2014). Discipline or Prejudice? Overrepresentation of Minority Students in Disciplinary Alternative Education Programs. *The Urban Review*, *46*(4), 620–631. https://doi.org/10.1007/s11256-014-0274-9

Townsend, B. L. (2000). The Disproportionate Discipline of African American Learners: Reducing School Suspensions and Expulsions. *Exceptional Children*, *66*(3), 381–391. https://doi.org/10.1177/001440290006600308

Tulley, M., & Chiu, L. H. (1995). Student teachers and classroom discipline. *The Journal of Educational Research*, *88*(3), 164–171.

Whittaker, J. A., & Montgomery, B. L. (2012). Cultivating Diversity and Competency in STEM: Challenges and Remedies for Removing Virtual Barriers to Constructing Diverse Higher Education Communities of Success. *Journal of Undergraduate Neuroscience Education*, *11*(1), A44–A51. PMC.

LIFELONG LEARNING: COOPERATION WITHIN ENGINEERING EDUCATION AND INDUSTRY

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ABSTRACT

The trend of continuous learning or lifelong learning is becoming the main unifying feature of education around the world. Large-scale social and economic changes and the development of technologies have become a catalyst and drivers for the evolution of this trend. Therefore, nowadays interest in continuous learning of a future engineer is critical. To meet society's challenges the successful future engineer should be ready to study through the whole life. Lifelong learning has become the new normal and under these conditions, it becomes increasingly important, opening up long-term opportunities for participation in social and career development. The article analyses several key elements of current Russian policy in terms of their potential contribution to the fostering of a learning culture, seen as a support for lifelong learning. Such activities need the support and cooperation between education and industry partners. The goal is to help workers gain higher level skills to secure their employment or achieve advancements in their career. The purpose of this research is to provide a summary of the evidence related to issues associated with the definition of lifelong learning and to present the results of the survey concerning different options of lifelong learning for industries' staff. According to the survey among graduates working on the industries' plants it was defined which types of lifelong learning can be provided by Vocational Education and Training. The paper also reviews existing barriers and explores how to boost participation industries in the university educational process, and what role universities can play in the long-term training of enterprise specialists. As a result, the paper presents an action plan that includes a description of the problem and possible solutions.

Key words: lifelong learning, engineering education, university initiative, industries' initiatives

INTRODUCTION

Everyone who is currently working understands how essential it is to stay up-to-date with the skill requirements of the job market. Lifelong learning as constant, voluntary and self-motivated pursuit of knowledge for personal or professional reasons not only promotes social inclusion, active position, and personal development but also self-reliance, as well as competitiveness in the labor market. As we all know far too well, the world of work is subject to periods of change. The recent COVID-19 pandemic really drives home the need to be flexible about your current situation, as well as being prepared for the requirements of the future. Thus, to stay relevant, an ongoing learning process is necessary. Lifelong Learning describes the ongoing process of learning undertaken in schools, universities and in the work place (Brennan, J., Little, B., Connor, H., Weert, E., Delve, S., Harris, J., Scesa, A., 2006). However, informal learning at home and in social life are contributing to this ongoing process as well. The motivations and reasons to engage in lifelong learning can range from a need to stay up-to-date for work requirements, through to studying for personal interest. For this reason, lifelong learning in work place is high in demand (Cacciattolo, K., 2015). Lifelong Learning is a relatively new trend in education. It is considered that the term "lifelong learning" was first used in 1968 in the materials of the General Conference of UNESCO, which has taken the lifelong learning approach as a basis when developing a global learning strategy for 2014-2021. It is the process of intentionally expanding our skills and knowledge for personal, professional, and organizational improvement. The classic example of continuous learning is when an employee learns new hard skills, enabling them to gradually move up to more complex and challenging roles. Continuous learning also includes the development of soft skill sets such as leadership, management, collaboration, and more. Moreover, lifelong learning is fundamentally understood as unfinished education that becomes the main driver of a career and a prerequisite for the possibility of multiple professional scenarios throughout life. This paper arises the following questions: How to develop a lifelong learning culture in the workplace? Do universities meet the needs for continuing education? Will they be able to respond to employers' need for their staff? Who will teach professions that do not yet exist?

PURPOSE AND SCOPE

The purpose of this research is to provide a summary of the evidence related to issues associated with the definition of lifelong learning and to present the results of the survey concerning different options of lifelong learning for industries' staff. The objective of this paper is to briefly review several developments in the future visioning of engineering educational programmes under the changing labor market and engineering university's initiatives concerning common strategic plan with university's industrial partners.

Theoretical framework. The Russian tradition of engineering education is one of the strongest in the world and was founded more than three centuries ago. During the period 1869 - 1961, Rusian natural science and technology have won a leading position in the world. Along with Germany, and later with the United States, Russia played an outstanding role in the implementation of the largest technical achievements. The foundation of the national engineering school was laid in the 70s of the 19th century in Imperial Moscow Technical School (now MSTU named after N.E. Bauman). They became the practice-oriented technology of engineering education created here, which received wide recognition and fame all over the world as the "Russian method" of teaching. This method was the basis for the construction of engineering education by many world universities. One of the first followers of the "Russian method" was the Massachusetts US Institute of Technology. MSTU named after N.E. Bauman, steadily following the tradition, continuously improves and develops this technology. Leading engineering universities in Russia educational technology also focuses on the practice of students in industry. Such a practice-oriented technology, called the Phystech system, is based on the ideas of the "Russian method" and is one of the effective options for its development. It has shown the property of high adaptability, including in modern market conditions. economics: MIPT retained its key competencies; demand for graduates is constantly growing (first of all, from the side of the new science-intensive business). The systemic crisis that engulfed engineering education around the world could not bypass Russia, moreover, experienced the destruction of the economy in the 90s of the last century. In addition, if at the beginning of this century, everywhere began to reform higher education, Russian universities fought for survival. Moreover, the fact that the Russian engineering school managed to save itself indicates that the fundamental foundations laid down in it have a total stability and a large "margin of safety".

For the Universities it is time for changes, dictated by the need to meet the challenges and realities of the labor market and the market of science and innovation. Therefore, engineering education needs modernization focused on lifelong learning approach. Leading universities are the first to do this, while maintaining traditional principles and inextricable links with industry. In order for the industry to have an adequate resource of personnel by the time the situation in the economy begins to

improve, the modernization of engineering education must be ahead of schedule. High-tech enterprises around the world are experiencing a shortage of qualified engineering personnel of the new generation. The labor market requires graduates of engineering universities to master a wide range of competencies: entrepreneurial, the ability to learn independently throughout life, the ability to focus on solving problems rather than accumulating knowledge. Therefore, industrial partners are interested in lifelong training of their personnel, thus we see the mutual interest of education and industry. The ideas of serving education to the goals of a stable and dynamic society, which is undergoing serious technogenic and socio-political upheavals, are becoming dominant.

ENGINEERING UNIVERSITIES – A SPACE OF UNIQUE OPPORTUNITIES FOR LIFELONG LEARNING OF INDUSTRIES' STAFF

Universities as whole and engineering universities, in particular, turned out to be not quite ready for social and economic shifts, for new requirements from people, government, and corporations - requests for individualized development, flexible completion and constant upgrade of the necessary competencies of the staff. Education itself as an industry is currently undergoing a painful process of digital transformation, from which it will emerge greatly changed. Educational institutions must learn to adjust their programs to global changes in labor markets and to the individual tracks of each person at the same time. If higher education does not change, it will perish. It should find the strength, tools, resources to change rapidly along with the changing demand of students and industries' staff, and then it has a chance to survive. In this study 30 structured interviews with industry partners on their successful experiences with initiating self-directed learning within organization in collaboration with the university. This resulted in ten ways for self-directed learning. show that participants (more then 75 %) heavily rely on self-learning activities, and internet searching predominates workplace learning (60%). The results show that participants heavily rely on self-learning activities, and internet searching predominates workplace learning. Generally, findings associated with the organizational level and individual-level factors that negatively influence participants' workplace learning are presented along with suggestions for better practice and further research.

To prepare for the challenging future, the National Research Tomsk Polytechnic University (TPU) undertook an in-depth study of how engineering education would have to change to the labor market, providing a diversity of new engineering programs with skill sets required by industry. This did not go unnoticed by the government and industries too. The key priority of the government and industries is their 2020-2035 Investment Plan that is focused on providing skills that are required to participate in today's workforce. The plan is structured into different

initiatives like the Employment Promotion Program and Staff Partnership. The reform of higher education is designed to make national higher education more modern, relevant and useful. It is necessary to make such requirements for educational programs that ensure the development of student's ability to think, act, and make decisions. The experience of the last decades has shown that active forms of learning, such as business games, workshops, trainings, etc. Industry in Russia has long been an active partner of universities in engineering training. Based on the generalization of the experience of leading Russian engineering universities and their interaction with industry partners, we formulate the following principles for building an integration system of engineering education with "immersion" of students in a professional environment, the proper implementation of which ensures high efficiency:

1. The training of engineers is planned on the basis of a long-term agreement between the university and the industrial enterprise in accordance with the industry development program.

2. Within the amount of teaching time, the practice is evenly distributed and carried out continuously throughout the entire period of the student's study at the university. This ensures maximum possible "immersion" of students in the professional environment of a team of scientists and engineers of enterprises.

3. The program of continuous scientific and industrial practice of students at the enterprise, in terms of content and timing, is rationally combined with programs of theoretical teaching at the university.

4. Integration is carried out on the basis of curricula agreed with the enterprise and programs of theoretical disciplines with a rational ratio of the number university professors and attracted industry specialists.

5. In the educational process and within the course of scientific industrial activity of students, not only laboratory equipment of the university is used, but also a rich material and industrial equipment of the enterprise, including unique test benches and samples of new technology.

6. The content of the disciplines appropriately reflects the process of a dynamically developing industry. Educational programs are constantly adjusted.

7. Requirements for specialists are predicted and updated ahead of time.

8. University and enterprise staff skills are constantly improving by participating in joint training and scientific research work.

In the success of the integration system of engineering education discussed here, the main role belongs to the joint work of the enterprise and university teams, those researchers and engineers who create the enabling framework to form professionals.

Moreover, it is necessary to notice that one of the priority of TPU is Higher Level Skills program between the university and its industrial partners such as Gazprom, SIBUR, RosAtom and others. The goal is to help workers gain higher-level skills to secure their employment or achieve advancements in their career. As our research has shown that, there are clear stages at workers' life where the need

for further training is higher. According to survey from the 2022 Rosstat analysis, the motives were the following:

- 30.1% to get promoted or find a better job;
-25.4% because their job required an up-skilling;
- 12.1% for personal interest;
- 17.9% to acquire extra competencies for their work;
- 10.2% to go into a different carrier path;
- 4.9% to access a continuing course of their study.

There are two options of Lifelong Learning that can be provided by TPU for their industrial-partners staff: up-skilling and re-skilling. It is regarded as up-skilling if an individual wants to improve his/her skills or learn new skills to increase chances for a better career or a higher promotion,

As the market is changing rapidly, due in part to technology many people need to receive training while working at the same time. TPU tends to provide flexible courses to adjust to the schedules of employees, by offering short and part time courses, including distance courses.

TPU also suggest the courses of re-skilling for people who need to receive training to change jobs or start a different career. At present, TPU has all the prerequisites for lifelong learning of industrial partners' staff. Moreover, interaction with industrial partners is an important part of the Program "Priority 2030" for the creation and development of Advanced Engineering Schools. TPU is among the winners of this Program.

CONCLUSION

Tomorrow's world will require skill sets that are very different to those needed today. To foster a continuous learning culture the company should make a strategic plan. Learning and training are therefore taking a more significant and markedly different role both for employers and employees today, and the value of learning is rising and becoming more strategic. From this point of view, the universities could be a space of unique opportunities for industries within the common strategic plan of staff lifelong learning.

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REFERENCES

Brennan, J., Little, B., Connor, H., Weert, E., Delve, S., Harris, J., Scesa, A. (2006). Towards a strategy for workplace learning: Report to HEFCE by CHERI and KPMG. Bristol, UK: Higher Education Funding Council for England.

Cacciattolo, K. (2015). Defining workplace learning (Vol. 1). European Scientific Journal. Retrieved from https://eujournal.org/index.php/esj/article/view/5559

Collin, K. (2002). Development engineers' conceptions of learning at work. Studies in Continuing Education, 24(2), 133–152. https://doi.org/10.1080/0158037022000020956

Creswell, W. J. (2012). Educational research: Planning, conducting and evaluating Daheim, C. Corporate foresight in Europe: from trend based logics to open foresight. Technology Analysis & Strategic Management. Vol. 20, Issue 3. 321–336. (2008).

Duke, C. (1976) Australian Perspectives on Lifelong Education, Australian Education Review, No. 6. Hawthorn: Australian Council for Educational Research.

Levin, M., & Greenwood, D. (2001). Pragmatic action research and the struggle to transform universities into learning communities. Handbook of action research: Participative inquiry and practice, 103-113.

Rademakers, M. (2014).Corporate universities: Drivers of the learning organization. Routledge.

Lifelong Learning: Introduction. The Oxford Handbook of Lifelong Learning (1 ed.) Edited by Manuel London © Oxford University Press. (2022).

INTERTWINING TECHNICAL AND EDUCATIONAL CHANGE WITH TEMPLATES IN A VIRTUAL LEARNING ENVIRONMENT

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ABSTRACT

Within NHL Stenden University of Applied Science, a choice for a new virtual learning environment was made in mid-2021, primarily on policy and management grounds. Early in the migration process, it became clear that this approach could perturb the further rollout of the Design-Based Education (DBE, https://edu.nl/mwp8j) educational concept. Four templates were developed to intertwine technological and educational processes that structure different ways of "blended" learning and teaching within DBE. Initial user experiences show that the templates' structures help teachers reconsider online learning activities to shape and facilitate blended DBE learning processes.

INTRODUCTION

Design-Based Education (DBE, https://edu.nl/mwp8j) is the principal educational concept of NHL Stenden University of Applied Sciences (Geitz & de Geus, 2019). This innovative constructivist concept promotes multidisciplinary thinking and action, contains an international orientation, is grounded in Design Thinking (Rauth et al., 2010), and encourages personal leadership and sustainable education. Key concepts are learning from real-world experiences, learning from and with each other, and attention to personal and professional development. Design-Based Education works cyclically in six phases, see Figure 1, and takes place in an atelier.

Figure 1, Design-Based Education cycle

The DBE approach requires teachers within the university to promote student knowledge and skills through collaborative learning processes (Assen, 2020). Teachers struggle with this new approach.

With blended forms of DBE, an additional challenge is to perform parts of these collaborative learning processes online. Ongoing support is available within the university, but it needs to be more cohesive. From the Office of Education, Research & Internationalization (OO&I), an "Atelier Blended Learning" was formed in mid-2021 to unite support on blended learning for teachers in one place. In this open atelier, teachers from different academies work together, as well as staff from the internal training service, My Academy, and ICT administrators.

At the same time, the contract with the University's virtual learning environment (VLE) Blackboard Original expired, and a tender was required for a new one. The outcome of the tender was Blackboard Ultra. Subsequently and a vigorous migration

process was initiated. Although the name suggests otherwise, the two virtual learning environments differ considerably in how they facilitate the learning processes. The former Blackboard Original allows instructors to tuck the information away in folders within folders, etcetera. The new Blackboard Ultra has only three levels, forcing instructors to change the data structure. Changing this structure also forces teachers to rethink the student learning process and, more explicitly, design which learning activities occur online and which occur face-to-face. A combination with the educational concept, DBE, may also be part of this rethinking process.

When educational and technological change co-occurs, both come together in a teacher's sphere of work and might influence one another. This can be an uncertain time for teachers with an opportunity for change.

When the migration to Blackboard Ultra was technically underway, participants of the Atelier Blended Learning were more involved in the migration of Blackboard Ultra. At this time, the group was working on a definition for Blended Learning for the university and was looking for a way to support faculty in forming "blends" appropriate to DBE.

A search through existing policy documents and background on DBE led to two key articles: Kurtz and Snowden (2003) and Cronjé (2020). Kurtz and Snowden (2003) set forth four different views of knowledge utilization and call them: Known, Knowable, Construction, and Chaos, see Figure 2. Cronjé (2020) describes four different approaches to learning: Injection, Integration, Construction, and Immersion, see Figure 3.

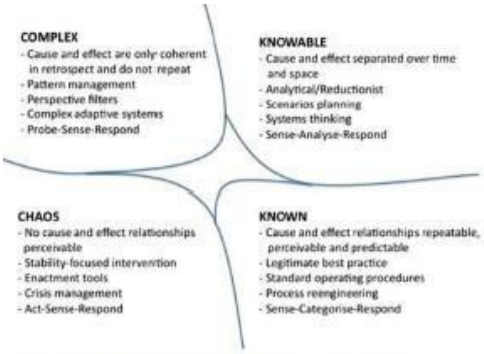


Figure2, Different knowledge approaches (Kurtz & Snowden, 2003, p. 464)

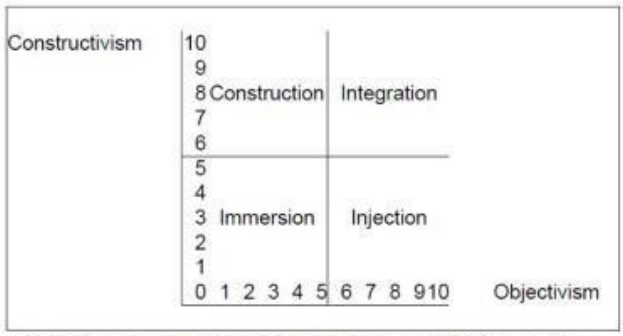


Figure 3, Four educational approaches (Cronjé, 2006, p.392)

Cronjé then superimposes the four approaches to learning over Kurtz and Snowden's (2003) four knowledge approaches and illustrates the differences between the approaches with pedagogical (methods) and technical (technologies) examples, as seen in Table 1.

With this matrix, Cronjé clarifies that different learning approaches are related to various activities and digital tools. This matrix also explains how definitions of blended learning from other universities might not fit NHL Stenden. The social constructivist approach of Design-Based Education fits better with Kurtz and Snowden's (2003) complex knowledge approach, and Cronje's (2020) Construction approach to learning than with the more commonly Known (Kurtz & Snowden, 2003) and Injection (Cronjé, 2020) approaches.

Within the university, all four approaches to learning occur. We see the Immersion approach primarily in internships. We see the Injection approach in lessons, lectures, and workshops emphasizing subject matter content and tests. We see the Integration approach mainly in situations where students practice skills, compare and analyse information from different (professional) sources, and discuss and puzzle with each other. What distinguishes the Integration from the Construction approach is that for the former teachers know the correct answer in advance, while for the latter, many answers are possible.

Table 1 Fourdifferent approaches to knowledge and learning require different pedagogies and theuse of digital tools (Cronjé 2020)

Context (Kurtz & Snowden)	Theory (Cronje)	Methods	Technologies
Known	Injection	Tutorial Drill	Lecture Book Video
Complex	Construction	Construction Exploration	Open-ended learning environments Construction kits and tools Spreadsheets
Knowable	Integration	Puzzle Discussion Debate	Games Discussion tools
Chaos	Immersion	Experience Field trip Apprenticeship	Blogs Logbooks Assessment tools

From the observation that four different educational approaches are recognizable in practice, though not mutually exclusive, Cronjé (2020) substantiates that a definition of blended learning should include clues regarding educational context, theory, method, and technology.

Because all four approaches are recognizable within NHL Stenden, the Atelier blended learning established the following working definition for Blended Learning:

At NHL Stenden, we interlace face-to-face and online learning environments to enrich and optimise student learning within Design Based Education. We make sensible use of digital tools to enrich inclusive learning and make learning and teaching more efficient.

This definition offers room for all four of Cronjé's different approaches to learning to shape their blend. This definition and the insight that every approach to learning requires its own blend also influenced the migration process from Blackboard Original to Blackboard Ultra.

Based on good experiences at other universities worldwide, the supervisors from Blackboard suggested supporting teachers during the migration to the new VLE with the help of a template. A template gives teachers a start to work with instead of an empty space.

Several online sessions took place with administrators, technicians, and educationalists of NHL Stenden to determine what the template for NHL Stenden might look like. It became immediately apparent that the templates proposed by Blackboard emphasized structuring subject matter content and tests. As such, the proposed templates revealed an objectivist approach to learning consistent with the quadrants "known" (Kurtz and Snowden 2003) and "Injection" (Cronjé, 2020) and not a constructivist approach desired for DBE.

It became increasingly clear that working with a template can certainly be helpful and give teachers a foothold and some guidance during the design of a learning process and that the unique educational concept of DBE requires its own template. The use of templates with an objectivist approach to learning developed elsewhere perturbs development toward the more constructivist forms of DBE. Thus, the real challenge appeared: creating a template in Ultra that can support teachers of NHL Stenden in shaping blended Design-Based Education.

This design challenge was taken up in three phases. For each phase, different steps of the DBE cycle were followed. The exploratory phase mainly focused on the second DBE step, "determine the question based on knowledge," and also generated ideas and design requirements. These design requirements were the start of the second phase, in which prototypes for a template were developed and presented to a teacher, a lecturer, and an educational advisor. The final phase, researching the effect, is currently still in progress.

The following sections provide further descriptions of each phase’s activities using the Design-Based Education steps.

ORIENTATION PHASE

STEPS 1, 2, AND 3 DESIGN-BASED EDUCATION

Based on the design challenge, Cronjé's (2020) matrix was expanded with requirements related to Design-Based Education, see table 4.

This chapter presents an overview of the theory gathered, ideas generated, and design requirements for the template that surfaced during the process.

The theoretical grounding for design requirements of the template

Several prerequisites for the template have been analysed: interactive quality; proficiency level; conversational framework; teachers' technological knowledge; and Ultra. Some theoretical background for each requirement is provided below.

Interactive quality

One of the requirements for DBE is that students work in groups and work with stakeholders from outside the university. A template for DBE in Ultra incorporates items that can facilitate the multidirectional interactions needed for group work. To identify these items for the template, the measure of 'interactive quality' (Roblyer and Ekhaml (2000) was used.

Cronjé's matrix does not elaborate on how the items under 'methods' and 'technologies' shown in table 1 were chosen and aligned with the different approaches to learning. To match the pedagogical requirements per approach to learning with the technical facilities Ultra provides, we used the measure 'interactive quality,' developed by Roblyer and Ekhaml (2000). The measure was initially designed for distance education. It was based on the finding that aligning the direction of interaction and the number of people involved, pedagogically and technically, was a critical success factor for online learning. The measure is not confined to distance education and can also be used to align pedagogical requirements and technical possibilities for blended learning.

The measure 'interactive quality'(Roblyer and Ekhaml (2000) has five levels that run from broadcasting information to mutual interactions among teachers and students and with external experts involved in the learning process, see Table 2.

Roblyer and Ekhaml (2000) state that in online education, the digital tools deployed must be capable of facilitating the pedagogically desired interactions. After all, if the digital tool chosen does not facilitate these interactions or facilitates interactions in a different way than intended pedagogically, the constraints of a digital tool determine the pedagogy rather than the teacher. It might seem like a matter of course that teachers choose digital tools that meet their pedagogical requirements. In practice, however, "mismatches" between the two frequently occur (Almå s & Krumsvik, 2008; Pareja Roblin et al., 2018).

Many experts emphasize that, during the design process, teachers should first determine the content learning goals, then decide which learning activities help

students acquire these goals, and then choose digital tools to facilitate the activities (Laurillard, 2012; Voogt et al., 2013). In practice, however, teachers are only acquainted with a limited number of digital tools (Brummelhuis & Binda, 2017) and are seen to work the other way around (Behnen & Kuijper, 2022). During online learning processes, teachers adapt the learning activities to what they know the digital tools can do. In other words, the possibilities of the digital tools teachers are acquainted with determine what happens pedagogically. It follows that the technical options of a VLE might influence pedagogical processes and that heed needs to be given to how teachers perceive them. A template that aligns the educational concept of the University with the possibilities of the VLE might thus support teachers in designing blended Design-Based Education.

Table 2, Levels of interactive quality (Roblyer & Ekhaml, 2000)

level	Interactive Quality	Ways of interaction
1, very low	Broadcasting	
2, low	Individual communication between two people or one person and a technology	
3, intermediate	In addition to individual communication, small group work takes place with just the group members involved in the interaction	
4, high	In addition to communication within small groups, the groups share their outcomes with the other groups and reflect and comment on each other's work	
5, very high	In addition to small groups sharing their outcomes, outside experts are involved, harvesting information within and outside class and instant sharing of outcomes with all participants	

We analysed Cronjé's (2006) approaches to learning with Roblyer and Ekhaml's (2000) measure of interactive quality. Pedagogically, the 'Construction' and 'Immersion' approaches to learning require all five levels of interactive quality (Roblyer & Ekhaml, 2000). 'Injection' and 'Integration' approaches can make do with the first three levels; see Figure 4.

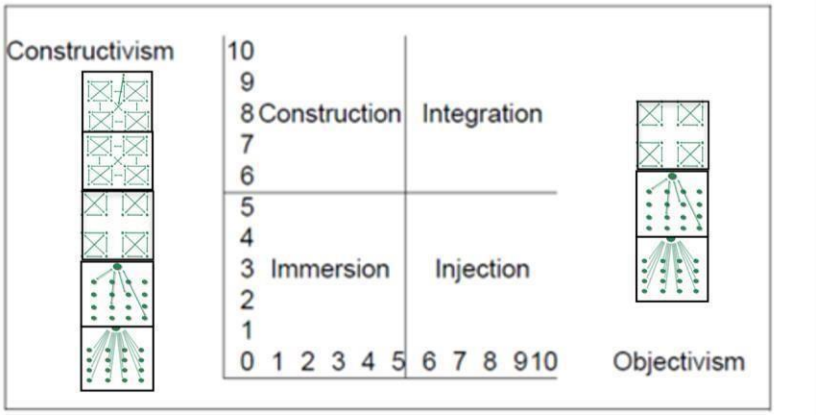


Figure 4, Levels of Interactive Quality (Roblyer & Ekhaml, 2000) for the four approaches to learning (Cronje, 2020)

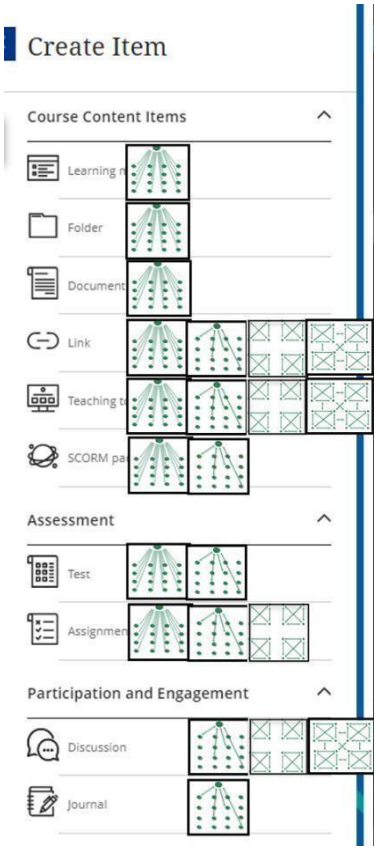


Figure 5, Interactive quality (Roblyer & Ekhaml, 2000) of Ultra features

We did the same for Ultra. Many features within Ultra promote lower levels of interactive quality (Roblyer & Ekhaml, 2000); see Figure 5. Unfortunately, interaction with an external expert, an essential facet of DBE, is not yet possible.

The analysis betrays a mainly objectivist view of the learning of the developers of Ultra. With this analysis in mind, the design challenge can be refined to develop a template with the mainly objectivist features of Ultra to support teachers of NHL Stenden in shaping a constructivist approach to blended Design-Based Education.

Proficiency level

Another requirement we wanted to add to Cronjé's matrix was students' proficiency levels. We analysed Bloom's taxonomy (Anderson & Krathwohl, 2001) and Miller's (Miller, 1990).

Both taxonomies could be linked reasonably easily to the different teaching approaches. Miller's *knows* and *knows how* apply well to Injection and Integration (Cronjé, 2006). Miller's *shows how* is apparent to Integration, Construction, and Immersion, and Miller's *does* to Construction and Immersion. With Bloom's taxonomy, it is possible to link the levels *remember* and *understand* to all of Cronjé's approaches, but are most apparent within the Injection approach. For Cronjé's Integration approach, *apply* and *analyse* are appropriate. In the Construction approach, the mastery levels *evaluate* and *create* are essential for students to self-assess the quality of their work. In the Immersion approach, the ability to *analyse* practical situations and *evaluate* actions is critical to the learning process. The outcome of the analysis was that Miller's taxonomy had a clearer 'fit' with the approaches to learning and was thus added to the matrix.

Conversational framework

Laurillard's (2012) Conversational Framework was already in use for other support facilities within the University. Within the Atelier blended learning team there was a request to connect Laurillard's framework with Cronje's approaches to learning. However, the analysis revealed that this was impossible. All components of Laurillard's conversational framework could be included in all of Cronje's approaches to learning. Also, all levels of interactive quality could occur within each element of Laurillard's conversational framework leaving us with no possibility to differentiate. We, therefore, dropped this requirement.

Teacher's technological knowledge

Another requirement for the template design was the teacher's knowledge of technology. Thus we analysed teachers' Technical, Pedagogical, And Content Knowledge (TPACK; Mishra & Koehler, 2006) needed per approach to learning.

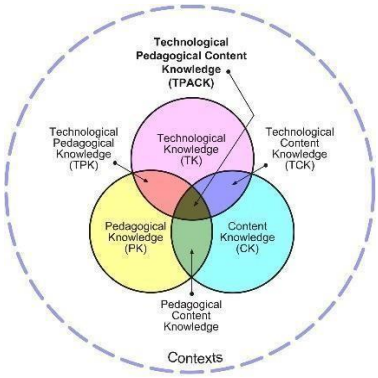


Figure 6, The TPACK-model by Mishra & Koehler (2006

Within the Injection and Integration approach, teachers primarily combine technical knowledge (TK) with content knowledge (CK) to steer the learning process.

The Construction approach requires more intensive student interaction. Combining technical knowledge (TK) and pedagogical knowledge (PK) is essential. For Immersion, the combined TPACK of teachers is necessary because this approach involves teachers helping students connect practical experience from their internships with theory learned during their training.

Ultra

Finally, the features of Blackboard Ultra were connected to the four approaches to learning according to their interactive quality, as shown in figure 5. All Ultra features can be used within all teaching approaches, but some have a better fit.

In the Injection approach, knowledge transfer is essential, and a clear sequence of files and activities aimed at acquiring knowledge is appropriate. The Integration approach is about solving problems. These problems can be structured in Ultra's assignments. In the Construction approach, Ultra features that facilitate group work and enable discussions are appropriate. For the Immersion approach, all available

features can be helpful. Input for the learning process in this approach is whatever students encounter during their internships. Therefore, Ultra features that can support students in reflecting on their actions, such as a journal, are helpful.

Summary of design requirements and ideas for the template

Based on the above, an overview was made in table 3 of the design requirements and ideas that surfaced.

Table 3, Summary of design requirements and generated ideas

Design requirement	Generated idea
Recognizable and distinguishable for teachers and easy to use	Not all courses within the university follow the steps of the DBE cycle and do not have to. Create a template for these other approaches as well. Cronjé's different approaches to learning also include differences in how teachers and students, students among themselves, and students with outside experts work together. Their manner of interaction differs. Roblyer & Ekhaml's (2000) five levels of interactive quality can potentially help to further identify those differences.
The template helps teachers avoid 'mismatches' between pedagogy and technology.	Based on the five levels of interactive quality, analyse the various "items" within Ultra. Incorporate Miller's taxonomy (Miller, 1990) into the templates. Roblyer & Ekhaml's (2000) five levels of interactive quality have both pedagogical and technical dimensions. These dimensions can be helpful in "matching" the interaction that is pedagogically desirable per Cronjé's (2006) educational approach with what the virtual learning environment Ultra can facilitate technically.
Inspiring, using the templates, teachers can discuss the design of their teaching.	Develop four templates instead of one, using Cronjé's (2006) approaches to learning as a starting point. For each template, select the items that facilitate the interaction required for that approach to learning and build the templates around them.
Supporting Design-Based Education (DBE).	The template to be developed includes the steps of the DBE cycle.
Teachers are allowed, but not required, to use the templates	Practice what you preach: the structure of each template is unique and reflects the respective approach to learning
Bring together information and resources for teachers scattered across different platforms and services on the intranet.	Supplement the templates with information from other fragmented resources within the university.
Discarded ideas - Develop a template around the five facets of DBE - Incorporate Bloom & Krathwohl's (2001) taxonomy into the templates - Develop a template with Laurillard's (2012) conversational framework	

Stakeholder feedback

The design guidelines and first ideas were discussed with a teacher, a researcher, and an educational advisor within NHL Stenden.

The teacher:

"What a great idea to use four approaches to knowledge for four approaches to learning and translate them into a template. I Never thought about being able to set up a VLE that way. Brilliant."

The researcher noted that more than one template would be required for NHL Stenden. All four approaches occur at NHL Stenden, and each deserves a template.

The educational advisor:

"We seem to have advanced further with blended DBE than expected."

The educational advisor emphasized that DBE allows room for different approaches to learning. The aim is that about 30% of every study program is organized according to DBE.

With these encouraging responses, it was decided to build four templates instead of one based on the gathered theory.

DEVELOPMENT PHASE,

STEP 4 OF THE DESIGN-BASED EDUCATION CYCLE

The building of the templates took place within Ultra, as seen in table 4.

The templates have been available to teachers since the summer of 2022. When teachers request a new Ultra environment, they are first asked which template they would like to use. There are resources available with which they can make a grounded choice.

Teachers can select one of the four templates, a combined template that includes the content of all four templates or choose no template. With the latter choice, teachers receive an empty Ultra environment.

The templates are for inspiration. Teachers are not required to use them. After requesting a template, teachers can adjust everything to their liking.

IMPLEMENTATION AND TEST PHASE

DBE STEPS 5 AND 6

The implementation and test phase of the templates is currently taking place. We follow how teachers use the templates both quantitively and qualitatively.

Preliminary quantitative results show that, to date, 115 templates have been requested, 23% of which asked for the Injection template, 7% for the Integration template, 28 % for construction, and 43 % for Immersion.

Some preliminary qualitative results are:

"If I had not seen the possibility of what a template could do, I think I would have gone back to the copy-and-paste activities we were used to in Blackboard Original" MF.

"Thank you so much for these templates and all the resources now in one place," AK.

"So happy not everything has to be DBE," HK.

"Templates are a good idea. We will make our own for our academy," KZ.

"We used the Construction template, and it seems to fit well with what we are doing. Looking back, we found out we did not use the last two steps of DBE the template provides. This was a wake-up call for us... This is interesting because the template helps to design what we have in mind but also helps us keep on track. Yes, I think the template can help to implement DBE" AK.

FUTURE

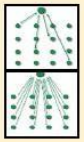
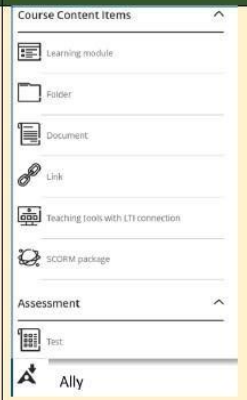
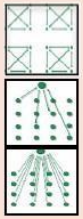
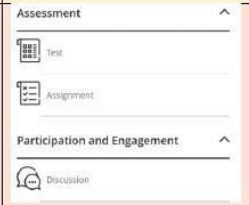
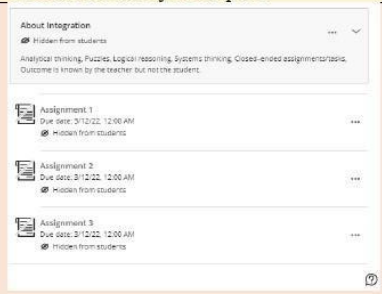
NHL Stenden has a unique educational concept, Design-Based Education. This requires its own approach to blended learning.

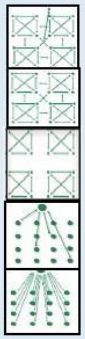
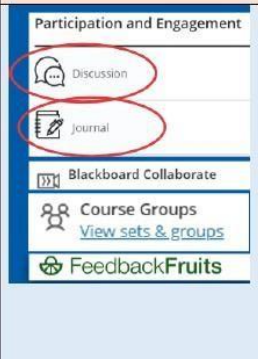
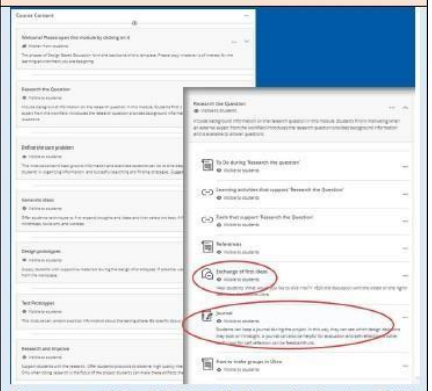
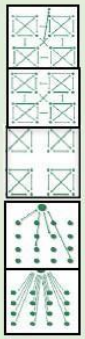
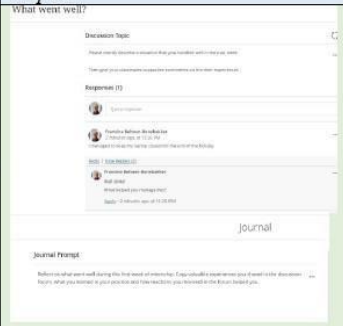
By comparing the interactive quality of pedagogical requirements with the technical features of the virtual learning environment, four distinct templates were developed based on four approaches to learning (Injection, Integration, Construction, and Immersion).

Initial practical experiences with the templates encourage us to continue to develop the templates with more teacher resources. We will also continue to monitor how

teachers adopt the templates and how this can affect shaping blended Design Based Education.

Table 4, a summary of requirements for a template per approach to learning (Cronje, 2020) and prototypes in Ultra

Approach to learning (Cronje, 2020)	Students proficiency level (Miller, 1990)	Teacher's TPACK, (Mishra & Koehler, 2006)	interactive quality (Roblyer & Ekhaml 2000)	Features of Blackboard Ultra for building the template	Prototypes in Ultra
INJECTION knowledge acquisition & Direct instruction Cause and effect are repeatable, imaginable, and predictable. There are existing practices and standard procedures. In this approach, knowledge about the use of technology focuses on the teacher making information available and the student processing it individually, which can also take place a-synchronously (student can set own pace).	Knows	Mainly TCK, Knowledge about how to present information online.			 *The sequence of material to be learned is visible in the main structure of the template.*
INTEGRATION Puzzles with correct answers are known in advance. Exercise and exchange through discussions, conversations, and games This approach requires analytical thinking in which cause and effect are separated by time. This involves puzzles and assignments/tasks, of which the outcome is known to the teacher but not to the student. Through this approach, students learn	Knows how and shows how	TCP Knowledge about structuring online learning activities that facilitate students to analyse and discuss resources			 *This template emphasizes analysis and puzzling. Assignments form the backbone of this template.*

to reason logically and think in systems.					
CONSTRUCTION Issues from the field and experimentation This course focuses on exploring and exploring complex issues from the field in iterative cycles (Geitz & de Geus, 2019). Students learn by doing, experimenting, and making mistakes. All stakeholders, students, teachers, and experts participate in this collaborative learning process.	Shows how + Does (under guidance)	TPC Knowledge about facilitating interaction and group work online (Heitink et al., 2016)			 *The steps of the DBE cycle form the basis of this template.*
IMMERSION Practical experience, stepping into the unknown, experiential learning, and internship. Experiential learning in a real-life situation In this approach to learning, There is no predictable relationship between cause and effect, and interventions aim to gain stability and grip. This is where most theories indicate that real learning takes place (e.g., Shipley 2017). Examples of learning activities within this quadrant include field trips, internships, and authentic life assignments.	Does (independent)	TPACK Knowledge about adapting technological needs to the learning process as it unfolds.		 For this approach, a sound portfolio system is also needed.	 *This template is the least filled. The recommendation is to match what students need closely. They may therefore be given teacher rights in this environment.*

REFERENCES

Almå s, A. G., & Krumsvik, R. (2008). Teaching in Technology-Rich Classrooms: is there a gap between teachers' intentions and ICT practices? *Research in Comparative and International Education*, *3*(2), 103. https://doi.org/10.2304/rcie.2008.3.2.103

Assen, H., de Boer, M. R., & Fernandes, M. B. (2021). Moving to design-based education in hotel management school: proof of success and beyond—a research journey. *Research in Hospitality Management*, *11*(2), 145-150.

Anderson, L. W., & Krathwohl, D. R. (2001). A Taxonomy for Learning, Teaching, and Assessing. In *Longman, New York*.

Behnen, F., & Kuijper, M. (2022). The Development of Interactive Quality of Online Teaching and Learning During the Corona Crisis. In M. Willemse, N. Gee, Z. Charlesworth, P. Belpaire, H. Stokhof, E. Ryymin, T. De Schryver, S. Heremans, T. Davison, L. Verschakelen, L. Vanhaeren, & R. Hendrickx (Eds.), *Eapril 2021 conference proceedings* (Issue 7, pp. 28–42). EAPRIL, European Association for Practitioner Research on Improving Learning. https://doi.org/ISSN 2406-4653

Brummelhuis, A. ten, & Binda, A. (2017). *Vier in balans-monitor 2017: de hoofdlijn*. Kennisnet.

Cronjé, J. (2006). Paradigms regained: Toward integrating objectivism and constructivism in instructional design and the learning sciences. *Educational Technology Research and Development*, *54*(4), 387–416. https://doi.org/10.1007/s11423-006-9605-1

Cronje, J. C. (2020). Towards a new definition of blended learning. *Electronic Journal of E-Learning*, *18*(2), 114–135. https://doi.org/10.34190/EJEL.20.18.2.001

Geitz, G., & de Geus, J. (2019). Design-based education, sustainable teaching, and learning. *Cogent Education*, *6*(1). https://doi.org/10.1080/2331186X.2019.1647919

Kurtz, C. F., & Snowden, D. J. (2003). The new dynamics of strategy: Sense-making in a complex and complicated world. *IEEE Engineering Management Review*, *31*(4), 110–130. https://doi.org/10.1109/EMR.2003.24944

Laurillard, D. (2012). I was teaching as a Design Science: Building Pedagogical Patterns for Learning and Technology. In *Routledge*. https://doi.org/10.1080/00071005.2012.742279

Miller, G. E. (1990). The assessment of clinical skills/competence/performance. In *Academic Medicine* (Vol. 65, Issue 9, pp. S63–S67). https://doi.org/10.1097/00001888-199009000-00045

Mishra, P., & Koehler, M. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *The Teachers College Record*, *108*, 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Pareja Roblin, N., Tondeur, J., Voogt, J., Bruggeman, B., Mathieu, G., & van Braak, J. (2018). Practical considerations informing teachers' technology integration decisions: the case of tablet PCs. *Technology, Pedagogy, and Education*, *27*(2), 165–181. https://doi.org/10.1080/1475939X.2017.1414714

Rauth, I., Kö ppen, E., Jobst, B., & Meinel, C. (2010). Design thinking: An educational model towards creative confidence. *DS 66-2: Proceedings of the 1st International Conference on Design Creativity, ICDC 2010, December* 1–8.

Roblyer, M., & Ekhaml, L. (2000). How interactive are your distance courses: A rubric for assessing interaction in distance learning. *Online Journal of Distance Education Administration*, *3*, na. https://www.westga.edu/~distance/roblyer32.html

Voogt, J., Braak, J. Van, Heitink, M., Verplanken, L., Fisser, P., & Walraven, A. (2013). *DIDACTISCHE ICT-BEKWAAMHEID VAN DOCENTEN*.