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on Improving Learning

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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 2019 Conference as well as some afterglow moments of the 2018 Conference can be found on our conference website http://www.eapril.org.

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EPORTFOLIO AS A TOOL TO ACHIEVE NEXT GENERATION STUDENTS

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ABSTRACT

The expectations of future employers for graduated students have changed the last decades. Due to different general trends such as digitalization, flexibility and decentralization but also due to our fast changing biomedical context 'next generation students' are of aim. How can higher educational institutes keep up with these changing expectations? These trends acquire the capabilities of students to be familiar with different generic competences as also acknowledged by evaluating job applications for our graduated students. Our educational programme 'Biomedical Laboratory Technology' from the University of Applied Sciences Leuven-Limburg, will work on these generic competences in a structured way with focus on domain specific contents by using ePortfolio. By implementing an ePortfolio not just in one curricular unit but overall the curriculum as a stable base for the different curricular units within the three years of the educational programme, the aim is to achieve next generation graduated students. This will benefit the students personal development and will be beneficial for the working field.

INTRODUCTION

The educational programme

This design is performed in the professional bachelor programme (PBA) 'Biomedical Laboratory Technology' (BLT) from the University of Applied Sciences Leuven-Limburg (UCLL). This higher educational institute arose in 2014 after a merge between three Belgian higher educational institutes. The institutes were located in Flemish Brabant and Limburg and the locations did not changed after

merging except for the two institutes in Flemish Brabant which are now located on one campus. The educational programme BLT is organized on both campuses. The creation of a new curriculum was one of the priorities for the programme coordinators during the merge to give students the options to switch from campus after completing one curricular unit. This new curriculum created a momentum to introduce ePortfolio, more detailed information about the set-up of the ePortfolio is given later in this article.

The BLT programme belongs to the Faculty of Health and there is an ongoing interaction with University Hospitals both in Leuven (Flemish Brabant) and Hasselt (Limburg). The lecturers within the programme have different preliminary education levels. There is a mix of professional bachelors, masters and/or masters with a Ph. D. degree.
The government in Flanders developed a Qualification framework related to the European Qualification framework (Vlaams ministerie van onderwijs en vorming. (n.d.)). The PBA BLT reaches level six in this Qualification framework and has a duration of three years.
The first year is common for all students, from the second year on there are two different specializations the student can choose of. The first, 'Pharmaceutical and Biological Laboratory Technology' (PhBT), is related to the biomedical research field. The second, 'Medical Laboratory Technology' (MLT) is related to the clinical field.

NEED FOR NEXT GENERATION STUDENTS

"*The landscape of higher education in Europe has been changing during the last decades*." (Devaere, Martens & Van den Bergh, 2017). The world wide web contributes to expanding networks (Claassen & Dehandschutter, 2008) and create possibilities for time and place independent learning. Consequently this gives opportunities for another organization of education (table 1).

Table 1:
Education is no longer time and place dependent

Time and place dependent	Time and place independent
Fixed hours: 9 till 5	24h/7d
Lessons in classroom – in group	Lessons available with WWW – alone?
Classgroup depend on setting	Variable classgroups
Regional	International
'Traditional' learning	Blended learning
Teacher centered	Student centered

The organization of education influences the well-being of students as examined within the educational programme BLT in 2015-2016 (Devaere, 2016).

Not only higher education has faced several changes, also our society in general is changing due to globalization. Digitalization, flexibility and networking became important characteristics of our society and work life. Transnational networks arise and communication take place in an international context (van den Berg, 2003; Verhoeven, Kelchtermans, & Michielsen, 2004).

An important example of influence of the international context is the Lisbon strategy, introduced in March 2000 by the European Council (Fannes, 2013). The aim was to make the EU "the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion" (Verhoeven et al., 2004). As a result, the European Union aims to facilitate the employment opportunities for young people through the design of various strategies. For example the implementation of a European Qualification Framework (EQF) enhanced uniformity, transparency and visibility among Europe (Depreeuw 2006). Flanders, who agreed the Lisbon strategy, developed a Flemish Qualification Framework (FQF) based on the European one as mentioned before (Vlaams ministerie van onderwijs en vorming, n.d.). All BLT educational programmes in Flanders worked together to define learning outcomes each graduated BLT student needs to achieve at the highest level, the Flemish Qualification Framework was the base for the defined learning outcomes. There are three different levels for each learning outcome, within each level complexity and autonomy increase .

In 2014 Mourshed, Farell and Barton indicated that the same needed skills and competences for young graduates are missing across Europe: English proficiency, team work, hands-on experiences and problem solving and analysis.

Within the biomedical working field

Since the industrial and academic field of biomedical sciences is also a fast changing sector with rapidly evolving technologies the needs for graduated BLT students has also changed in here. Biomedical professionals are expected to immediately be productive, to work independently and be capable of problem solving. Moreover, this sector is more and more active in an international context. Laboratory staff are expected to communicate fluently in English and to work in international teams. Consequently, there is a need for well-qualified and well-educated professionals.

Through discussion with the work field and the evaluations of job applications for the professional bachelor biomedical laboratory technology, a number of generic competences were defined as important for graduated BLT students such as:

communication, team work, flexibility, internationalization, life-long learning, being critical.

A combination of all those elements resulted in higher education colleges that are no longer just a place to transfer knowledge but a triggering environment where students become critical and conscious cosmopolitans. Higher educational institutes have to keep up with this changing professional environment. The teaching-learning methodologies must have an emphasis on real life phenomena allowing students to reflect, connect and to experience in the learning environment (Dochy & Nickmans, 2005).

WHY INTRODUCING EPORTFOLIO?

As stated before there is a need for next generation students, students who have not only received a lot of knowledge and skills during their education, but that also achieved some generic competences beneficial for future work life activities and personal growth.

An ePortfolio is a tool that can help instructors to teach students 'the competences of the 21st century'. Students have the opportunity to get involved in their own learning process and career development, as stated in the definition of ePortfolio given by the 'Empowering Eportfolio Process' (EEP) project (Kunnari & Laurikainen, 2017).

There is a growing interest to introduce ePortfolio in STEM education whereas in previous years mainly teacher education programmes had ePortfolios. Also the KU Leuven Association noticed this interest, and therefore since 2015-2016 up till 2016-2017, 19 bachelor and master programmes started with an ePortfolio within the MyPortfolio application. Only two of those 19 were teacher education programmes, the other programmes were related to STEM education, medicine and economy (Associatie KU Leuven, 2017).

Most educational programmes introduce ePortfolio as a communication and reporting tool during internship. Of course ePortfolio is a fruitful tool to do so, but within the BLT programme a broader approach was prefered. To make learning paths, related to some generic competences, more visible within the curriculum, the ePortfolio was introduced not in just one curricular unit but overall the three year curriculum. This gives the opportunity to see the learning process as a 'story of learning' (Barret, 2010). By creating the ePortfolio as a supporting curricular unit beneath the different specific curricular units, as given in figure 1, a strong cooperation between generic competences and specific BLT competences are provided. Students need to work on generic competences with an emphasis on real

life phenomena to enhance the learning process as stated before (Dochy & Nickmans, 2005). There is a clear link between tasks provided within the curriculum and the content of other curricular units. Students will be motivated by creating useful and well-described tasks and will be empowered by stimulating them to be more autonomous in their learning. This will be realized by creating tasks to be performed by students throughout their entire bachelor programme (Devaere, 2018a). They will be responsible for planning and organization of those tasks. During this process it is important that students receive professional guidance. Giving support to students in their own autonomy next to a well-structured learning environment are necessarily for autonomous motivation (Vansteenkiste et al., 2007). By giving the students responsibilities and linking portfolio tasks to real life phenomena, intrinsic motivation of students is stimulated which will hopefully positively influence their learning path since there is, however, evidence that suggest that external rewards may decrease intrinsic motivation and thereby influence learning in an unwanted way (Deci, Koestner, and Ryan 2001).

Figure 1: Portfolio as supporting curricular unit

Also the professional environment , which whom the educational programme discussed this approach, follows the vision of the educational programme to link the benefits of ePortfolio in making some generic competences more visible. When students use their ePortfolio, it could be possible for the interviewer during job

interviews to discover a deeper understanding of the future employee. With the use of ePortfolios, students can provide an objective evaluation of their generic competences (Devaere, 2018b).

THE EPORTFOLIO WITHIN THE EDUCATIONAL PROGRAMME BLT FROM UCLL

Developing the ePortfolio

The purpose of the ePortfolio in UCLL-BLT is to enhance deep-level learning. Therefore all stakeholders (students, teachers, working field, steering committee) need to adapt their roles to create an inspiring learning environment. For example as stated by Entwistle et al. (2006): "*The teachers' enthusiasm for the subject and the level of active support provided*" (Devaere & De Preter, 2018).

All stakeholders were interviewed about the implementation of an ePortfolio in UCLL-BLT (Devaere et al., 2017; Devaere, 2018a; Devaere, 2018b; Devaere & De Preter, 2018). By involving all stakeholders, the study programme was able to create a shared vision on their use of ePortfolio. Building a shared vision is one of the five building blocks for learning defined by Senge (Dochy, 2011). Especially the teachers were of attention. Since the ePortfolio was overall in the curriculum and not just in one curricular unit, different teachers were involved. A lot of questions arose by interviewing the teachers (Devaere, 2018a):

- clear goals for guidance and evaluation needs to be set for all teachers and students involved;
- which teacher or portfolio coordinator will have the responsibility in the end?
- the implementation will possibly enhance the number of meetings between teachers: how will this affect time management and work pressure?
- who will teach the teachers in guiding the students? Will the portfolio coordinator be, or become, 'an expert' in guiding and evaluating (formative and summative) skills like critical thinking, problem solving, etc.?
- who will be responsible for feedback and evaluation of generic competences, the 21st century skills? Will this be the teacher of the curricular unit or will this be a task for the portfolio coordinator?

During the development process, the educational programme was also part of the 'Empowering Eportfolio Process', an Erasmus+ programme between September 2016 and September 2018 (EEP 2016-1-FI01-KA203-022741). Discussions and shared information between the different European partners inspired and helped the educational programme within their development process and the arose questions.

An overview of the development process and the involvement in the EEP project is given in the video behind figure 2.

Figure 2: QR-code to set-up movie

The structure of the ePortfolio

The ePortfolio is structured containing three parts and an overall part as given in figure 3. Each part consists of a few well described tasks that students need to combine within their ePortfolio.

Within the part of lifelong learning students need to follow some seminars both internally organised as external seminars, including international ones. In this way students learn how to find interesting seminars and how to organize participating them. It is the aim of the educational programme and the desire of the working field and the steering committee (Devaere & De Preter, 2018) that (graduated) students have an emphasis on lifelong learning. This is obviously at need within the biomedical field.

Within the part of my (study)career students make, at some fixed moments during their education, a personal reflection, started from a document with preliminary questions. For example, related to their graduating, students need to reflect on their 'next step'. They make a preparation for a job interview, they contemplate whether they will go for a Master's degree or another educational programme.

The last category is social responsibility, this is related with some extracurricular activities. Students need to carry out some activities such as helping to organize an info session, participating at focus group interviews, sharing notes with disabled students, …

The overall part, my personal growth, will – hopefully- exist in all different parts. To confront students with their growth, there are specific tasks for this part. A few generic competences that students need to learn will be linked to a few courses. For

example, team work will be linked to a course where students need to carry out group work during the first, second and third year of the educational programme. Students will be able to notice their progression in team work while teachers can create a learning path in introducing team work to the students.

Figure 3:
The structure of the ePortfolio

CONCLUSION

To conclude, this article stated the need for next generation graduated students according to different changes within the society and the fast changing character of the biomedical field. To obtain next generation students the biomedical laboratory programme of the University of Applied Sciences Leuven- Limburg developed an ePortfolio overall the curriculum that focuses on some needs evolved by discussions with the working field and steering committee.

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ENHANCING THE INTERNATIONAL COMPETENCES OF BIOMEDICAL STUDENTS THROUGH AN EUROPEAN EXCHANGE PROJECT

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ABSTRACT

The work field of biomedical sciences is a fast changing sector with rapidly evolving applied technologies. Biomedical professionals are expected to immediately be productive, to work independently and be capable of problem solving. Laboratory staff are expected to communicate in English and to work in international teams. To implement these competences more in the biomedical curricula, an international 'living lab' for students following a professional bachelor in Biomedical Laboratory Sciences was set up in the present project. Students worked together on a project in mixed international groups. This project was developed by four European higher educational institutions. The main learning outcomes were that (i) students were able to effectively communicate in English and operate as an active and focused member of a project group, (ii) students reflected on their own performances, determining their own learning needs and translating them into autonomous initiatives to professionalize themselves in an evolving (inter)national context, and (iii) students manifested an open mind and respect for the fellow international students by participating in a range of social and cultural activities.

INTRODUCTION

The changing biomedical professional work field

The industrial and academic field of biomedical sciences is a fast changing sector with rapidly evolving applied technologies with digitalization as an important factor. Biomedical professionals are expected to immediately be productive, to work

independently and be capable of problem solving. Moreover, this sector is more and more active in an international context. Laboratory staff are expected to communicate fluently in English and to work in international teams. Consequently, there is a need for well-qualified and well-educated professionals (Figure 1).
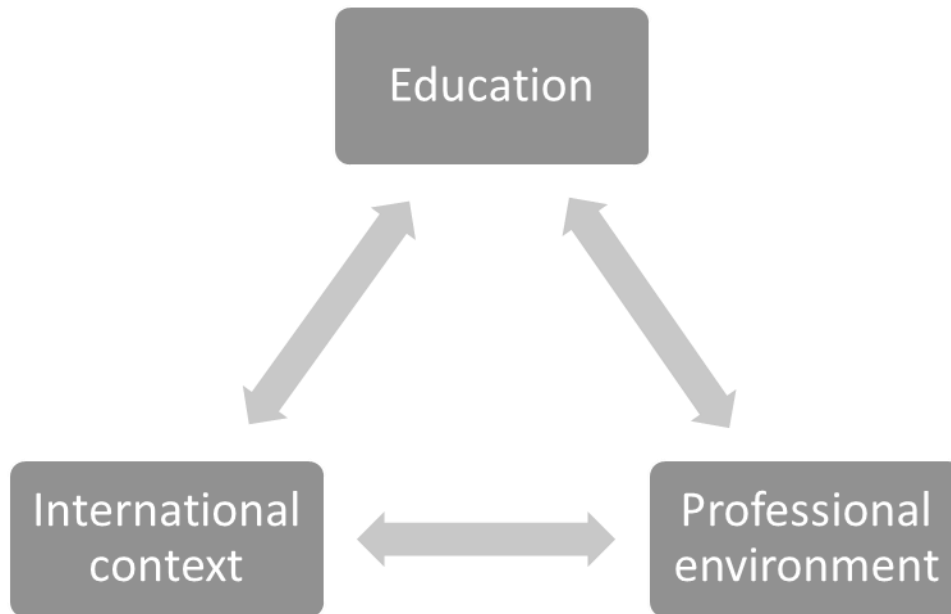
Figure 1: Interrelation between education, professional environment and the international context within biomedical sciences

These changes are characterized by a higher demand for digitalization, flexibility, networking and decentralization which are all due to globalization. International networks arise in which processes occur irrespective of distances or borders (van den Berg, 2003; Verhoeven, Kelchtermans, & Michielsen, 2004). The endless possibilities of the World Wide Web and wireless communication contributed to these expanding networks (Claassen & Dehandschutter, 2008). In this way, it is possible to create place- and time independent learning such as blended-learning courses, in which a technology rich environment is combined with more traditional learning paths (van Merriënboer & Kanselaar, 2006).

In addition, also the European Union aims to facilitate the employability for young people through the design of various strategies. This also facilitates changes in higher education. An important impulse was the Lisbon strategy, introduced in March 2000 by the European Council (Fannes, 2013). The aim was to make the EU "the most competitive and dynamic knowledge-based economy in the world, capable

of sustainable economic growth with more and better jobs and greater social cohesion" (Verhoeven *et al.*, 2004). Also the manuscript of Mourshed *et al.* 2014 indicated that employers across Europe have a similar view on which skills/competences young graduates are missing: English proficiency, team work, hands-on experience, and problem solving and analysis. The Bologna declaration, implemented in the Lisbon strategy, aims to enhance international uniformity, transparency and visibility by implementing an European Qualification Framework (EQF) (Depreeuw, 2006).

How to prepare students for the changing biomedical environment?

Higher educational institutes have to keep up with this changing professional environment. The teaching-learning methodologies must have an emphasis on real life phenomena allowing students to reflect, connect and to experience in the learning environment (Dochy & Nickmans, 2005).

International networks have an influence on higher education. Almost every higher education institute has 'internationalization' as priority and also different governments are promoting an international experience for students and staff. For example, the Flemish government developed 'Brains on the move': "Through international mobility students can discover new cultures, expand their language skills and broaden their idea on sociality. They can develop competences that are necessary for acting in the globalized and intercultural society of today." (Ministerie van de Vlaamse Gemeenschap: Departement onderwijs en vorming, 2013, p. 12). Furthermore, within the Erasmus 2020 programme the European government has a key action to encourage mobility. Their aim is to reach a 20 % international mobility rate among European Graduates at the end of 2020. In Flanders, the government is even more strict thereby aiming at a 33 % mobility rate among students.

A combination of all these elements indicates that higher educational institutions are no longer only a place to transfer knowledge, but also the international and intercultural competences are important. This is also clear from the EQF where eight educational levels are described. Each level contains three qualifications: knowledge, skills and responsibility and autonomy. Higher education institutions need to be a triggering environment where students become critical and conscious global citizens and teachers become coaches that are capable to guide the students to achieve 21st century competences (Binkley *et al.*, 2010).

21st century competences

The 21st century competences like problem solving, critical thinking and teamwork are classified as generic competences which are applicable across different professional contexts (Miller, 2015 and Winch, 2015). It is important that young graduates are more aware of the importance of the 21st century competences (Figure 2). Students drive their own learning through inquiry, as well as work collaboratively to research and create projects that reflect their knowledge (Bell, 2010).
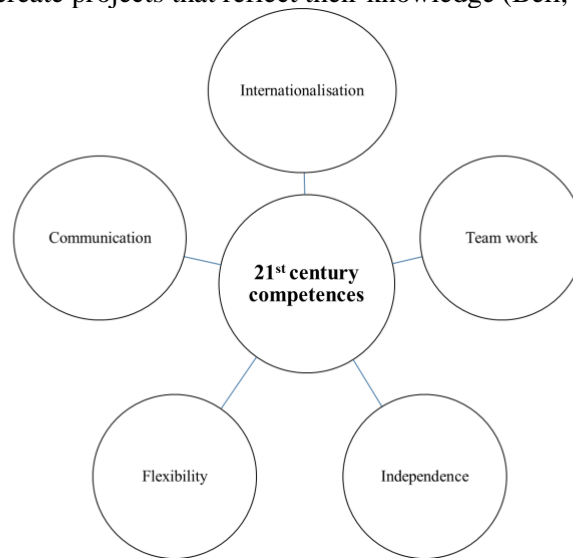
Figure 2: Overview of the 21st century competences

ENHANCING INTERNATIONAL COMPETENCES

Project development

The project idea has been developed in the period 2015-2018. The initial idea was launched during an international staff week at University of Applied Sciences Leuven-Limburg (UCLL). During a meeting with UCLL-Leuven, Hanze Applied University of Sciences (Groningen, The Netherlands), Absalon University College (Naestved, Denmark) and FH Gesundheitsberufe OÖ GmbH (Steyr and Linz, Austria), a collaboration was initiated to stimulate short term student mobility between partner institutions to improve the students' teamwork and

language/communication skills. Furthermore, also the intercultural aspect was emphasized.

Educational programme

The proposed method is an international 'living lab' for students following a professional bachelor in Biomedical Laboratory Sciences. Students with a specialization in medical laboratory technology were selected for the project. This specialization focuses on clinical laboratory investigations supporting the diagnosis of a patient. In medical laboratory technology, students learn how to analyse body fluids, how to trace and identify bacteria, and how to study blood cells and tissue samples. Moreover they focus on immunological techniques and medical biotechnology.

European exchange project

The exchange project involved a 1-week student exchange between different collaborating institutions (Figure 3). In all four participating institutions, the application rate to participate in the 1-week exchange project was high. Selection was based on the motivation of the students. Students not selected to go abroad, stayed at the home institution to take in students from the collaborating European partners.

Figure 3: Different student exchanges between partner institutes

At the participating institutions, in-house and incoming students worked together in mixed groups of 4-5 students on a research project for 1 week. This were the so-called living labs and the research focussed on real-life problems within the context of biotechnology, microbiology, haematology, immunology, point-of-care testing. After an introduction workshop during which the students became acquainted with each other, the students had to make an active contribution to the practical realization of a biomedical research project based on scientific sources and current developments in an international context within a pre-set timeframe. At the end of the week, student presented in group their research results for an international jury of teachers. In addition to the project work during the week, extracurricular cultural and social activities were organized in the evenings to stimulate the intercultural competences.

Students were assessed not only on the technical aspects (clear and correct reporting, correct interpretation of experimental data and analysis, using the appropriate biomedical terminology), but also the more transversal skills (grammatically and idiomatically correct English, teamwork, intercultural competences).

The creation of European exchange project was seen by the partnership as a professional tool that can increase employability, in parallel to being a useful learning environment for both teachers and students.

An overview of the international student exchange project is given in the video behind figure 4.

Figure 4: QR-code of the movie giving an overview of the international student exchange project

LEARNING OUTCOMES

The students participating in the international project week demonstrated several learning outcomes:

- Students were able to effectively communicate in English and operate in a constructive, respectful way as an active and focused member of a project group;
- Students reflected on their own performances, determining their own learning needs and translating them into autonomous initiatives to professionalize themselves permanently in an evolving (inter)national context;
- Students manifested an open mind and respect for the fellow international students by participating in a range of social and cultural activities.

IMPACT

The main expected impact of the project is to level up the students' international communication, team work, problem-solving and life-long learning skills as well as career management skills and employability. Also the project will encourage biomedical students for more intensive involvement in mobility programmes.

This project seeks to level up the educational environment by utilizing a variety of digital tools and applications to enhance international communication, team work and problem-solving skills. For this, a differentiation is made between the participant, the target groups, the participating institutes and the stakeholders.

Participants and target groups

- The project aims to increase the students' life-long learning skills, especially digital competence in the modern world as well as career management skills and employability. Additionally, through enhanced transparency of assessment and improved practices there will be a significant impact on the credit transfer and recognition of skills.
- Also the project will encourage biomedical students for more intensive involvement in mobility programmes (such as Erasmus+) because maybe after the exchange they will want to go to project partner institutions (or any other foreign partners) to have longer mobility period, for example semester study exchange or for practice.
- Participating teachers will learn new innovative teaching methods, will learn to work internationally and will implement this in the curricula.
- The long-term impact of the project is that graduating students will possess skills that are better adapted to the expectations of the work field and thus make a smoother transition to the work environment.

Participating organizations
- Student and staff mobility as well as international experience in higher education institutes is limited, so the results of this project will have an impact on their international network.
- The current project will also contribute to the further internationalization of each organization which will results in more exchanges of students and staff, but also more participation in European projects.

Stakeholders
- The long-term impact of the project will indicate that employers will be more satisfied with graduate students starting in their work field.

CONCLUSIONS

In conclusion, this international student exchange project demonstrated that in an international setting, students achieve the predefined 21st century competences. Furthermore, creating an international environment for a short period encourages students to go abroad for a long period. Indeed, in all of the collaborating institutions, the application rate for a longer internship in another European country raised, thereby achieving the 20 % mobility rate as Europe predefines.

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MATHEMATICS TEACHER EDUCATORS' PROFESSIONAL DEVELOPMENT AS BY-PRODUCT OF PRACTICE BASED RESEARCH: THE ELWIER RESEARCH GROUP

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ABSTRACT

In the ELWIeR (Expertise centre mathematics teacher education) research group about 25 mathematics teacher educators in primary teacher education reflect on mathematics in primary teacher education. This group developed from a network group which started in the 1980's. About ten years ago the group refocused becoming a research group. Members in the group perform practice based research aimed at improving their practice or participate in the group as critical friends for others. In doing so, they share ideas, methods and results in the research group meetings and on a LinkedIn forum. Reasons for participating are the felt need to improve teacher education practice and in doing so learn about teacher education and research on teacher education. Although never an aim in itself, the ELWIeR research group functions as professional learning community (PLC). This research in retrospective focuses at the ELWIeR research group as PLC and answers the question why and how this group could become an effective professional learning community as it is, while becoming a learning community was never opted for.

INTRODUCTION

The ELWIeR research group is a group of mathematics teacher educators, who perform practice based research in their teacher education practice, that is primary mathematics teacher education. ELWIeR is a Dutch acronym for 'Expertisecentrum Lerarenopleiding Wiskunde en Rekenen', in English 'Expertise Center for

Mathematics Teacher Education'. The group aims at improving primary mathematics teacher education by performing research in or helpful for primary mathematics teacher education. The group developed from a network of mathematics teacher educators, which is active from the 1980's. Discussions within the group generally take place in face-to-face settings, although sometimes arguments are shared using the group's LinkedIn-pages. About 10-15 mathematics teacher educators and researchers attend the face-to-face meetings. More than 110 educators, researchers and other professionals interested in the group's work participate in the ELWIeR online (LinkedIn) community.

As improving mathematics teacher education is the group's aim, ideas, discussions and research results are not only shared within the group, but also to a larger audience, when researchers from the group publish and present their research. These publications for example answer research questions coming forward from discussing how institutes and student teachers try to deal with two nationwide test for mathematics in primary teacher education in the first and third year in teacher education. These nationwide mathematics tests in the Netherlands cause the drop out of several student teachers from teacher education. In order to support the students who are at risk of dropping out, it is necessary to know more about their characteristics. We found that these student teachers can be characterized by refrain from self-reflection related to their mathematical knowledge and skills. As a consequence, they can be characterized by blaming the test and teacher education for their failure passing the test (Keijzer & Boersma, 2017).

Another issue that the group focusses upon is the relation between student teachers' mathematics content knowledge and their PCK. Also here the nationwide mathematics tests formed a starting point for the research. Namely, the tests assess content knowledge but are introduced as a means to safeguard student teachers' PCK development. We showed that there are specific differences in teaching between student teachers who are high achieving in mathematics and those who are low achieving in mathematics (Gardebroek-van der Linde, Keijzer, Van Doornik-Beemer, & Van Bruggen, 2018). Low achievers for example stick to the textbook and express how difficult mathematics is, while high achievers discuss mathematics with students without referring to the textbook and do not talk about the problems' difficulty.

In the Netherlands the focus in mathematics education is mainly on low achievers (Mullis, Martin, Foy, & Arora, 2012). This is not different in primary teacher education. Some group members, however, did want to focus on high achievers. They did so by asking and supporting these student teachers in developing test items for a site their peers could use in practicing for the third year nationwide test. Analyzing these high achievers' development showed they all can learn how to construct these test items, but only can do so with specific scaffolding (Kool & Keijzer, 2015).

The two nationwide mathematics tests in Dutch primary teacher education are discussed frequently in the ELWIeR research group, because these tests form a concern in (nearly) every institute. The discussions lead to the idea that the first year

test might predict the score in the third year test. The group compared two tests and indeed uncovered how the first test predicts the score on the second. The group actually proved that the pass mark for the entrance test was insufficient for passing another nationwide test student teachers need to pass in their third year in teacher education (Keijzer & Hendrikse, 2013).

IN RETROSPECTIVE

The ELWIeR research group was not developed as professional learning community (PLC). As stated above, the group's activities started from mathematics teacher educators shared concerns. The group did not reflect on learning in the group. However, in a research group, work is shared and discussed and this evidently leads to learning. In other words, although the group was not developed as a PLC, it may have accidentally developed into one. And if this is so, developing a PLC might be best developed by working as a group on shared concerns, like the ELWIeR research group does for primary mathematics teacher education. That is what this paper is about: can a group develop into a PLC by just co-operatively doing practice based research in one's field of expertise, without explicit reflecting on learning in the group.

When turning to learning within the ELWIeR research group it might be helpful sketching the group members' context, namely primary mathematics teacher education or more generally mathematics as educational domain. In mathematics teacher education, although not wanted by mathematics teacher educators, mathematics is used as selection instrument. Nationwide tests for both language and mathematics cause that teacher education focusses on mathematics and language. And although many student teachers develop their interest in mathematics learning and teaching, student teachers' motives to start primary teacher education is rarely that they are interested in mathematics teaching or pupils' mathematics learning processes. This context sets the scene for mathematics teacher educators concerns. They need to stimulate student teachers for their subject, while this subject at the same time is used as selection instrument. They need to deal with their fellow educators, who see student teachers dropping out when they are unable to pass mathematics tests although they might from fellow educators' point of view be perfect candidates for teaching practice (Keijzer, 2015).

Apart from their specific position in teacher education, primary mathematics teacher educators are also confronted with opinions in society about mathematics in primary schools. These opinions include that,

- most primary school teachers are low achievers in mathematics and this is also true for student teachers (Weel, 2006; KNAW, 2009),
- educational results for mathematics in primary schools are miserable (cf. Mullis, Martin, Foy, & Arora, 2012), and

- mathematics in primary education should focus mainly on algorithms for addition, subtraction, multiplication and division, and definitely has nothing to do with any form of creative thinking or inquiry based learning (Beter Onderwijs Nederland, 2013).

RESEARCH QUESTIONS

In this paper we explore to what extent the ELWIeR research group can be considered a PLC in an educational setting, namely in the setting of primary teacher education. Several review studies on PLC's in education provide characteristics for effective PLC's. We here follow Louise Stoll and her colleagues (Stoll, Bolam, McMahon, Wallace, & Thomas, 2006). They characterize PLC's in education when:
- PLC members share believes and understandings,
- the group shows interaction between members and participation of all members,
- these PLC members depend on each other,
- they concern for individual and minority views, and
- cultivate meaningful relationships with the world outside the PLC.

In an effective PLC members of the PLC:
- share values and vision,
- are collectively responsible for the group and its learning
- are involved in reflective professional inquiry, that is discussing serious educational issues and examining teachers' practice,
- collaborate and by doing so promote both group learning and individual learning, and
- are aimed at student learning.

For the ELWIeR research group this last aspect is translated as 'student teacher learning', as the group consists of teacher educators whereas PLC's in the review by Stoll and her colleagues focus on teachers in primary and secondary education.

From this notion of PLC's the following two research questions are answered here:
1. To what extend did the ELWIeR research group develop into an effective professional learning community?
2. To what extend and how do the group's characteristics strengthen this development?

METHOD

We performed a case study in answering these research questions. We took arguments from Yin (2009) why a case study is appropriate here. We want to explain how the group develops and operates, meaning we actually are exploring relations within the case, which is typically for case study research. Moreover, the explorative nature of the research also points in the direction of performing a case study. This study is explorative as we never looked at the group from the perspective of being a PLC. This explorative nature of the study makes that there are 'many variables' to explore. We want to know what they are and how they are connected.

However, Yin also warns for using case study in this situation. As the group forms the case, creating distance might be somewhat difficult. On the other hand performing our own case study makes we could build the case from first hand. In order to create necessary distance a critical friend, being the second author, did review and comment the case.

We did build the case from the chair's personal field notes and individual experiences and perceptions about what is discussed in the group and how this relates to desired teacher education development. This initial case, being a narrative about how the group is functioning, derived from these notes and the chair's individual experiences and perceptions was shared with group members. This member check leadto comments, which next were used in updating the case. This amended case was shared a second time and commented a second time. Finally, from this last round of comments a case was developed were all group members agreed upon.

As the case was developed to provide insight in the ELWIeR research group as PLC, we explicated the groups' learning in the case descriptions. In doing so we took the PLC characteristics from Stoll and colleagues (Stoll, Bolam, McMahon, Wallace, & Thomas, 2006) into consideration. We, thus, followed Yin's (2009) recommendation considering the case in a relevant theoretical framework.

INITIAL CASE

The ELWIeR research group started as mathematics teacher educators' network. The groups' reason for forming a group were shared concerns about mathematics in primary teacher education and the idea that forming a group would enable (re)developing and improving primary mathematics teacher education. Group members shared concerns and choose performing practice based research as tool to deal with these concerns. In the research preformed in the group members take their role as researcher or as critical friend. This results in a continuous dialogue in a shared language, unique to mathematics in primary teacher education. This, however, there is a good reason for negotiate on this language. Institutes have

different curricula, both in general as for mathematics (Keijzer, 2017). Group members therefore need to explicating one's situation. Doing so research group members express themselves as they use within their institute. Next, in the group these local situations are elaborated as such that every group member understands the context and also practice based research originating from this context.

Thus, the group's concerns are elaborated into research that is helpful for group's participants professional context. This research sometimes results in activities which can be exploited in teacher education. However, more often this practice based research leads to underpinning to be used in primary mathematics teacher education (re)development.

The following example shows how group concerns form the basis for small scale practice based research. As mentioned student teachers in the Netherlands need to pass two nationwide mathematics tests. These tests are discussed frequently in the ELWIeR research group. One of the tests is a third year test. Low achievers in mathematics often fail to pass the test (Keijzer & Boersma, 2017). Many of them complain that they need more time to complete the test. Group members reflected on these complains. They hypothesed that these complaining student teachers, having trouble passing the third year mathematics test, might fail the test because of their ineffective use of mathematical strategies. Two group members tested this hypothesis by analyzing scrap paper student teachers produced when doing the test. The analysis confirmed our hypotheses. Many student teachers showed inefficient mathematics strategies, which explained the need for more time to finish the test (Keijzer & De Vries, 2014).

This example illustrates how the ELWIeR research group, while working on this particular concern, show effective PLC characteristics. Namely, the example expresses how group member concerns are related to student teacher learning. Hypothesing on student teacher strategy use in solving mathematics test items resulted from analyzing student teachers complains on time pressure finalizing a nationwide test. ELWIeR research group members shared these student teachers complaints from their own practice (reflective professional inquiry). When these experiences are discussed, arguments on the situation are formulated, for example:

- are there specific topics within the test especially difficult for student teachers,
- is there something wrong with the test,
- how can we find out what student teachers who complain about time pressure do during the test.

In sharing these arguments every group member is involved, for example by connecting arguments with experiences in teaching practice (collaboration). In the discussion the group consensus on these arguments is sought for (collective responsibility). Here the consensus leaded the group in analyzing scrap paper in order to see how student teachers use mathematical strategies and find out that inefficient strategy use might well explain lack of time in finishing the test (promoting group learning and individual learning).

In table 1 arguments as given above are described more general as characteristics for the ELWIeR research group. In this we relate this group characteristics to the characteristics for effective PLC's, as formulated by Stoll and colleagues (Stoll, Bolam, McMahon, Wallace, & Thomas, 2006).

Table 1.
ELWIeR research group as PLC (initial case)

characteristic Stoll, et al., 2006	group's characteristics
shared values and vision	mathematics in primary teacher education is seen as important, considering students in primary education deserve excellent mathematics teaching
collective responsibility	group members help each other understanding various teacher education contexts and arguments related to teacher education practices
reflective professional inquiry	experiences in teacher education forms the starting point for formulating hypotheses or research questions
collaboration	in discussions every group member is involved as researcher or as critical friends
promoting group learning and individual learning	research results provide arguments that are discussed and are translated into individual professional contexts
aimed at student teacher learning	student teacher learning and developing is the starting point for discussions in the group

AMENDED CASE

The case, as described in the previous paragraph, was presented in the research group. Group members amended the case. They agreed on how the group and its activities were presented. They especially stated that the group formulates issues in mathematics teacher education. But this did not mean the group is uniform and non-differentiated. The group in many cases offered surprising new perspectives, as ideas from other institutes from another part of the country entered the discussions. Moreover, group members said that they appreciated the possibility of role changing from researcher to that of critical friend and from critical friend to that of researcher. Further, they stated that the initial case description did not mention things that were done to secure the group's continuity. This continuity is guaranteed by the group's chair, who sets meetings over the academic year and arranges an agenda for each meeting.

From the viewpoint of effective PLC's (cf. Stoll, Bolam, McMahon, Wallace, & Thomas, 2006), one could say this continuity sets the stage for collaboration within the group. Further, changing roles from researcher to critical friend and the other

way around links up with collective responsibility as everyone takes their role at a given time. This also links up with both promoting group learning and individual learning, as these roles provide for a setting where one is discussing one's own research and learns from others, while discussing the research itself makes that all group members learn about mathematics teacher education. Moreover, the surprising new perspectives, as mentioned by the group members, result in reflective professional inquiry, as will be elaborated on in the following example.

In this second example the context is again nationwide mathematics tests in Dutch primary teacher education. In earlier research group members showed that the pass mark set for the entrance test is insufficient for passing the third year nationwide mathematics test. Namely, the score on the entrance test predicts the score of the nationwide third test. If a student teacher scores the cut score on the entrance test, generally he/she will not be able to pass the second test (Keijzer & Hendrikse, 2013). ELWIeR research group members articulated that raising the entrance test pass mark would result in a lower number of student teachers dropping out in their third year in teacher education. However many institutes are reluctant doing so. The principals of the institutes fear that raising the pass mark will result in an unacceptable number of student teachers dropping out in the first year in teacher education. They further state that improving teacher education – without raising the pass mark – will help all students passing the entrance test in succeeding passing the nationwide third year test.

The new perspective here came forward from one of the institutes that did raise the pass mark. A case study showed that something different happened than was expected by institutes' principals. Student teachers did work harder. Moreover, the number of drop outs did not really change, however these student teachers dropped out at an earlier stage than their peers did who had to deal with a lower pass mark (Keijzer, 2015). This result set the stage for reflective personal inquiry, being a search for arguments why raising the entrance test pass mark did not lead to a higher number of drop outs.

CHALLENGES

In reviewing the initial case, group members mentioned several aspects that in their opinion show the group's strength. They stated that the group is strong, because group members generally do not complain about mathematics in teacher education, but instead are doing research. Doing so the group develops knowledge on primary mathematics teacher education and collects arguments for discussions at individual institutes concerning mathematics education. This implies group members' reflective professional inquiry. Group members also mentioned that the group's strength has to do with the clear focus on teacher education in relation to mathematics in society. This links up with the care for student teacher learning.

Finally they state that the group is a secure place for all participants. Group members are collectively responsible for the group and its development. Moreover, the group is a secure place where all contributions are valued, which sets the stage for effective collaboration.

This, however, does not mean that the group does not face challenges. There are challenges and they are quit crucial for the group's functioning. For example the group developed bottom up. Primary mathematics educators sharing concerns for teacher education gather aiming at improving teacher education. However, the ELWIeR research group had and has no priority in most of the institutes. This results in conflicting schedules, when educators are scheduled to teach instead of joining the ELWIeR research meeting. This results in some group members not being able to participate in all of the group's meetings. Moreover, several group members choose to participate in private time.
Having limited time, there is no time for sharing – apart from working on research papers. Further, as participation is not guaranteed from meeting to meeting, it is difficult to have discussions over the meetings. Finally group members state that the group highly depends on its chair.

CONCLUSION

This paper describes the development of the ELWIeR research group from the perspective of PLC's. In a case description we sought answers for the following research questions:
To what extend did the ELWIeR research group develop into an effective professional learning community?
To what extend and how do the group's characteristics strengthen this development?

The case description showed that primary mathematics teacher educators group members formed a group from more or less shared values and vision. Both values and vision are related to student teacher learning. We could say that the group developed being a PLC because of this focus.
We also saw that collective responsibility, reflective professional inquiry, collaboration were all group characteristics and also characteristics for effective PLC's. These characteristics for effective PLC's served as means in the development. This answers the second research question. We noticed, however, that these means are challenged by the context of the group – as group that is not really valued by the institutes' management.

Finally the promotion of individual and group learning is characteristic for the ELWIeR research group. This is welcomed, but not an explicit group aim. In fact it is a consequence of how the group is functioning.

REFLECTION

This paragraph provides a reflection on the ELWIeR case narrative. The reflection elaborates on the case with the question: how does the ELWIeR research group provide professional development for its members?

All professional development requires 'learning'. There are several possibilities to learn for professionals, such as formal or less formal routes and individual- or team-development. The case of the ELWIeR research group will be discussed from four different angles.

The first angle to look at the case is the perspective of formal or informal learning (Eraut, 2004; Kyndt, Gijbels, Grosemans, & Donche, 2016; Tynjälä, 2008; Van der Klink, Boon, & Schlusmans, 2012). We can distinguish learning into these two extremes. However, these two forms of learning should not be dichotomized; in fact, they represent the ends of a sliding scale of formality, ranging from totally unorganized learning as a by-product of working to learning that is organized within an well-defined educational setting. Thus, formal and informal learning should be considered to be on a continuum, although there are also a lot of varieties in between, where characteristics mingle. This is elaborated upon in Table 2. This table presents the characterics of informal learning at the left hand side. This type of learning is often present at the workplace, where it takes place in and through tasks in the job, although the learner often is not aware of the learning process. The right hand side of the table is about formal learning, represented by a training, a course or our education system. In formal settings, the contents of what there is to learn have been clearly defined and also time, place and learning activities have been designed and set beforehand. Another characteristic of this type of learning is that this most often is rewarded with a certificate.

Table 2. Characteristics of informal and formal learning

	Informal learning	Formal
goal	Self-directed, ownership of learning goals by individual teacher	Ownership of learning goals by other actors (training institute, school management)
Learning objectives	No prescribed learning objectives	Defined learning objectives
Learning activities	Unplanned activities resulting in learning (unaware)	Planned learning activities (aware)
Learning process	Implicit learning and invisibility of learning process	Explicit learning process with visibility of learning by award or certification given by other actors (training institute, school management)
Learning context	Social embedded learning	Focus on individual learning

Comparing the ELWIeR research group case description with the above mentioned characteristics, leads to the observation that this case mostly can be type casted as a setting in which informal learning takes place. The participants enrol voluntarily and they set their own goals to work on. The social aspect is also important, according to the case description, the individual group members complement each other in roles, experience and context. They work together on research projects and learning is not the main objective, it just occurs as a side effect. In fact, the learning process and learning outcomes in itself remained invisible, until the chair of the group decided to elaborate this further in the above described narrative about the groups' working process. This elaboration to uncover the learning process might be important for the group members, as it helps them to realise that they not only work together, but also learn together.

A second angle to look at the ELWIeR case is the perspective of effective professional learning activities. Recently, some review studies have been published on this topic, elaborating a few aspects that seem to be important in effective professional development activities for teachers (Van Veen, Zwart, Meirink, & Verloop, 2010; Darling-Hammond, Hyler, & Gardner, 2017). In summary, these are:
- Directed towards subject knowledge, PCK and the learning process of pupils (embedded in daily work),
- Active and inquiry based learning,
- In collaboration with others,
- Longer duration (not just 1 afternoon),
- Embedded in school policy,
- A learning culture in the school.

If we compare the ELWIeR research group case description with the above mentioned aspects, we can tick four of the six aspects. The ELWIeR group has a focus on mathematics in teacher education (subject knowledge) and the concerns of the participants are about the student teachers' learning processes. The group is actively engaged in inquiry and research and they collaborate with each other. The group plans several meetings throughout the academic year in which the participants build on their collective knowledge. There are two aspects that are not entirely covered, namely the embeddedness in the school (or institute) policy and the learning culture within the school (or institute). In the case description these aspects are mentioned as challenges: participation in this group highly depends on voluntarily presence, mostly also in 'private time'. It is a pity that the institutes do not fully recognise and encourage the opportunities for professional learning of the individual teacher educators who participate in this ELWIeR group.

A third angle to look at this case is from the perspective of the type of community that the case represents. In the above case description, the framework of Stoll and colleagues (Stoll, Bolam, McMahon, Wallace, & Thomas, 2006) for professional

learning communities is chosen. In this part of the paper another framework is taken into consideration. Vangrieken Meredith, Packer Kyndt (2017) distinguish three types of professional learning communities, namely:

- Formal *(official, government initiative)*,
- Member-oriented with pre-set agenda *(initiated by a school, teachers or researchers with a special goal)*,
- Formative *(spontaneous, goals develop during the process)*.

When we look at the ELWIeR case, it is clear that this is not a formal community according to the definition of Vangrieken et al., since this group was not established by a government or another official initiative. The case might have some characteristics of a member-oriented professional learning community, because the members do set agenda's for their meetings, once they have defined their collaborative goal. Since the origins of the groups' existence derives from voluntarily participation and open membership, the characteristics of a formative professional learning community seem to be the most suitable.
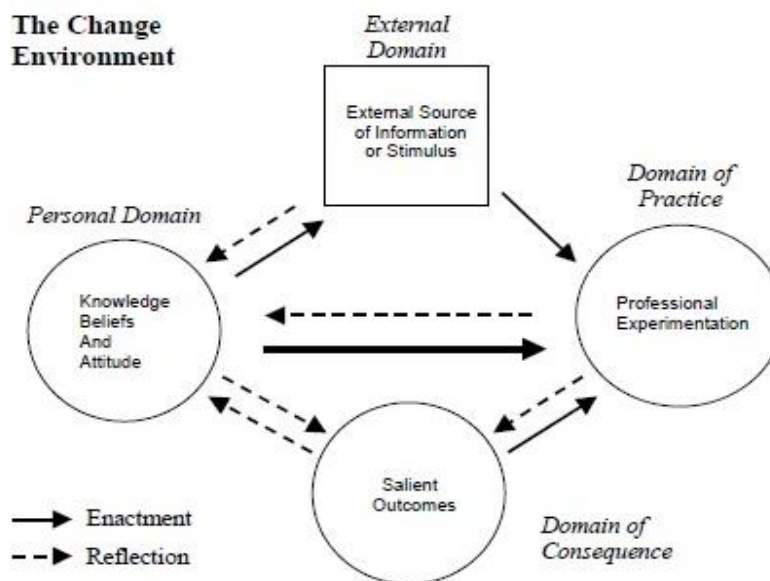
Figure 1. Clarke and Hollingsworth's professional growth model (2002, p. 951).

The fourth and final angle to look at this case is based on Clarke & Hollingsworth's professional growth model (2002). In their model (Figure 1), the authors describe both the possible learning outcomes as well as the learning processes that take place whilst teachers (or teacher educators) are learning. The model is especially helpful when it comes to elaborating the outcomes of informal learning, since this often takes

place unnoticed. The model consists of four domains, which are connected by arrows of 'reflection' and 'enactment'.

For example a learning process could start at the external domain, with a meeting in which literature on a specific topic is discussed. This might lead to new ideas and beliefs (personal domain) of the participant. (S)he then might be tempted to apply the new ideas in his or her practice (domain of practice), and observe what happens with the students (domain of consequence).

When we apply this model to the ELWIeR case (Figure 2), we recognize outcomes in the four domains. The group starts from their concern about student teachers test results on the nationwide mathematics tests (domain of consequence). This is not consistent with their beliefs and practical wisdom (domain of practice), so they decide to investigate this more in-depth in their own institutes. They gather data (domain of practice), read and discuss literature on the topic (external domain) and come to conclusions, which leads to both recommendations to their own institutes (domain of consequence). They even add an extra arrow to the original model of professional growth, since they also publish their findings and thus contribute to the external domain.

Figure 2. The professional growth model with the specific outcomes of the ELWIeR case

Summarizing, the reflection from four different angles of professional development to the ELWIeR case leads to the conclusion that this group – unintendedly – was indeed a professional learning community. They learn mostly informal, the activities

they undertake do have characteristics of effective professional learning activities, their group can be type casted as a formative professional learning group and they did yield outcomes on all doma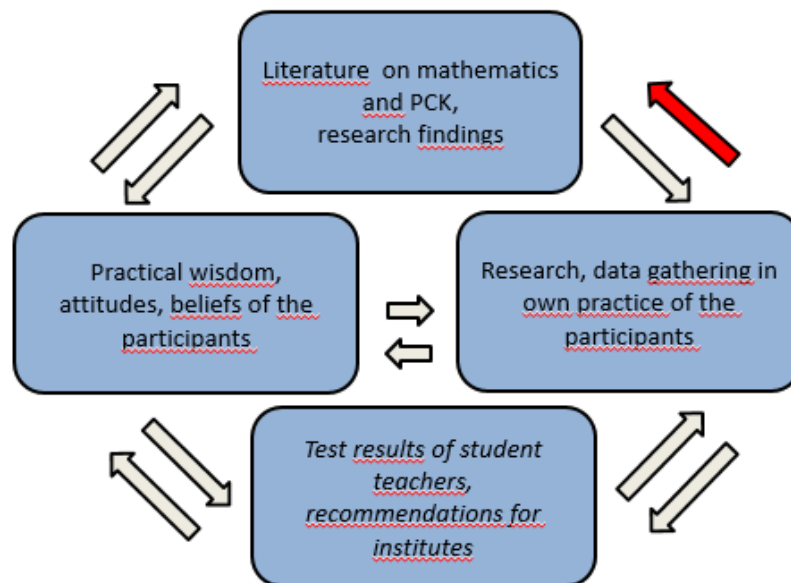ins that are distinguished in the professional growth model. In order to make their learning processes more visible for themselves and others, they should more often evaluate on their own learning process, by analysing their group narrative or by collectively discussing their process with the help of the professional growth model.

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THE KNOWLEDGE-CREATING PATTERN IN USER-DRIVEN INNOVATION

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ABSTRACT

The focus of this paper is knowledge-creating pattern in the initial phase of user-driven innovation. It studies, how proposals are built during group discussions and what factors enable or restrict knowledge creation. The data is from a development process where the focus is to develop ways to motivate citizens to be more physically active. Citizens, who had participated in lifestyle group or got physical activity counselling, were selected as a user group. The data consists of 42 questionnaires and four group discussions. In the group discussions 47 episodes, which contained a novel idea or proposal for sport-related services, were identified. The data were analyzed using Scardamalia and Bereiter's theoretical model for knowledge building and inductive content analysis. The questionnaire and the group discussions generated many similar proposals, but in the group discussions, many of the proposals became more concrete and gained new perspectives. This implies that the group created knowledge together. The most important enabler of knowledge building was common experience. The group discussions contained the many proposals where did not happen collaborative knowledge building. Knowledge building did not happen when the experiences were not shared, there were different requirements to the issue, or the participants had different attitudes to the theme of the discussion. The questionnaire and the group discussion are the different instruments for producing knowledge. They might produce similar knowledge, but a single proposal can be developed more by using the group discussion and it also enables collaborative knowledge building.

INTRODUCTION

Learning is defined by Moustaghfir and Schiuma (2013, 497) to mean "a process through where new knowledge is generated and existing one is renovated, combined and updated". In the literature, the organizational learning tends to be used to refer to the process, which develops a new way of seeing things or understanding them within organizations (Chiva, Ghauri, & Alegre, 2014, 689). The Learning organization combines its experiences and existing knowledge to meet new needs or changing circumstances (Savory, 2009, 152). Combining different sources of knowledge in a variety of ways, while increasing organizational learning (Jensen & Markussen, 2007). Organizational learning constitutes a basis of the generation of new ideas and supports creativity (Liao, Fei, & Liu, 2008). Therefore, organizational learning could be considered as one of the elements of innovation.

In addition to the intraorganizational knowledge, external knowledge can be utilized as a source of knowledge. External sources of knowledge are public and private organizations, universities and research organizations, external experts and users. It is widely acknowledged today that users or user networks are often a major source of innovation and have even proven to be the principal driving force of many innovations in different industries (Raasch, Herstatt, & Lock, 2008). In addition, user involvement is an important success factor for new services as well (Hennala, Melkas, & Pekkarinen, 2011). It is believed that users' involvement in service development increases the value of the services and their attractiveness (van der Weegen et al., 2013). In user-driven innovation, users are considered as an important knowledge sources.

Users' knowledge-creating is a part of knowledge-creating of an organization and organizational learning. However, how users create collaborative knowledge in the initial phase of the user-driven innovation process is poorly understood. Previous work has mainly focused on the knowledge building model in the collaborative learning process (Muhonen, Rasku-Puttonen, Pakarinen, Poikkeus, & Lerkkanen, 2017; Scardamalia & Bereiter, 2010; Stahl, 2000). In the innovation research, most studies have tended to focus on Nonaka's knowledge creation model and examined knowledge creation in the organization (e.g. Pässilä, Uotila, & Melkas, 2013; Ramírez, Morales, & Rojas, 2011).

The aim of this study thus is to analyze knowledge-creating pattern in the initial phase of user-driven innovation. The study is examined in the groups, where interpersonal ties among are not strong, thus it focuses on the micro-level of knowledge creation. The research questions of this study are how proposals are built during group discussions and what factors enable or restrict knowledge-creating.

KNOWLEDGE BUILDING

In the literature, knowledge building and knowledge creation are used. According to Bereiter and Scardamalia (2016, 13) these concepts mean the same and they entered the literature at about the same time but in different domains: Knowledge building in the learning sciences and knowledge creation in organizational sciences (Scardamalia & Bereiter, 2014, 397). Knowledge building is defined in different ways depending on the context (Scardamalia & Bereiter, 2010). According to Mitchell and Boyle (2010) the definition of knowledge creation demonstrates wide-ranging conceptual coverage, depicting knowledge creation as a series of activities or process, as the output of such processes, or as a value-adding outcome such as an exploited new product, service or process.

One of the most famous knowledge creation models, which is the process oriented model (Mitchell & Boyle, 2010), is Nonaka and his colleges' SECI (Socialization, Externalization, Combination, Internalization) model. This model explains how knowledge is covered and created through the interactions between two different knowledge types – explicit and tacit (Nonaka, Takeuchi, & Umemoto, 1996). Nonaka, Toyama and Konno (2000) describe explicit knowledge as what can be embodied in a code or a language and it can be communicated, processed, transmitted and stored relatively easily while tacit knowledge is personal and hard to formalize. It is rooted in action, procedures, commitment, values and emotions, etc.

According to Jakubik (2008), from the early 2000s, the focus has shifted from knowledge creation within a firm to more inter-firm collaborations and toward knowledge creation in human interactions. Nonaka and his colleges' model has also been applied in addition to organizational context, for example, teaching context (Tee & Lee, 2013), interorganizational level (Bartolacci, Cristalli, Isidori, & Niccolini, 2016) and teams' knowledge creation (Hubers, Poortman, Schildkamp, Pieters, & Handelzalts, 2016).

In this study, the construction of collaborative knowledge by utilizing Scardamalia and Bereiter's principles of knowledge building is evaluated. Scardamalia and Bereiter's Knowledge Building model's roots are in the learning science, but today it is widespread as a common model for the community knowledge building (Scardamalia & Bereiter, 2014). According to Hong and Scardamalia (2014) knowledge building is a group phenomenon, even when contributions come from identifiable individuals and its aim is the creation and improvement of knowledge of value to one's community.

Knowledge building is a dynamic process, in which ideas have a life beyond the individual mind and can be continually accessed and improved (Hong &

Scardamalia, 2014). Thus, the key factor is a dialogue that is more widely recognized as the center of knowledge creation (Tsoukas, 2009). In collaborative knowledge building, it is not enough, that knowledge is shared, but knowledge needs further elaboration based on the presented ideas and thoughts (Arvaja, Salovaara, Häkkinen, & Järvelä, 2007). It involves, according to Harasim (1989) who has introduced collaborative knowledge building, the mutual exploration of issues and arguments, agreements and disagreements, questioning, dynamic interaction and a building on another's idea (Harasim, 1989 as cited in Muhonen et al., 2017).

USER-DRIVEN INNOVATION

In user-driven innovation new products, services, concepts, processes, systems, and methods are inspired by or are the results of a need, ideas and opinions derived from users (von Hippel, 2005). User means, depending on the context of the discussion, a customer, consumer, or citizen who uses a service or product (Sundbo & Toivonen, 2011, 8-9). In this study, users are citizens who use public sports services or potential users who can be using services in the future.

The different approaches can be distinguished from user-driven innovation for instance the 'voice of user', the participating user, and lead-user approach, but to all these, it is common that user-oriented activities are central (Buur & Matthews, 2008, 256-259) and processes rely on activities that search for, acknowledge, tap, and understand users' explicit and implicit knowledge and ideas. Users are also able to participate in different stages of the development process (von Hippel, 2005). According to Alam (2002), user involvement, especially for the beginning of the innovation process, where ideas and understanding are collected into the next stages of the innovation process, has been shown to be valuable. Furthermore, users can have different roles in innovation processes. Users can be considered for instance as a source or a producer of information or co-creators (Buur & Matthews, 2008; Grabher, Ibert, & Flohr, 2008).

The methods in user-driven innovation include the observations, consultations and intensive involvement of users in co-creation processes. These kind of the methods could be collaborative methods in which users together solve their own everyday problems and thereby develop innovations (Nyström & Leminen, 2011, 4). Nowadays, many problems need the participation and contributions of different actors with various backgrounds. If a group has the range of skills and knowledge required for a particular problem area, it is likely that they can tap this diversity to come up with a broader range of the ideas than those with a more limited diversity in knowledge. Meaning that one individual does not hold all of needed knowledge to construct a creative solution but the potential for the creative solution requires the skills of many participants. One person might have a potential idea but may not

recognize its value, while another has enough knowledge of the problem valuing that idea but does not know of it (Hargadon & Bechky, 2006; Parjanen, 2012). In this kind of situation, the participants create knowledge together, which can be called collaborative knowledge building.

The collaboration between heterogeneous participants triggers creativity. This is because the collaboration between heterogeneous actors allows drawing upon additional expertise (Burt, 1992) and accessing additional knowledge (Zhang, Baden-Fuller, & Mangematin, 2007). This study uses the concept of cognitive distance (Boschma, 2005; Nooteboom, Vanhaverbeke, Duysters, Gilsing, & van den Oord, 2006) to describe the heterogeneity between the participants. A cognitive distance presents both a problem and an opportunity. As cognitive distance increases, it has a positive effect because it creates opportunities for the new ideas. Knowledge building often requires the dissimilar, complementary bodies of knowledge (Boschma, 2005) meaning that new knowledge is created through interactive processes based on sharing and integrating of previously unshared knowledge (Mitchell & Nicholas, 2006). However, at a certain point, cognitive distance becomes so large as to prevent a mutual understanding (Nooteboom et al., 2006).

RESEARCH METHODOLOGY

This study is a case study, which can be used to extend and increase understanding for knowledge building of the initial phase of user-driven innovation. The case study is used, when a phenomenon is studied its real-life context and such understanding encompasses important contextual conditions. (Yin, 2009.) This study is part of a user-driven development process where the focus is to develop ways to motivate citizens to be more physically active and it investigates the initial phase of user-driven innovation.

Data collection

The data collection includes two phases. In the first phase citizens, who had participated in a lifestyle group or got physical activity counselling, were sent a questionnaire, which contained questions about physical activity and sport-related services of a municipality. The questionnaire was sent to 93 citizens from where 42 returned the questionnaire. Citizens, who returned the questionnaire, were invited to a workshop, where the Learning Café method was used (Sandell et al., 2016; The world Café, 2019). In the workshop there were 26 participants (7 men /19 ladies), who were divided into four groups, in each group was 6-7 participants. Four pre-

selected key questions, which related to physical activity and sports services of the municipality, were discussed to create the basis and structure for group discussions.

Before group discussions, the Learning Café method and the key questions were described to the participants. The groups sat at separate tables and they were asked to discuss a pointed question for 15 minutes. After 15 minutes, the group moved to the next table and discussed a new pointed question. All the groups went to around four tables. Every table had a host, who asked questions, if necessary and summarized the discussions of the previous groups, when the new group arrived at the table. The discussions were recorded and transcribed verbatim. The text to be analyzed was 64 pages (Times New Roman, font 12, line spacing 1).

Analysis of the data

In the first phase, the transcribed group discussions were read several times to identify episodes. Each episode contained a new idea or proposal for the sports service of municipality and the idea or the proposal was discussed in the group. 47 episodes were identified in four group discussions.

In the second phase, the identified 47 episodes were analyzed for the functions of a talk by using the adaptation of The functional Analysis of Children's Classroom Talk (FACCT) developed by Kumpulainen and Wray (2002) and modified by Muhonen, and her colleges (2017, 29) (see Table 1). The unit of analysis was a single word, a sentence, or sentences where at least one function was clearly identified (e.g. Muhonen et al., 2017, 29). The residual data were analyzed by using the adaptation Scardamalia and Bereiter's theoretical model for the Knowledge Building (Bereiter & Scardamalia, 2010; 2016; Scardamalia & Bereiter, 2010). Scardamalia and Bereiter's theoretical model can be used for example as pedagogical guides, and bases for evaluating existing practices (Scardamalia & Bereiter, 2010). Knowledge is constructed collaboratively and new knowledge is created when the proposal fulfilled the following principles: 1) Clarifying the essence of the challenge, why it is important. 2) Ideas originate from the participants and they create reactions and counter-reactions. 3) All are taking responsibility for idea improvement. 4) Ideas are improved through comparison, combination, and alignment with other ideas. 5) Idea has potential for development into service. 6) The new idea or solution must have application beyond the immediate situation, be communicable, and involve an element of creativity.

In the next phase, the amount of the proposals constructed in the group discussions and the questionnaires were calculated and the proposals of the group discussions were compared with the proposals of the questionnaires.

TABLE 1.
Adapted version of the Functional Analysis of Children's Classroom Talk (FACCT) framework applied to the context of the initial phase of user-driven innovation dialogue.

Function	Description
Idea	Expressing idea or proposal
Factual	Providing facts, knowledge or general information, from previous ideas, pre-existing knowledge
Interrogative	Asking questions to obtain information or social approval
Supportive	Expressing agreement
Judgement	Expressing disagreement
Experiential	Expressing personal experiences
View	Expressing personal opinion or view
Affectional	Expressing personal feelings and dreams
Reproductional	Reproducing previously encountered language
Summary	Formulating a summary
Extended	Expanding the view
Alternative	Finding an alternative solution

Finally, the group discussion data were analyzed by using inductive content analysis. The analysis of the data was extended by presenting the new questions of which factors restricted and which enabled knowledge-creating. First, initial categories were generated by grouping similar ideas. Thereafter the initial categories were combined by identifying different themes. Themes like experience, motivation, attitude and knowledge were found.

FINDINGS

In the group discussions, 47 different new proposals for the sport-related services of the municipality were identified. The questionnaire generated 17 proposals; all of these were also discussed in the group discussions. Many of the proposals on the questionnaire became more concrete and gained new perspectives during the group discussions. In addition, in the group discussions, the meaning of the services for the participants was described. The following example describes how the proposal given in the questionnaire was developed during the group discussion. The background to the proposal was that many citizens live far from the city center and most sports services are in the city center. Public transport goes only a few times during the day.

"I would like, that municipality would organize sports services also outside the city center" (Questionnaire and group discussion/ group 1 and 2)
"The municipality could give sports vouchers that a taxi could be paid when a citizen goes to a sports service of the municipality." (Group discussion/ group 1)

"A sport group that is in different places in different days" (Group discussion/ group 2)

In the group discussion, the proposal typically pertained to the participant's own experience (28 proposals). Twelve proposals began with the participants' view and the rest of seven facts, for example, how it is done somewhere else or as an answer to the host's question. The participant's personal experience or view most usually initiated knowledge building. Nevertheless, some of the participants looked at the matter from others' point of view, as the following sample demonstrates: *"I know many who had to finish the water gymnastic group when group's price rose."* (Group discussion/ group 1, woman 2)

The quarter of the proposals in the group discussions fulfilled modified Scardamalia and Bereiter's principles of knowledge building. The recognized knowledge-creating pattern is in Figure 1. The experience described by the participant usually contained the problem or challenge, why the sports service did not work or it was identifiable of a speaker's speech. The municipality mainly offers sports groups during day. This problem is recognizable in the following sample: *"I can't find a sport group, because I'm so big (overweight) and at the working age."* (Group discussion/ group 3, woman 5)

In many cases, the participant, who initiated the dialogue and described the experience or the view, articulated a solution to the problem. The solution to the problem could also be presented by another participant who shared the common understanding about development needs. The dialogue was also initiated by a good sports service experience, for example, a service that was finished or used outside its own municipality.

When many of the group participants shared the same experience and they had a common understanding about the development need, the participants started the dialogue. This can also be seen as a critical point in knowledge building. Collaborative knowledge building did not continue if the participants did not share an understanding about the need for development. From the data, it was found the factors, which restricted collaborative knowledge building. These factors were the experiences were not shared, different requirements to the issue to be development, for example, different needs were related to the different life situations and different attitude to the theme of the discussion.
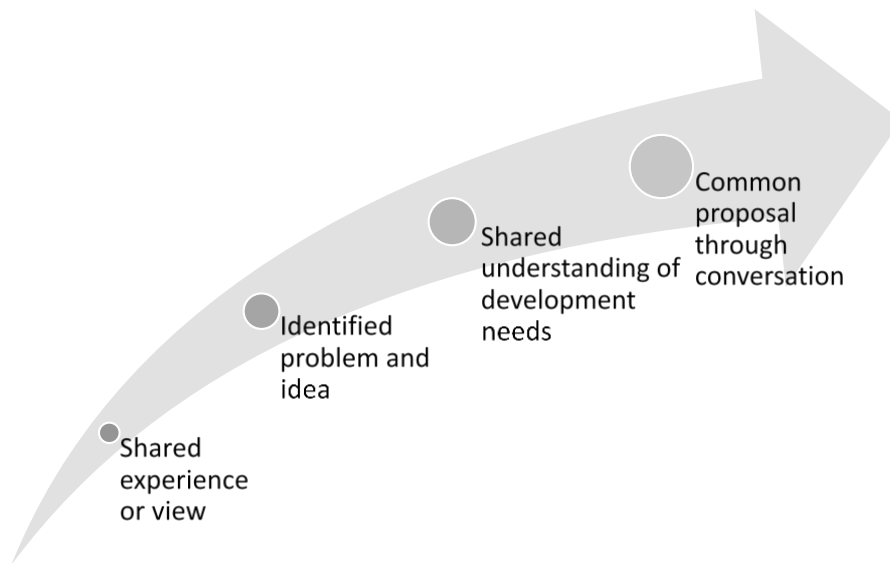
Figure 1: The knowledge-creating pattern in the initial phase of the user-driven innovation process.

In addition, different motivation to participate in the development and different knowledge about the theme of the discussion were identified as restricted factors. The experience of the participant was sometimes so personal that others did not share it, for example, one participant shared the experience that it is difficult for obese people to find a suitable exercise group or the participants had a different experience of the same service as in the following example describes.

"You never know when school classes are in the swimming hall. At that time, I don't want to go there, because there is so many people" (Group discussion/ group 4, women 4)
"The times when the school classes are swimming can be found in a bulletin board of the swimming hall" (Group discussion/ group 4, women 6)
"Where in there? I haven't been able to watch." (Group discussion/ group 4, women 4)
"There on the board, they can be taken from there." (Group discussion/ group 4, women 6)

After shared understanding, the solution of the problem was developed by expanding the view, introducing alternative solutions and concretizing proposal. The discussions contained a lot of acceptance, where the participants agreed with the shared thoughts, opinions and information. On the other hand, when knowledge was created, the participants only disagreed in a few statements. This dialogue formed a common proposal.

DISCUSSION

This descriptive study set out to examine what kind of knowledge-creating pattern can be identified in the initial phase of user-driven innovation. The most remarkable result to emerge from the data was that the experiential function of knowledge was actively involved in the majority of the identified dialogic episodes. Second, the questionnaire generated mainly declarative knowledge that expressed the wishes and needs of the respondents. The group discussion produced declarative knowledge as well as productive knowledge, where participants created knowledge together.

Both the questionnaire and the group discussion produced the proposals that can be used to develop sports services. Many of these proposals were similar, but in the group discussions, many of these became more concrete and gained new perspectives. This was made possible by the fact that the group created collaborative knowledge and it can also be spoken about group creativity. Several studies for examples Hargadon and Bechky (2006) and Parjanen (2012) have stated that one individual does not hold all of the required knowledge to construct a creative solution but the potential for the creative solution requires the domain relevant skills of many participants.

In the productive knowledge pattern four phases were identified: the sharing of experience or view, the definition of the problem, the building of a shared understanding about the development need and the dialogue, which included the production of different perspectives, the presentation of different solutions and the idea and approving the ideas. This pattern has a number of similarities with Stahl's (2000) cycle of social knowledge building. The cycle of social knowledge building happens when someone shares his or her personal belief with others and this statement is taken up in a social setting and discussed from the multiple perspectives of several participants.

The quarter of all proposals in the group discussions fulfilled Scardamalia and Bereiter's principles of knowledge building when the common proposal was created through conversation. This study especially highlights the role of experiential knowledge in collaborative knowledge building. At the beginning of negotiation, individual experience has meaning and value only for one participant, but when it is shared with other and is acknowledged by others, the individual experience can be changed as shared knowledge (Muhonen et al., 2017, 34). In addition, experiential knowledge may enhance users' ability to identify needs and opportunities and generate ideas and solutions (Chatterji & Fabrizio, 2012). However, in most of the proposals, the common proposal was not created indicating the presence of cognitive distance between participants (Boschma, 2005; Parjanen, 2012). Experiential knowledge was so different that it prevented a mutual understanding.

Too large social distance could restrict dialogue, along with cognitive distance. The ability to collaborate depends largely on trust. Trust facilitates a positive affect, learning and risk taking, which are considered the crucial components of creativity (Amabile, Barsade, Mueller, & Staw, 2005). When there is a close relationship, people are willing to support and encourage innovative ideas, as the individuals involved are able to give the confidence needed to generate various ideas (Carmona-Lavado, Cuevas-Rodríguez, & Cabello-Medina, 2010). In this study, the participants did not know each other and interpersonal ties among were weak. Social distance was shown, for example, between working and retired citizens.

In addition, the participants had different motivation for physical activity; some had high and others had low motivation. It was difficult for these two groups to understand another's view and together find new solutions for sports services. According to Füller (2010), users' motives in user-driven innovation may be heterogonous. Differently motivated users or user groups may have different expectations towards the co-creation process, the content, as well the partners. These different motivations can affect collaborative knowledge building.

This study may have some limitations. Firstly, this is the case study, and results of this study can be transferred only to user-driven innovation contexts similar to this research environment (Yin, 2009). Secondly, there is lack of studies on knowledge building in the dialogue and in this study, the criteria for knowledge building was modified from Scardamalia and Bereiter's theoretical model for the Knowledge Building. The criteria were lax and gave a lot of room for interpretation. The criteria have also been built for a group, where people know each other and that was not the case in this study. However, Scardamalia and Bereiter's theoretical model provided a framework for knowledge building and the criteria gave an understanding of how the proposals were built.

Despite the limitations of this model, this study provided insights into the nature of knowledge building of the initial phase of the innovation process, which can be used in the user-driven innovation process. For example, the role of experiences is essentially important in the initial phase of user-driven innovation process. In the user-driven innovation process it would be good to support the sharing of experiences and creating possibilities to participate in collaborative knowledge building. A developer and facilitators should pay attention to the critical points of knowledge building and especially in the heterogeneous groups to how to use participants' cognitive distance and how to decrease participants' social distance.

Future studies should address, for example, how the sharing of experiences could be supported with different kinds of methods and how various distances between participants could better be taken into consideration. This study did not examine how hosts' or facilitators' effect on dialogue and in the future it can be studied, what kind of skills the facilitators need that they can support knowledge building especially in those situations where the restricted factors are present.

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CAREER GUIDANCE AT THE TRANSITION FROM SCHOOL TO VOCATIONAL TRAINING OR UNIVERSITY: A DBR-PROJECT FOR A SOCIAL-SCIENTIFICALLY EMBEDDED PROFESSIONAL ORIENTATION

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ABSTRACT

Due to the high demand towards higher qualifications, the vocational education system in Germany is coming under increasing pressure. In order to cope with the future needs of those who have obtained the university entrance qualification (Abitur), the political and economic level calls for targeted career guidance at the upper level of school. Looking at school curricula as well as university practice, it becomes evident that there are no concepts addressing this gap so far. A possible explanation for this is that career guidance which is geared towards a matching process does not fully meet the needs of the target group. In our view, the extension of vocational orientation to include social-scientifically and subject-based aspects offers the possibility to foster curricular developments in this field.

This paper describes a design-based research project that builds on these ideas and has been developed conceptually by academics and teachers and jointly tested by pupils and students. In this context, the world of work is regarded as a research and learning environment which, through the application of the learning by research method, permits reflection on the societal and personal reasons for initial career choices and for vocational reorientation.

INTRODUCTION

To cope with future requirements like digitization or the key challenges for the knowledge society of the future, there is an increasing high demand towards higher qualification mostly on university level. By the same time the vocational education system in Germany has to cope with new challenges. The number of pupils attending a high-level entrance qualification increase, so that more and more people enter universities and universities of applied sciences. Concurrently, more and younger people with a high school degree (Abitur) are interested in the vocational training system. In 2009, only 20% of new contracts in the vocational training system were signed by high school graduates. In 2016, this rate rose to 28% (BIBB 2018, 132).

To support young people in the choice to enter higher education or the vocational training system, Esser (2017) for example demands the consolidation of career guidance in *all* schools. Professional guidance should especially be established at Gymnasiums (secondary school incl. high school) to inform high school graduates about the options of a dual training in the German vocational training system. Indeed, the increasing demands and efforts to implement a professional career guidance into the senior classes of Gymnasiums is basically welcome. But it has to be considered that this presents a curricular gap so far and that – in our view – there are no sufficient concepts existing the way they could be realized reasonably for a higher qualified target group. Mindful of winning the brightest minds, it does not surprise that a kind of colonization of professional career guidance is taking place by companies and economically oriented associations at Gymnasiums (Engartner 2014). These provide various offers for professional orientation at as well as for school und make further efforts (exhibitions, open house days etc.) in order to inspire particularly high school graduates for a vocational training. Of course, companies and associations are important partners of a promising counselling in this field. But there is also a risk of a one-sided counselling (Schmerr 2013, 14) because companies pursue their own economic interests and advertising.

Regarding the senior classes of a Gymnasium, the risk of such a monopolization is so contagious as the career guidance is often articulated as a cross-sectional task, i.e. it is thematised in all subjects and/or realized in (interdisciplinary) projects (Dedering 2000, 271).

In our opinion this diagnosis of deficiency particularly points to two desiderata. On the one hand – on a structural level – it would be desirable to give an answer to the question how (a) to implement career guidance meaningfully into Gymnasiums and their curricula, respectively, regarding the principally welcomed intensely thematization of the professional living environment as a soon-to-be relevant part of their life. How (b) universities and institutions of higher education can embed the topic of career guidance systematically into the teachings as part of teacher training. On the other hand – on a conceptual level – it is about the question of a basic customization of the professional orientation if it is supposed to be conceptualized and realized as a promising (cross-sectional) task of the senior classes of a

Gymnasium. Even all these questions cannot be dealt with separately, due to analytic reasons; in the following we are going to commit ourselves to them separately.

Our paper focuses on a project developed by researchers of the University of Bremen and teachers at Gymnasiums of the federal state of Bremen. As this project is realized in the style of a design-based research (DBR) approach, for this purpose it is at first useful to outline the approach in the next chapter. In a following step we present the project in all phases in detail. At the end of the paper we conclude with a brief perspective on further challenges.

DESIGN-BASED RESEARCH (DBR) APPROACH

As mentioned before, the project has been drafted in terms of a design-based research approach. Since this approach cannot be explained in detail (for more details Reinmann's online reader 2015) at least some of its essential aspects shall be outlined shortly.

Design experiments were developed as a way to carry out formative research to test and refine educational designs based on principles derived from prior research. In the literature different terms like "design experiments" (Brown 1992) or "design research" (Cobb 2001) were used to describe the research paradigm of design-based research. All approaches have the same idea of iterative research in practice fields. We are following the definition of Wang and Hannafin (2004, 2): "Design-based research is a research methodology aimed to improve educational practices through systematic, flexible, and iterative review, analysis, design, development, and implementation, based upon collaboration among researchers and practitioners in real-world settings, and leading to design principles or theories." (Wang & Hannafin 2004)

Characteristics of design experiments are:
- addressing complex problems in real contexts in collaboration with practitioners,
- integrating known and hypothetical design-principles with technological affordances to render plausible solutions to these complex problems, and
- conducting rigorous and reflective inquiry to test and refine innovative learning environments as well as to define new design-principles.

The DBR approaches aim for a productive "development partnership" [Translation by the authors] (Reinmann & Sesink 2011, 12) between research and practice, whereby the former functions as a hinge between two markets generally characterized as inherently logical. According to this understanding, DBR projects distinguish themselves by their iterative basic mode. Consequently, the development

or design of an intervention (design) is followed by testing this intervention in practice (enactment), its evaluation (analysis), if necessary, changes or improvements of the respective intervention based on the results of the evaluation (redesign), a repeated testing, another subsequent evaluation and potentially required adjustments.

Science theory (Truth as a benchmark)		**Practice** (Usability as a benchmark)
Scientific Community: Relatively closed group with an explicit set of rules, access barriers and high level of identification		*Practice communities:* Relatively diverse and heterogeneous groups with implicit rules and openness for situational requirements
Fictive market activities: Self-imposed norms and criteria determine the action; no interaction with the „end user"	**(Vocational) education** /	*Real market activities:* Usability or resource consumption determine the actions; decision by „end users"
Value system: Pure knowledge *vs.* usability as the issue of science and research → stronger dissent	**(Subject) didactics**	*Supply system:* Practical problem solving *vs.* reform (disorder) as a potential issue → weaker dissent

Source: Own illustration

These DBR principles have been transferred to our context and were worked out in a practice-oriented project. We as researchers developed together with practitioners from schools and companies a concept for career guidance, which is outlined in the following graphic.
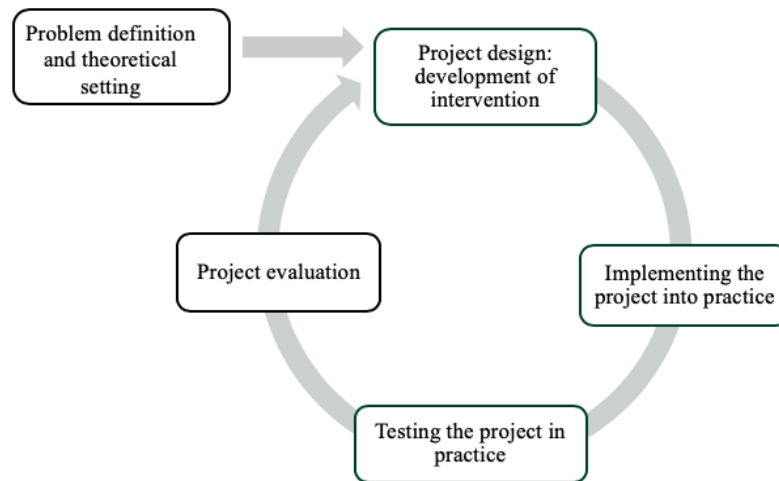
Source: Own illustration

The principals which are outlined in the graphic will be described in the following chapter.

THE PROJECT "BREMER LIVES": LEARNING FROM BIOGRAPHIES – RESEARCHING WORKING LIFES

Based on the desiderata depicted in the first chapter and the ideas of a social-scientifically embedded perspective in third chapter the project "Bremer lives" was developed by the Center for Labour and Political Education/ Center for Didactics of Social Sciences, both part of the University of Bremen, together with teachers of two senior classes of Gymnasiums of the federal state of Bremen. The team decided that an appropriate place for career guidance in school would be in the social science subjects (as civic education) as the respective teaching methodologies articulate that „[to be able to] orient oneself in the modern economy and society" [Translation by the authors] (GPJE 2004, 9) is the upmost teaching goal. The following chapters describe the developed project in detail.

Theoretical setting: Social-scientifically embedded career guidance/ professional orientation

A social-scientifically embedded perspective carves out the „constructional character" [Translation by the authors] (Hedtke 2013, 48) of this world considering social perspectives as well as social, cultural and political knowledge. Besides the social element, the personal aspect of the profession is considered within the framework of a socio-scientifically embedded professional orientation. The working

and professional world presents a relevant part of human life which in addition to the functional execution of an activity influences the personality, the moral concepts as well as the social orientations of an individual (Heinz, 2000; Sproull, 1981; Holcombe Ehrhart, 2006). Also Famulla (2007, 65; 2013) emphasizes that the professional orientation understood as a one-time orientation at the transition from school to work falls short since movements of searching and orientation accompany the entire professional history. As the personal attributions to meaning of the profession are dependent on the cultural and social interpretation, Hedkte (2013, 62) concludes consequently: "in order to understand the meaning of work and profession and to develop the personal sense for oneself, particularly a communicative and reflective process" [Translation by the authors] is necessary.

Not at least due to the age and the education level of the students of senior classes of a Gymnasium, the approach has to be adjusted to the target group. Hence, (1.) the levels mentioned above are not supposed to be analyzed separately but rather the "essential interconnections" [Translation by the authors] (Negt 1993, 662) between them are supposed to be presented in detail and understood. The backdrop of this formulation of goals is that social, political and technical development as well as interpretative patterns (macro level) have an influence on companies (meso-level), which again bring about direct and indirect effects on employees (micro level) (and vice versa) (Anslinger & Barp 2017). A further objective of a socioscientifically embedded professional orientation is (2.) the initiation or (further) developments, respectively, of a context competence according to Negt (1990), under which the breakdown and classification of the abovementioned levels as well as the critical discussion about them can be subsumed. These two objectives (3.) can be achieved particularly by teaching concepts, which follow qualitative methods. Hence, qualitative methods make it possible in a particular way to practice the analysis and interpretation of social interconnections and to reveal the „constructed character" (of the world of working and profession) through dealing with a section of social reality created by them. This activity results in reflecting own resources as well as integrating these into the own political and professional self-image in terms of a political and professional biographical judgement ability (Anslinger & Partetzke 2016).

Project design/development of intervention

Since the project was supposed to both, identify the multidimensionality of the working and professional world and to enable a critical insight into the same, the participants of the project quickly agreed upon a method of inquiring learning "characterized by a largely open teaching-learning-situation" [Translation by the authors] (Detjen 2014). It provides the learners with the opportunity to identify political attitudes by their own capacities, to determine facts from the political-social

environment or to make an effort to solve problems to be found in this area (ibid., 493f.).

Particularly, working with the methods of qualitative social research offers the possibility through its "interpretative paradigm" [Translation by the authors] (Lamnek & Krell 2016, 46) to work out the abovementioned "essential interconnections" [Translation by the authors] (Negt 1993) and thus the interactions between institutional and social interpretations (macro and meso level) as well as individual action and thought (micro level).

As a result, the following research questions provided the direction of our project:

1. Which effects do changes in the area of conflict between "politics-work-economy" have on employees?
2. How are these changes and demands linked to those managed by the employees?

With the help of the instrument of work-biographical interviews, the members of the individual research teams were supposed to learn and reflect upon different economic, political and social effects on professional biographies in order to integrate the insights gained by that into their own work-related self-image.

The project design intended that students and pupils elaborate on both the quality criteria of social research (Steinke 2012) and characteristic features of biographical-narrative interviews (Schütze 1983, 1992) within the respective events at university and school. Regarding this, it was clarified that biographical-narrative interviews were places of performative production and presentation of a narrative identity (Ibarra & Barbulescu 2017, 9; Partetzke 2016, 198, 310ff.).

Implementing the project into practice

The essence of the project consisted in the intensive cooperation between schools and universities – with the aim to answer the questions how (a) the project topics could be incorporated into the ongoing lessons and (b) which adjacent area of themes need to be processed preliminary (e.g. main political and economic changes in the labour organization, regional particularities of Bremen as a business location etc.).

The project was located in school in a so-called profile course in the second last year. Here, the pupils are demanded to work out a project in small groups as well as to create a product, which has to be presented subsequently in front of an examination board. This project work becomes part of the final examination grade (Abitur), by which a higher level of commitment could be ensured.

The attachment to the university teaching took place within the social-scientific subject compound during the teacher training for high school (Gymnasium) and vocational schools at the University of Bremen. The core concern of the course was

the training of student mentors, who were supposed to support the participating pupils in their research-oriented learning process. The students obtained credit points through the perception of their roles as a mentor as well as through the elaboration of a didactically or curricular-oriented reflection so that the commitment was given here as well.

The access to the field was realized through the cooperation with regional companies. During factory tours – which were an additional part of the concept, the access to the potential interview partner was arranged for the research teams.

Testing the project in practice

The first project draft planned that the pupils and students were introduced to the (auto-)biographical research within separated events in their respective institutions. Following to this project start, both groups got to know each other during an opening event and formed research teams. For this purpose, the pupils presented their research goals that had already been identified. Finally, the groups were told to concretize their research independently as well as to keep elaborating on it while being supported by the teachers and lecturers equally.

In different settings, the research groups prepared the biographical-narrative interviews. The function of this preparation was, among other things, the construction of a narrative impulse and of a guideline for the inquiring part following the interview as well as to practice the interview technique and the usage of recording devices.

Meanwhile, the factory tours mentioned above took place, where it was possible to identify appropriate interview partners.

Each group carried out a work-biographical-narrative interview, whose subsequent transcription followed common social-scientific rules. Further, the groups could make use of various methods for the evaluation of the interviews (content analysis, narratological analysis, narrative analysis) while the focus was consistently on the reconstruction of the collected CVs and on working out key interpretation patterns of the interviewees. Throughout several evaluation workshops within the lecture, specific difficult situations during the analysis and interpretation of interviews were addressed together with the students. During the classification of the results of evaluation into social correlations the research teams were supported by the teachers and lecturers.

As a last step, the research teams edited the key results of their research process and developed an appealing form of presentation, which was presented during a symposium at the university.

Project evaluation/evaluating the testing of the project

Due to project constructions with different project participants located on many levels, it was considered as useful to realize the first evaluation by separated evaluation sessions at the university and school. Based on the evaluation results, an exchange between the teachers and lecturers took place, which also encompassed a discussion and conceptualization of a redesign for the second run in the following school year or semester.
Both, the students and the pupils, emphasized during the evaluations that the research part of the project had been experienced as particularly gainful. However, the structure and organization of the project were criticized. The essential results of the first evaluation are presented in the following chart.

Positive aspects	Negative aspects	Suggestions for the *redesign*
Exploratory learning approach („Out of the school and university")	Requirements of the school unclear (to students)	Designing working papers for the pupils
Theory-practice-transfer	Course at the university insufficiently embedded into the context of school	Lecturers give an introduction about the project at school
Interests could be pursued	Arrangements between the university and the school	Milestone meeting of all project participants
Becoming creative	Diversity of partners, role of mentors was not well-defined	Establishing more detailed framework conditions
Merging of school and university	Too few obligatory meetings between students and pupils (time-related aspect)	Pupils participate in university course and students participate in school lessons, respectively
Combining knowledge work and methods	Level of education of the research groups unclear for too long	Uniting the research teams sooner
Factory tours	Factory tours too late → too little to establish contact to the interview partners	Earlier factory tours

Source: Own illustration

These evaluation results illustrate that the different learning venues including their various time-related logics have complicated the project management. While it was assumed in the original concept of the project that students and pupils would design the exchange within the research teams occasion-related and according to the amount of work, the evaluation emphasized that binding meetings are necessary particularly previously to the interviews but during the entire research process as well. Moreover, responsibilities and roles were not always clearly defined, which partly resulted in the consequence that individual tasks within the research teams could not be

distributed clearly. Due to the overall impression, the (first) redesign of our project particularly took place on the structure level.

Redesign of the project and testing the project anew

The following changes were made for the second run of the project:
- Lecturers at the university introduce the project at the school at the beginning of the school year.
- Lecturers organize a workshop about biographical research at the school.
- Developing training material for the pupils, which the teachers can work on together with the pupils during the lessons.
- During the opening event the students also introduce their research interests in order to accomplish a better matching of research teams.
- Organizing WhatsApp-groups to improve the communication within the research teams.
- Factory tours take place right at the beginning of the project in order to enable a faster first contact to potential interview partners.

Against the backdrop of the evaluation results, the contextual level of the project was not changed during the redesign except some minor details. The decisive reason for that was particularly the high quality of products designed by the research teams, due to which it could be assumed that the contextual requirements of the projects of the research teams could be met well and the objectives defined in advance of the project could be achieved. The embedding of the project and the project partners (regional companies, school classes) were kept on the structural level as well.

New project evaluation/evaluation of the redesign

While the evaluation of the first run of the project, as mentioned before, focused on potentially required corrections of the structural dimension of the project, the evaluation of the second run focused particularly on the project concept. A multi-level evaluation procedure was selected, in which both pupils and students first assess the project via an online-based evaluation before the university partners could evaluate the developed products. This was followed by a full-scale evaluation the participating project partners (teachers, companies, students), which on the one hand provided possibilities of exchanging respective experiences and perspectives and on the other hand facilitated a discussion of the previous evaluation results. In consequence of the various and comprehensive data basis of the evaluation, which cannot be reproduced in its entirety here, the evaluation results are subsequently presented with the help of a thematic structure.

Evaluation

The social contouring of the working and professional world was unanimously considered as gainful. Thus, 100% of the students revealed that they perceived the extension of the professional orientation by the social perspective as useful (student evaluation). At the same time the chief instructor of a large Bremer company underlined that the proceeding pursued in the project would distinguish itself positively from those of other projects regarding the professional orientation and particularly would lead to more realistic ideas of the working and professional world (group evaluation). Also, 60% of the pupils confirmed that the project had contributed to a broadening of their perspective on the working and professional world and 85% even agreed that they had learnt very much about it from their interview partners.

Both, the pupils (92% agreement) as well as the students (100% agreement), assessed the data collection method of the work-biographical interview as useful in order to gain a social perspective on the working and professional world. But during the discursive group evaluation, the difficulty in dealing with an open and – as one student depicted it – "unusually little predictable" survey situation on part of the learners of both institutions was stressed. Furthermore, the significance of the medially unfiltered narrations of interview partners for the interpretation of "essential interconnections" [Translation by the authors] (Negt) and thus the initiation and (further) development of the connection competence was stressed particularly during the group evaluation. As a result, the participants perceived that a complete and authentic narration of a biography has to include the references to social, political, economic and personal (changes of) life situations. This in turn impacts the constructions of professional biographies.

The fact that the realization of the "essential interconnections" (Negt) between the various levels of social reality has succeeded becomes clear by considering the results of the product evaluation.

Product evaluation

The products, in which the individual biography has been referred to particularly one social context, primarily emphasize the transformation in the working and professional world as a result of technological innovations, social changes and the consequently necessary adjustment performances of the interview partners. Particularly in the category in which biographies are understood as (a) "testimonies of social change", it is shown how far the exemplary occupation of a professional biography (micro level) can refer to a social phenomenon (macro level). A (b) "comparative perspective on working world phenomena" was encouraged particularly by the narrations about work histories, which were hardly predictable for the learners. Just as in the example of the "biography as testimonial for social

change", the individual case gave cause to further research about social conditions and changes.

In contrast, the categories (c) "professional orientation as a part of life planning" and (d) "extraprofessional activities as a resource" accentuate primarily the subjective perspective of professional orientation. Within the products of "professional orientation as part of life planning", the research teams particularly accentuated that many possibilities of reorientation and new orientation exist during the course of professional life, whereby they highlighted the life-long process of professional orientation. All works of the category "extraprofessional activities as a resource" underlined that the working and professional world presented only a section of life while the subject would always include his entire personality into the working process.

In sum, it can be noted that the exemplary work with a professional biography occasionally enables a certainly critical examination of overall questions and developments within the working and professional world. Therefore, the analysis of a professional-biographical narration is obviously qualified for initiating the connection competence and develops it further since it is able to reveal the construction character of a professional biography, which in turn is characterized by cultural and social interpretations.

social context		subject perspective	
testimonia of a social change	professional orientation as a part of life planning	comparative perspective on working world phenomena	extraprofes-sional activities as a resource
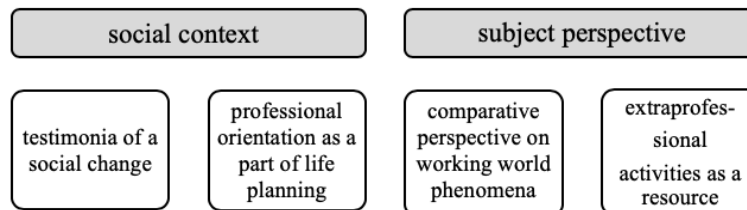
Source: Own illustration

OUTLOOK

As it could be demonstrated by the example of the project "Bremer lives. Learning from biographies – researching working life", an integration of career guidance – as a cross-section task of senior classes of the Gymnasium – into the socioscientific subjects is not only possible but can also generate innovative teaching concepts besides bringing about the realization of a qualitative-socioscientific method. Simultaneously, through the application of a DBR approach, it could be achieved to integrate our concept into a school-intern curriculum of the participating schools. By the joint further development of the project by researchers and practitioners, the adjustment of the concept could be realized, which complied with various demands of social sciences and practice. Also, the objective to enrich university teachings by

didactic concepts in the area of professional orientation in favour of student teachers for high school/Gymnasiums and vocational schools, respectively, could be achieved. In addition to the contextual teaching of a critical-reflective perspective on the working and professional world, the students were taught didactic-methodical know-how. Further re-(re)designs of the project with various partners from different schools were already contemplated for future planned runs. Among other things:

- The adaption of the project for younger target groups for the middle school.
- Creating a pool of interview partners consisting of various employees from the region.
- Facilitating the first contact to potential interview partners through industrial placements.
- Analysing historic employee biographies by means of existing visual and audio material.
- Stronger inclusion of the topics interculturality and diversity.

Of course, these re-(re)designs will be evaluated subsequent to their implementation/testing and further developed if necessary in order to embed the professional orientation both into the senior classes of the Gymnasium and the teacher training at universities in the long term.

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MODELLING AND PROBLEM-POSING IN THE TEACHING OF MATHEMATICS: TEACHERS' PERCEPTION AND PRACTICE

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ABSTRACT

Modelling and problem-posing are powerful tools to improve students' reasoning and critical thinking. In this contribution we present the results of a questionnaire about teachers' knowledge and practice of the educational strategies of modelling and problem-posing related to realistic situations. The questionnaire was administrated to mathematics teachers of primary and secondary school of the North of Italy. The approach for the data analysis is mixed quantitative and qualitative. Despite teachers implement regularly modelling activities, they ask for more materials to support their preparation. Problem-posing, instead, needs to become more integrated in the school practice. In conclusion, we believe that teachers' training courses based on realistic problem situations should be developed, in order to give students mathematical competencies and instruments to interpret the society they live in.

INTRODUCTION

How can we give sense to mathematics? A possible answer could be *"connecting mathematics with everyday life"*. Therefore, the problem becomes how to connect mathematics with reality, or, more in general, if it is possible, and how, to connect mathematical activities with daily-life activities. One of the most crossed bridges to overcome this boundary in mathematics education is represented by *word-problems*. In Verschaffel et al. (2000), elementary school children were posed questions of the

type: *"there are twenty-six sheeps and ten goats on a ship. How old is the captain?"*. A large majority of the students gave a numerical answer. As a consequence, students' reasoning and critical thinking is not favoured by the practice of classical word-problems. On the contrary, powerful tools to improve students' reasoning are given by modelling and problem-posing (Blum et al., 2007; English, 1998). Both these strategies, in fact, enhance students' mathematical competencies and represent precious instruments to interpret the society they live in. In this contribution we will focus on the educational strategies in order to favour modelling and problem-posing processes. In the specific, in agreement with the approach of Realistic Mathematics Education (RME), we will consider realistic contexts as starting point for the development of these educational strategies.

THEORETICAL BACKGROUND

The teaching of mathematics has assumed a stereotypical nature (Verschaffel, 1997). Mathematical activities, in fact, are become nothing more than exercises in the four basic operations solved in a mechanical way. Moreover, students seem to have established a set of rules of which include: i) any problem is solvable and makes sense; ii) there is a single, correct and precise (numerical) answer which must be obtained by performing one or more arithmetical operations with numbers given in the text; iii) violations of personal knowledge about the everyday would may be ignored (Greer, Verschaffel & Mukhopadhyay, 2007). The main consequences of this situation are an increasing gap between mathematics and real-world (Gravemeijer, 1997), and a suspension of sense-making (Schoenfeld, 1991).

About RME

RME is a domain specific instruction theory for mathematics, developed by the Freudenthal Institute for Mathematics and Science Education of Utrecht, as reaction to the limitations of a mechanistic and structuralist approach to mathematics education. Rich and realistic situations are given a prominent position in the learning process and represent a starting point for the development of mathematical concepts and applications. Realistic refers to problem situations that students can image and that are, at a certain stage, meaningful for them. Therefore, problems can come from the real world, but also from a fantasy world or from the formal world of mathematics, as long as the problems are experientially real in students' mind (Van den Heuvel-Panhuizen & Drijvers, 2014).
The core of RME can be synthetized in six educational principles (Van den Heuvel-Panhuizen & Drijvers, 2014):

i) *activity principle*: students are active participants in the learning process. Mathematics is a human activity (Freudenthal, 1991): you do mathematics through mathematization (Treffers, 1987);

ii) *reality principle*: students are able to apply mathematics in solving real-life problems. Mathematics education should start from rich contexts, i.e. problem situations that are meaningful to students and that offer them opportunities to attach meaning to the mathematical constructs they develop while solving problems;

iii) *level principle*: students pass various levels of understanding in their learning process. A fundamental tool for bridging the gap between the informal, context-related mathematics and the more formal mathematics is modelling.

iv) *intertwinement principle*: mathematical content domains must be heavily integrated;

v) *interactivity principle*: learning mathematics is a social activity that favours whole class discussion, group work and reflection;

vi) *guidance principle*: the learning process should be a guided re-invention of mathematics (Freudenthal, 1991). Therefore, teachers should have a pro-active role in students' learning, and educational programs should contain scenarios which have the potential to work as a lever to reach shifts in students' understanding.

About modelling

The mathematization process can be divided in two parts: *horizontal* and *vertical mathematization* (Treffers, 1987; Freudenthal, 1991). In horizontal mathematization, students use mathematical tools to organize and solve problems situated in real life. It involves going from the world of life into that of symbols and viceversa. Vertical mathematization, instead, refers to the process of recognizing within the mathematical system resulting in shortcuts by using connections between concepts and strategies. It concerns moving within the abstract world of symbols (Van den Heuvel-Panhuizen & Drijvers, 2014). These two aspects of mathematization are naturally reflected in two types of modelling. Commonly modelling is seen as the process whereby a situation has to be problematized and understood, translated into mathematics, worked out mathematically, translated back into the original (real-world) situation, evaluated and communicated (Bonotto, 2009). Besides to this definition of modelling, there is another nature of modelling, the so-called *emergent modelling*. The term has its roots in the theory of RME and was initially developed by Gravemeijer (1999) with the meaning of supporting the emergence of formal mathematical ways of knowing. The emergent modelling, in fact, can be seen as a

dynamic process in which students start with modelling their own informal mathematical activity. This means that the model is firstly a *model of* the students' situated informal strategies. Then the model gradually develops into a *model for* more formal mathematical reasoning in a generalizable mathematical structure (Gravemeijer, 2007). In this second connotation of modelling students do not previously need at their disposal mathematical tools, instead the process of modelling becomes itself a way to develop new mathematical concepts and applications (Greer, Verschaffel & Mukhopadhyay, 2007). In conclusion, emergent modelling is a long-term learning process that favours reasoning and sense-making. Following this direction, another educational strategy that collaborates with modelling is problem-posing (Bonotto, 2013).

About problem-posing

Problem-posing is a characterizing component of mathematical activity at every level (English, 1998). It is an important aspect of both pure and applied mathematics and an integral part of the modelling cycle (Christou et al., 2005). Nevertheless, almost of the mathematical problems a student encounters have been proposed and formulated by another person: the teacher or the text-book author. In real life, instead, many problems must be created or discovered by the solver, who gives the problem an initial formulation (Kilpatrick, 1987). In this contribution we will consider problem-posing as the process by which, based on previous mathematical experience, students construct personal interpretations of a concrete situation and formulate it as a meaningful mathematical problem (Stoyanova & Ellerton, 1996). Therefore, it is evident that problem-posing cooperates with modelling and problem-solving. Problem-posing, in fact, could occur: i) prior to problem-solving, when problems were being generated from a particular stimulus; ii) during problem-solving, when the individual intentionally changes goals and conditions while in the process of solving the problem; iii) after problem-solving, when experiences from the solution context are modified or applied to new situations (Silver, 1994).
Several studies (English, 1998; Bonotto, 2013) have shown that performing problem-posing activities improves students' thinking, reflection, lexical skills and understanding of mathematics. It is a form of mathematical inquiry that can also be used to analyse the meanings given by students to a specific mathematical topic (Canadas et al., 2018).

In this study we want to focus on the collaboration between modelling and problem-posing, not only to increase the teaching of mathematics, but also to enhance students' critical thinking and to prepare them to situations they have to face out of school.

RESEARCH QUESTIONS

The aim of the study is to investigate teachers' orientation to modelling and problem-posing. Our research questions are:

1. Do teachers implement modelling activities in their school practice?

2. Do teachers know and use problem-posing in their school practice? Moreover, in which situations do teachers implement problem-posing activities?

3. Which suggestions make teachers to improve the teaching of mathematics?

RESEARCH METHODS

The aim of the research is to have a picture of teachers' knowledge and effective practice of modelling and problem-posing and about their needs to improve the teaching of mathematics. In (Schukajlow, Kaiser & Stillman, 2018) the authors ask for: i) monitoring the development of pedagogical content knowledge of in-service teachers; ii) using a quantitative approach for the analysis of the research questions; iii) developing a questionnaire for quantitative analysis. In agreement with the goal of the project, and to support (Schukajlow, Kaiser & Stillman, 2018), a questionnaire for mathematics teachers was developed.

The participants to the questionnaire were fifty-two primary school teachers and sixty-one secondary school teachers, from the North of Italy. The questionnaire was directly administrated by the second author.

The data analysis is both quantitative and qualitative. In the specific, to analyze the open questions, the answers were closed and grouped in categories and families. Then the distribution of each category was calculated and divided between primary and secondary school teachers.

RESULTS

The first research question is about teachers' implementation of modelling activities in their classrooms. It was split in two items of a five-Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always). The first item deals with the use of real contexts as starting point for the introduction of a new mathematical topic, while the second one with mathematical applications. The averages of the answers are shown in Table 1.

Table 1.
Avarages of the answers to the first research question.

	First item	Second item
Primary teachers	4,3	3,8
Secondary teachers	3,7	3,8

The second research question is about teachers' knowledge and use of problem-posing. The research question was divided in two questions. The first one is a closed question in which we ask teachers if they implement or not problem-posing activities during their teaching. In Figure 1 are shown the distributions divided between primary and secondary school teachers.
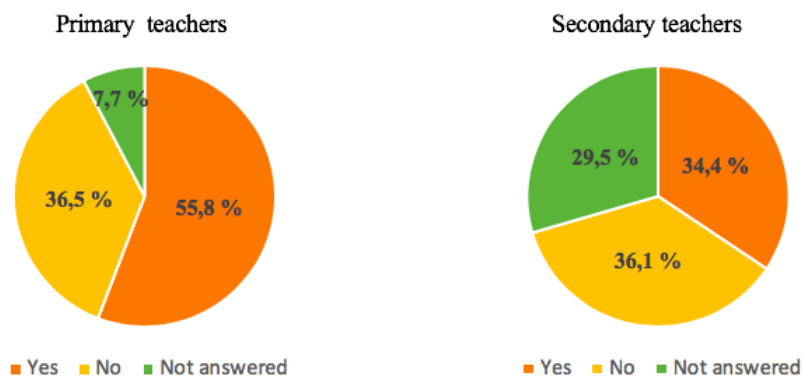
Figure 1. Problem-posing implementation distributions divided between primary and secondary school teachers.

The second one is an open question. In the specific we ask teachers who implement problem-posing activities, to describe a significant example. In the specific, closing the answers we identified eight categories (*artifacts, real contexts, practical experiences, problem-solving, problem formulating, generalizing, new topic, open problems*) and we grouped them in two families (*reality, problems*). To each

category we associated its distribution divided between primary (P) and secondary (S) teachers (Figure 2).

The third research question was given in an open form. In the specific we ask teachers two (or more) suggestions they believe indispensable to improve the teaching of mathematics. The question was answered by the 74,3 % of teachers. The approach for the analysis is the same as for the second research question. In this case we found twenty-seven categories and we grouped them in four families (*school organization, teacher training, math topics, educational strategies*). The distributions of the four families are shown in Figure 3. Note that, since each teacher could express more suggestions, the total percentage is more then 100 %.
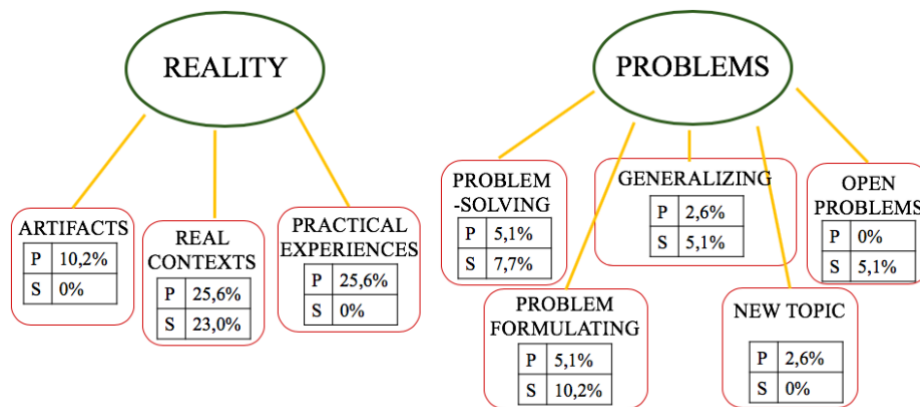
Figure 2. Families and categories from the analysis of the second research question. Distributions associaed to each category divided between primary and secondary teachers are reported.
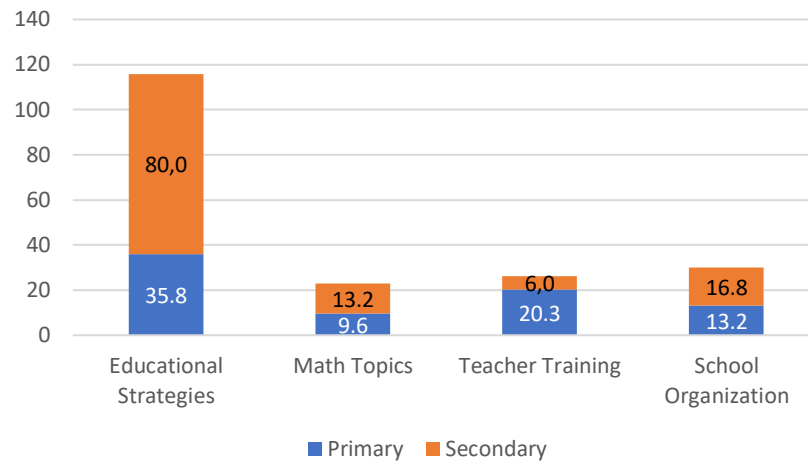
Figure 3. Distributions in percentages of the families from the analysis of the third research question.

In Table 2 the categories individuated from the analysis of the answers to the third research question are reported. The distribution of each category is split in primary and secondary teachers.

Table 2.
Distributions associated to each category from the analysis of the third research question, divided between primary and secondary teachers.

Category	Family	Primary (%)	Secondary (%)
Laboratory	Educational Strategies	16,6	15,5
Interdisciplinarity	Math Topics	1,2	1,2
Math & Reality	Educational Strategies	3,6	17,9
Teacher Training	Teacher Training	12,0	2,4
Students' Motivation	Educational Strategies	4,8	14,3
Problem Solving	Educational Strategies	3,6	9,5
Less Students	School Organization	0,0	2,4

Level Groups	Educational Strategies	0,0	2,4
Group Work	Educational Strategies	1,2	4,8
Logic	Math Topics	6,0	3,6
Euclidean Geometry	Math Topics	1,2	2,4
Classroom Equipment	School Organization	6,0	6,0
Mental Counting	Math Topics	0,0	2,4
Research in Education	Teacher Training	8,3	2,4
Software	Educational Strategies	0,0	6,0
More Hours	School Organization	6,0	6,0
Teachers Cooperation	School Organization	1,2	2,4
Practical Experiences	Educational Strategies	2,4	1,2
Link with University	Teacher Training	0,0	1,2
Textbooks	Educational Strategies	0,0	2,4
National Examinations	Math Topics	0,0	1,2
Problem-Posing	Educational Strategies	0,0	3,6
History of Mathematics	Math Topics	0,0	1,2
Differentiation	Educational Strategies	0,0	2,4
Probability and Statistics	Math Topics	1,2	1,2
Cooperative Learning	Educational Strategies	1,2	0,0
Theory	Educational Strategies	2,4	0,0

We now report some significant examples of suggestions expressed by teachers to improve the teaching of mathematics. In the specific, all the examples are from the family *educational strategies*: the first from the category *laboratory*, the second from the category *math&reality*, the third from the category *students' motivation*, which are the most represented with respectively the 32,1%, the 21,5% and the 19,1%.

Example 1. *Show the importance and the use of mathematics with more laboratorial activities and group work.*

Example 2. *Show practical and realistic applications of mathematics.*

Example 3. *Promote students' emotional involvement.*

DISCUSSION

From the analysis of the first research question we realize that teachers implement regularly modelling activities. The only difference is in the first item. Primary school teachers, in fact, use more real contexts to introduce a new mathematical topic than secondary school teachers. However, in the results of the third research question, teachers ask for more activities based on realistic situations and applications to improve their teaching. We believe that researchers should develop a repertoire of practices, textbooks, materials based on modelling available for teachers.

Problem-posing, instead, is not very common at school. In fact, less than a half of the participants (44,3 %) implement problem-posing classroom activities. It is significant to remark that primary school teachers use problem-posing more than secondary school teachers (Figure 1). The analysis of the answers to the open question, thanks to categories such as *real contexts, artifacts, practical experiences, problem-solving,* supports previous researches. In the specific, the cooperation between modelling and problem-posing (Bonotto, 2013); the precious contribution of artifacts in problem-posing activities (English 1998; Bonotto, 2013); the strong link between problem-posing and problem-solving (Kilpatrick, 1987; Silver, 1994; Bonotto, 2013).

In the third research question, the most suggested family deals with educational strategies, with several categories connected with modelling and problem-posing (*laboratory, math&reality, problem solving, group work, practical experiences*). In particular, the prevalent category is laboratory. This fact remarks that it is necessary a change in the way of doing mathematics. We believe that there is no need of a specific *math-lab*, but activities of modelling must be integrated in teachers' daily lessons design and practice. Therefore, there is a need to improve in-service (and also pre-service) teacher trainings: i) changing the type of activities with more realistic problem situations; improving the knowledge of teaching methodologies such as problem-posing; creating a repertoire of practices available at school based on modelling and problem-posing.

OPEN PROBLEMS

The limited number of participants does not permit to generalize the results. Nevertheless, the study is useful to have a picture of teachers' orientation and needs about some educational strategies. In addition, more time is needed to perform bi-variate analysis to have a deeper understanding of the relationships between different educational strategies.
This contribution is part of an ongoing project whose overall aim is to create a repertoire of practices available for teachers based on modelling and problem-

posing. The next step would be the implementation of some teaching experiments based on modelling and problem-posing in every school level.

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NURSING STUDENTS LEARNING TO PREVENT FALLS OF OLDER PEOPLE THROUGH SIMULATIONS

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ABSTRACT

Falls and fall-related accidents have serious consequences for older people's health and well-being but there is not enough emphasis on fall prevention in nursing education. Students should be taught more about methods of fall prevention and offered experience in counselling clients during their studies. The aim of this study was to examine if simulation is feasible in teaching nursing students how to guide the older people in fall prevention. The outcomes and usability of the scenario were evaluated, and the results may inform development of full-scale simulations for other contexts.

A full-scale fall prevention simulation scenario was designed and tested in a gerontology nursing course. The data were analysed using deductive qualitative content analysis and categorised according to earlier theoretical knowledge of fall predisposing risk factors among older people. Simulation helped nursing students to apply theoretical knowledge about fall prevention in authentic simulations without placing clients at risk. It also encouraged students to look at their development targets in a versatile way and to increase understanding of lifelong learning.

BACKGROUND

Falls and fall-related accidents are serious global health issues (WHO, 2018) and cause significant financial costs for healthcare services, such as when a hip fracture increases hospitalization and the number of days in the hospital (Hartholt et al., 2012, Gill et al., 2013). This problem is also global. In addition, falls are the second leading cause of accidental or unintentional injury deaths worldwide (WHO, 2018). For example, in US hospitals almost one million people fall each year (AHRQ, 2013) and in Finland, falls are the most common cause of accidental death (OFS, 2016). Prevention of falls is the most inexpensive and available means to tackle this problem.

Health care students need to learn the methods used in fall prevention. They also need practical experience in guiding and counselling the clients. The Regional Fall Prevention Network (RFPNetwork) (www.psshp.fi/rfpnetwork) is an interprofessional group whose aim is to collaborate with educational organisations to support evidence-based fall prevention education (Tervo-Heikkinen, Äijö, & Holopainen, 2016). Savonia University of Applied Sciences (SUAS) cooperates with the RFPNetwork and produces new information for educational development to ensure, that nursing students are given training in how to prevent falls. This study of a fall prevention scenario is one of the practical outcomes of the co-operation among SUAS, RFPNetwork, and Kuopio University Hospital.

Simulation is an effective method in nursing education, because it allows to replicate clinical nursing care, which students need to be competent before entering the clinical practice (Reime et al., 2016). It combines different learning methods and styles and makes learning as a combination of affective, cognitive and psychomotor skills (Jansson et al., 2014, Shin et al., 2015, O'Regan et. al., 2016).

The positive outcomes of simulation include e.g. improved self-confidence (Reising et al., 2017, Jakobsen et al., 2018), communication (Webster et al. 2014, Reime et al., 2016) and better management of acute events (Andrea & Kotowski, 2017, Jakobsen et al., 2018). In addition, simulation helps to develop patient safety (Levett-Jones & Lapkin, 2014, Mariani et al., 2017). Although simulation has become an important teaching method in nursing there is little knowledge about how to develop simulation scenarios in areas other than acute care. Thus, more research into what designs and practical conditions make full-scale simulation scenarios effective is still needed (Tosterud, Hedelin, & Hall-Lord, 2013), particularly in the field of gerontology nursing.

There are different types of simulations, but in this article we concentrate on full-scale simulation. Full-scale simulations are comprehensive and standardised exercises that are planned and focus on core competency outcomes instead of

individual skills (Bambini et al., 2016). They are based on a scenario of an authentic patient situation, and often consists of non-technical and clinical learning objectives that reflect on the intended outcomes. The objectives must be clear and have a defined start and end point. Additionally, they should be assessable and focus on specific aspects, avoiding too broad a perspective (Bambini et al., 2016). That helps participants to concentrate on learning a few things per scenario (Dieckmann & Krage, 2013). Full-scale simulation proceeds from the orientation and briefing of the situation through the implementation of an exercise and to the debriefing (McGaghie et al., 2014, Al Sabei & Lasater, 2016).

Simulations can be carried out using human patient simulators (HPSs) or standardised patients (SPs). Highly sophisticated simulators are appropriate in contexts where students are supposed to practise assessing patients' vital signs and to have real-time response for further interventions (Smith et al., 2012). In scenarios that require the patient to move, shuffle, or communicate naturally, such as in patient examination or therapeutic communication situations, SPs are more appropriate (Webster, 2014, Slater, Bryant, & Ng, 2016). An SP can be a role-player who is trained to simulate illness, or a real patient who has been trained to present his or her illness; in both cases, the presentation of illness is standardised (Slater, 2016).

Preventing falls in older people to ensure their continuing well-being is a challenge in health and social care (OSF, 2016). There is not enough emphasis on fall prevention in healthcare education, despite the fact, that in the future students will be professionals, who play a key role in fall prevention. This means that students need more experiential knowledge about fall prevention and fall-related risk factors.

The aim of this study was to investigate the feasibility of using simulation to teach nursing students how to educate patients about fall prevention. We designed and tested a full-scale fall prevention simulation scenario.

STUDY DESIGN AND ETHICAL CONSIDERATIONS

This article describes the design and testing of a full-scale fall prevention simulation scenario. The aim of this study was to assess the feasibility of using simulation to teach fall prevention. The specific research questions we investigated in scenario testing were as follows: 1) What impact does working through the scenario successfully have on students' capability with respect to fall prevention and 2) How does the scenario help students to integrate theoretical and practical knowledge of fall prevention?

The participants included 25 third-year nursing students enrolled in the gerontology nursing course. Experience of the simulation preceded theoretical and self-directed

learning, which consisted of, e.g. learning about normal, age-related changes and the impact of diseases on older people's functional abilities, daily activities, and use of fall assessment scales. In total, the course included six hours of simulation experience per student, and the data for this study were collected from a scenario involving an older man who was living alone at home and at severe risk of falling.

The scenario was tested in five small-group simulations, which were videotaped. The data were collected using observation. (Denzin & Lincoln, 2011). The data about students' capability in fall prevention were analysed using deductive qualitative content analysis and categorised according to earlier theoretical knowledge of fall predisposing risk factors among older people. Intrinsic factors were grouped into evaluation and counselling of physical, mental and cognitive, and social capacity. Extrinsic factors were grouped into indoor and outdoor environment risks based on previous research (WHO, 2018). The usability of the scenario in the integration of theory into practice was evaluated from the point of view of reality of the patient case, environmental details of the scenario, having an SP as a co-teacher, and objectives related to the flow of the scenario (ASPIH, 2017).

Permission to conduct the study was obtained from SUAS. All participants provided written, informed consent to participate after the nature, purpose, and procedures used in the study had been explained fully. They were told that participation was voluntary and that they had the right to withdraw at any time. The participants were informed that their names would not be used in any documentation relating to the study. All information was treated confidentially (EU, 2013).

RESULTS

Nursing students´ capability in evaluating older people's fall-related risk factors are described in two categories of intrinsic and extrinsic factors (Figure 1). The usability of the scenario from the point of view of reality, environmental details, SP activities, and objectives are described alongside the students' fall prevention competence.
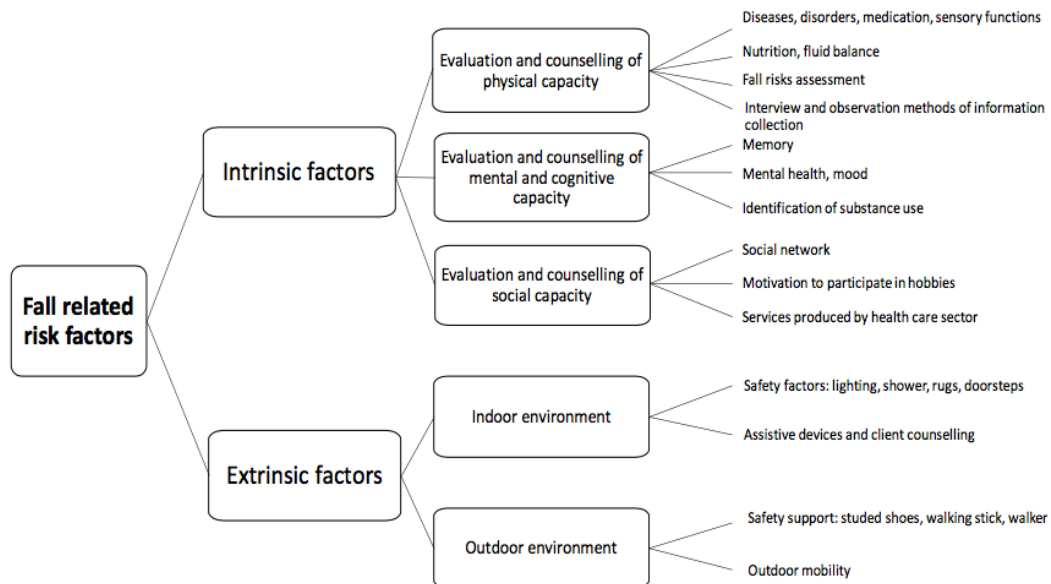
Figure 1. Nursing students´ competence in evaluating older people's fall-related risk factors

Intrinsic factors related to risk of falling

In this gerontology simulation, the learning outcome was that students learn to use suitable methods and practical tools to evaluate clients' risk of falling. During the simulation, student's evaluation and counselling of the physical capacity of the client was thorough, and the client was advised on how to prevent falls, such as by maintaining general physical condition and muscle strength and the use of safe practices at home. The frequency of falls and their consequences were also explored. Students were well aware of the general causes of falls, but they did not deal in detail with risk factors specific to the client. Although students had been taught about the fall risk assessment scales and these were available to them in the simulation, few students made use of them to evaluate the client's fall risk.

Students reviewed the client's illnesses, medication, and nutritional status and supported him in daily activities. Medication was examined mostly technically, for instance by asking who distributes the drugs to the dispenser. Students considered central nervous system (CNS) drugs and their influence on falls, but they did not ask why the client used such medicine. Sensory functions vision and hearing were investigated thoroughly, but pain was discussed only in relation to falls.

Evaluation and counselling of the mental and cognitive capacity of the client was limited. Assessment of the client's memory based on just a couple of questions.

Moreover, students occasionally used terms or phrases that might confuse the client. There was little attempt to clarify his fear of falling. Since the client's mental state was not addressed in the discussion, his mental capacity could not be evaluated. Although assessment of mental capacity is a complex area and often requires multiple contacts, the most important elements of the client's mental state could be determined in this full-scale simulation scenario. Students were well aware of the causes of falls but were only just beginning to learn how to use psychological knowledge to develop a fall prevention plan. Students found the idea of talking about substance abuse with an older person intrusive and therefore left this topic undiscussed.

Evaluation and counselling of the social capacity of the client was narrow. Students encouraged the client to hobbies and social contacts and suggested using voluntary organisations' befriending services. They failed, however, to find out what hobbies and sports the client was interested in; instead, they routinely suggested some sort of fitness training for older people.

Students assessed the client's physical functions effectively through a wide range of interview questions and observations. They collected plenty of information through their questions, but they failed to use the clues provided by the client's description of his personal situation in their overall assessment of his capacity. Because students tended to rush their questions and failed to follow a logical line of enquiry, they did not always elicit the full story and sometimes ignored the client's point of view. Observation of the client's physical condition was good, but because students did not integrate their observations and verbal communication effectively, their summary of the evaluation was mainly declaratory. The students were keen to help the client but sometimes fell into a patronising approach. Rather than using motivational interviewing and open-ended questions, they relied on their theoretical knowledge of fall prevention and forgot to strengthen the client's own recourses.

Extrinsic factors related to risk of falling

Because the case and indoor environment presented in the scenario were realistic, it offered participants the scope to assess the client's risk of falling indoors. Students' assessments of indoor environmental risk factors in the scenario covered physical barriers, unsafe footwear, and toilet facilities, and they were given plenty of information. Students recommended assistive devices very well, such as extra handles for the bathroom, and advised the client on how to obtain a free trial of such devices.

Students' assessment of outdoor environmental features were superficial, and outdoor mobility accessibility evaluation took place mainly on the client's initiative.

Use of shoes suitable for the weather conditions, such as studded shoes, walking sticks in wintertime and a walker were discussed. It was difficult to assess the client's outdoor mobility because the scenario was not planned for outdoor conditions and the client´s movement in the yard was not possible to observe. Poor props - no indicators about outdoor clothes and the facilities outdoors - diminished the realism. Some students seemed to consider it natural for an older person not to move much in wintertime.

The flow of the scenario was described in a pre-written script, which allowed the facilitator to lead the scenario in the right direction. In this scenario, the client (SP) initially rejected all offers of help but cooperated when the nature of the help being offered was explained and the patient´s wishes were appreciated. Using a SP in this simulation made it easier to show the cognitive and physical condition of the client via gestures, motor clumsiness, and balance difficulties. The course of the scenario varied from participant to participant, evolving through the interaction between the SP and the participant. Thus, the SP behaved in accordance with the learning objectives but also adapted his responses to the situation and participant by giving cues when needed. The SP, for example, reminded the participants about his recent falls and asked for help when he tried to get up from the chair.

DISCUSSION

During the simulation, students analysed the client's physical capacity very well and gave plenty of good advice. However, they almost completely omitted to analyse his mental capacity. Having the possibility to apply theoretical knowledge about fall prevention in their own way made them realise their skill strengths and weaknesses and possibly triggered reflection on their performance. In other words, the simulation experience helped students to extend their previously knowledge-based competence and develop their professional identity (Rooney et al., 2015, Kelly et al., 2016).

According to the results, students had plenty of knowledge about the potential fall risks and gave the client good advice. However, sometimes they were too eager to help and thus forgot to respect the client's autonomy. Engaging with the client by using open-ended questions might have helped students to gain a better understanding of his perspective and enabled them to encourage him to change his behaviour (Purath, Keck, & Fitzgerald, 2014). Communication and decision-making skills can be developed only through practical experience in realistic contexts. Taking part in the simulation stimulated students' curiosity, enhanced self-knowledge, and catalysed further learning.

Students' interview skills were unilateral. They asked plenty of questions, but they were unable to synthesise adequately the information they received and advise the

client accordingly. The previous research also claims that nurses use routine client guidance (Jansik et. al., 2010, Nikki & Paavilainen, 2010). The students in this study displayed positive attitudes towards older people, but their understanding of older people's daily lives, in relation to psychological and social functioning, was limited. Psychological and social functioning are more difficult to assess than physical capacity because the person being assessed has to be encouraged to disclose information about his inner self, and therefore better interview skills are required for such evaluations. Furthermore, when one gets older there are changes in both physical and psychological functional capacity that may undermine the existing social contacts (Stephens et al., 2011). This study suggests that while students need to learn to recognise such changes to be able to guide and assist older people, they should be more exposed to pedagogies that encourage them to engage with real patient scenarios (Walshe et al., 2013).

Careful scripting of the scenario helped to ensure that the simulation was standardised and offered all students similar learning opportunities, as well as made it easier for facilitators to run the simulation. The practical solutions proposed for this scenario were mostly adequate and effective. The scenario focused on the main learning objectives in falling and reflected the home healthcare situation realistically. Having a pre-written scenario helped facilitators and SP, but they were also able to improvise when necessary. During the simulation, the facilitator can encourage participants with convincing visual and auditory cues and cognitively help them in situations, which are crucial in progressing to the next step in the scenario. Also, irrelevant or confusing data can be incorporated into scenarios to make them more challenging for students (Dieckmann & Krage, 2013; Bambini, 2016).

Defining the complexity level of the scenario means comparing objectives to the level of the competence of the student group. If the objectives are sufficiently challenging, the simulations can stimulate and empower students to expand their competence and thus deliver meaningful learning outcomes (Bland & Tobbell 2016). However, participants can find simulations intimidating and fear the resulting criticism. Creating a safe, open, co-operative, and trusting atmosphere helps students to feel supported when they participate in simulations, and encouraging them to prepare material specific to the scenario is also helpful (Dieckmann & Krage 2013).

Designing and implementing a full-scale simulation is time-consuming and requires dedication, adaptability, and a wide range of professional skills. The Universities of Applied Sciences in Finland are discussing the establishment of a national simulation educators' forum for sharing scenarios and innovating. Scenarios designed by participating organisations will be stored in an Internet-based bank and will be freely available to other participating organisations. Some simulator manufacturers also make it possible to use predefined scenarios when using HPSs, which allow manipulating physiologic responses on the fly. Such technological innovations will make it possible to reduce the amount of work involved in developing scenarios.

However, incorporating SPs has the potential to make gerontology learning a routine part of a well-planned and executed programme of learning. SPs help students to achieve their learning goals (Gardner et al., 2018) and provide an additional dimension of reality that some suggest is greater than that achievable with high-fidelity simulators (Dearmon et al., 2013).

CONCLUSIONS AND IMPLICATIONS FOR PRACTICE

Testing of this scenario helped the facilitators to track both successful and problematic aspects of the standard approach to gerontology nursing education. The scenario does, however, require further development. First, theoretical learning before simulation exercise needs to be instructed even more than before. Second, the learning objectives for the scenario should be more closely tied to ensuring that students acquire the skills to carry out a comprehensive analysis of an older person's functional ability. Third, to better emphasise the client´s perspective, the SP should be advised to act more self-definite. That is how students understand that ageing should not lead to narrowing of individual autonomy. Self-study assignments about motivational interviewing could support the use of dialogue to reinforce the students' skills even before the simulations take place. Fourth, even though the home environment may be too demanding for the students to do fall risk evaluation at first, there should be a better description of the outside environment to help the students understand the meaning of the external risk factors of falling in the everyday life of an older person. The approach required to ensure realism will vary according to the nature of the scenario (Dieckmann & Krage, 2013.) Providing enough detail to make the scenario seem realistic to learners (Hamstra et al., 2014) and providing realistic physical inputs also encourage students to suspend disbelief (Bambini, 2016).

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EXPLORING THE LEARNING POTENTIAL OF EVALUATION RESEARCH BY A REVIEW OF 17 IMPACT STUDIES

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ABSTRACT

Organizations find it important to evaluate the yield of training and development efforts in terms of work results and impact for the organization. Although the aim of impact studies is to learn more about the carry-over effects of learning interventions, it is possible that such an investigation itself carries learning potential. The current research explores this particular side-effect of evaluation research. The method consists of an analysis of 17 impact studies in 11 organizations. All impact studies have been carried out following similar steps that stem from the success case method. Analysis of the meaningful moments during these investigations shows that learning takes place at various points in time of the research process. In particular, learning takes place during the construction of impact maps, during in-depth interviews and during the end presentation. Next to the researcher, various stakeholders are involved in these moments. Using the learning potential of these generative moments is in particular possible when the people involved work on a concrete product.

INTRODUCTION

As long as learning interventions have been designed, the importance of evaluating them is addressed (see for instance Romiszowski, 1981). The generic model for educational design (Plomp, 1982) prescribes evaluation to take place after the realization of a learning intervention. Although the attention for evaluation as such is nothing new, it seems that there is a shift in the focus of organizations with respect to evaluation. For long, organizations conducted evaluation with the main aim to learn more about the experience of participants, and to determine training effects. More recently, this attention shifted to evaluation studies that are able to determine

impact on organizational goals (Verdonschot, 2016). The model of Kirkpatrick and Kirkpatrick (2006) consists of four levels of evaluation and is often used as a framework to execute evaluation research in practice. It seems that the attention is moving from the first two levels of this evaluation model, reaction and learning, to the last two levels: behavior and results (Kirkpatrick & Kirkpatrick, 2006). There are three developments that gave rise to this shift.

First, more and more organizations are interested in the so-called performance-oriented HRD (Human Resource Development) (Schramade, 2011). This causes organizations to emphasize the business results they want to achieve rather than the effects they expect from for instance training. Second, the recent attention for evaluation studies on the level of performance and impact is related to the shift from offering training to facilitating learning (Marsick & Watkins, 1990). Since the effect of training programs in terms of transfer to the workplace were disappointing (Baldwin & Ford, 1988; Burke & Baldwin, 1999), organizations focus more on the learning potential of the workplace. This causes them to organize different types of learning interventions next to, or, instead of training. Similarly, the focus of evaluation moves from tracking down learning experiences to understanding what employees start to do differently in their day-to-day work, and the benefits of these new actions for the organization. Third, the increased attention and openness for learning from mistakes might also contribute to the attention for evaluation research with a focus on performance. It is known that learning from mistakes is essential for learning, and at the same time it is known that it is difficult to realize this in practice (see for instance Bauer & Harteis, 2012; Edmundson, 1996). Recently, learning from mistakes gets new attention, both in research (e.g. Den Hollander, 2017; Frese & Keith, 2015) and in society (e.g. Tavris & Aronson, 2015). This might have led to a more open mind to reflect on results of evaluation studies. Rather than perceiving the outcomes as a judgement in terms of 'good' or 'bad', the outcomes can be perceived as an opportunity for learning. This focus can evoke evaluation studies that addresses behavior of employees and their managers in day-to-day practice. In fact, a non-judgmental approach can help to further develop the work environment as a stimulating learning environment and makes it attractive for the stakeholders in the work environment to take on a role in the evaluation study.

Now that the attention of learning and development professionals in organizations shifts from studies that evaluate reaction and learning to studies that focus on behavior and results, it is likely that recommendations resulting from these studies have a new focus too. After all, the intention of acquiring knowledge on these levels is to initiate actions in order to improve learning interventions, and in order to be able to better facilitate learning in the work context. Indeed, in evaluation research, what counts is the extent to which the evaluation leads to modified policies, programs and practices (Rossi, Freeman & Lipsey, 1999; Verloop and van der Schoot, 1995). Evaluation studies that focus on learner experiences and competences, are likely to come up with recommendations about the organization of

the learning interventions, and the instructional design of these interventions. In the same line, evaluation studies that focus on work behavior and organizational impact are likely to result in advice that refers to the support that employees experience in their workplace for experimenting with new behavior, and to the organizational context that should foster the emergence of new practices. Putting into practice these recommendations requires different people in the organization to collaborate. Where tips on the instructional or organizational design of learning interventions can be put into practice by employees responsible for learning, advice with respect to the work environment and the organization as a whole, needs to be taken up by people who work in line functions, management and learning and development staff. This makes evaluation not merely the domain of learning and development professionals, but rather that of various stakeholders in the organization.

In order to increase the chance of the evaluation study to have an impact on the actions and thinking of these stakeholders, the present research explores the potential the evaluation process itself carries to connect these different stakeholders and to stimulate learning. The idea behind this is that the more the different stages of an evaluation study generate energy, new ideas, and learning opportunities, the earlier an evaluation study creates 'movement' in the organization. And, finally, the idea is that the sooner a study leads to learning and action in practice, the easier it is to pursue these actions after the evaluation study has finished. By being intentional about learning throughout the evaluation process, the evaluation can gain impact (Coghlan, Preskill, Catsambas, 2003). The present study therefore aims to explore the learning potential of evaluation research conducted in practice.

Research question

The following research question is central: *What is the extent to which evaluation studies that focus on work behavior and organizational impact carry learning potential?*

RELEVANCE OF THE STUDY

Recently, organizations have more interest in finding out what participants actually apply in their work after a learning intervention, and how this work behavior is related to the organizational goals. The focus on performance-oriented HRD, on learning interventions at the workplace, and the attention for learning from mistakes contribute to this growing wish to determine carry-over effects of learning interventions in terms of behavior and results. Since evaluators aim to impact the persons who can affect organizational change (Rossi, Freeman & Lipsey, 1999), and since evaluation studies on the level of behavior and impact affect more and various stakeholders, it becomes relevant to know more about the involvement of these

stakeholders in the evaluation study. In fact, it seems to be important that the evaluation study is not only carried out properly so that it provides substantive information, but that it also ensures that those involved learn from what works and what does not, and that it gives energy to get started. Furthermore, the yields of evaluation studies that are often stressed are statements on the intrinsic or extrinsic value of a learning intervention (Nieveen & van den Berg, 2001). However, less is known on the value that the evolution process itself carries. Therefore, the present study explores the learning potential that evaluation studies, that include the last two levels of Kirkpatrick and Kirkpatrick (2006), carry. In doing so, the present study connects to other studies that explored the "process-use" of evaluation (e.g. Forss, Rebien & Carlsson, 2002) and empirical research as a learning experience (Gaskell, 2000).

THEORETICAL FRAMEWORK

This section goes deeper into the two main concepts that the research question addresses. Evaluation studies that focus on work behavior and organizational impact are defined, and so is the learning potential of these studies.

Evaluation studies that focus on work behavior and organizational impact

The present research focuses on evaluation studies in which learning interventions such as a training, a workshop, a leadership trajectory or change intervention are investigated to learn more about their carry-over effect in the workplace and for the organization as a whole. An evaluation method that serves this purpose and that is both pragmatic and thorough is the success case method that is developed by Brinkerhoff (2006). The success case method is a mixed method approach (Creswell, 2009) that combines a short survey with in-depth interviews. An important step in this evaluation method is to design an impact map together with relevant stakeholders (Brinkerhoff & Gill, 1994). An impact map creates a visual depiction of the learning process. It highlights roles, interactions and results that are needed to realize worthwhile business results. One of the elements of this map are the work behaviors that the learning intervention needs to promote. The list with work behaviors is used to create a short survey that helps to trace people who tried several new actions in their work and achieved concrete and worthwhile results by doing so, and people who weren't able to achieve results in their work. Based on their answers participants are divided in sub-categories based on the extent to which they were able to achieve concrete and worthwhile results. In the next stage in-depth interviews take place with participants of all sub-categories. The purpose of this phase is finding out what stories there are to be told about the impact of learning interventions in the

daily work of employees who attended the learning intervention. The power of these narratives is that they do not seek to blame, problematize, or judge, but rather open up possibilities and enable to move forward (Swart, 2016). The approach also connects to the idea that it is promising to learn from people who managed to realize behavior change in their work environment, since learning from these success cases can help to develop favorable conditions for others to attain similar results (Coghlan, Preskill, Catsambas, 2003; Cooperrider, Whitney & Stavros, 2003).

The learning potential of evaluation studies

Often, research into learning becomes in itself a learning experience for the participants as well as for the researcher (Gaskell, 2000). Specifically, in evaluation studies this phenomenon has been investigated as 'process-use' of evaluation (Forss, Rebien & Carlsson, 2002). In evaluation research, a lot of actions take place on the boundaries of functions. For instance, between people with staff functions who often initiate evaluation studies and can use the results to improve learning interventions, and people with line functions who are participants in the evaluation and ideally can use the results to improve their practice. These boundaries carry learning potential (Akkerman & Bakker, 2012).

A way to track down these process yields of research is to look for generative moments during the research process. Carlsen and Dutton (2011) describe generative moments as moments that vitalize, and create energy, and give room to new ideas to emerge. These generative moments can be regarded as process yields of an investigation that can stimulate the development of people involved. For the present study we explore the learning potential by tracking down generative moments that occurred during the evaluation studies.

Refined research questions

Based on the theoretical framework the following sub questions are formulated in order to answer the main question:
1) What generative moments take place during evaluation studies that focus on work behavior and organizational impact?
2) What characterizes these moments in terms of the moment in time they take place and the persons who are involved?
3) What is the extent to which these moments are followed up in the organization after the evaluation study has finished?

RESEARCH DESIGN

The study uses 17 impact studies that were carried out in 11 different organizations in the period Dec 2014 - Oct 2018. These impact studies evaluated the impact of professional training, leadership trajectories and inspirational workshops. All impact studies used the success case method developed by Brinkerhoff (2006) to be able to assess the impact. The studies were carried out by a group of researchers who had biweekly meetings to discuss their progress and to design next steps. The research group's way of working resembles that of a community of practice (Lave & Wenger, 1991). In order to answer the research questions a review took place of 1) the conversations during the biweekly meetings of the research team; 2) the research reports of each study; 3) observations of the final presentations; 4) interviews with initiators of the impact studies several months after the evaluation study. Table 1 gives an overview of the 17 impact studies, and the data that was available for each of the studies.

Procedure

In order to answer the research questions an overview was made of generative moments that took place during the execution of the 17 impact studies. Initially, the researcher reconstructed 25 generative moments. This list was sent via e-mail to the 15 researchers who were involved in the impact studies to validate these moments. Most researchers responded to this request. Moments of 12 of the 17 impact studies were validated in this way. The researchers involved recognized all the moments that were listed. They provided some additions or clarifications for some of these moments, and they added descriptions of new moments. The end result is a list of 42 generative moments. Table 2 shows several examples of generative moments.

Additionally, four interviews were held with four stakeholders who were involved in one of the impact studies. The interviews were conducted by a student researcher that did her internship on the topic of evaluation research. She did the interviews via telephone and focused on questions that the respondents had, several months after the impact study was finished. Reports of these conversations were made and sent back to the interviewees for a member check (Merriam, 1988).

Analysis

A matrix was developed to analyze the generative moments (Miles & Huberman, 1994). Each row displays one of the 42 generative moments. With help of the research reports the activities were listed that were recurrent in the different impact

studies. The columns display these research activities. The columns also show who could be involved in the generative moments.

With respect to the interview reports, an inductive analysis of recurring themes took place.

Table 1
 Overview of the evaluation studies and the data that was available per study

Impact study	Type of learning intervention that was central in this evaluation study	Organization in which this evaluation study took place	Data that was available for this study			
			Conversations during the biweekly meetings of the	Research report of the impact study	Observations of the final presentations	Interview with the initiator of the impact study several months after the study
1	Leadership trajectory	School for vocational education	✓	✓	✓	
2	Leadership trajectory	Organization that provides care for people with disabilities	✓	✓		
3	Leadership trajectory	Organization that provides care for people with disabilities		✓		
4	Leadership trajectory	Technical research center	✓	✓	✓	
5	Inspirational workshop	Organization for youth care	✓	✓	✓	

6	Leadership trajectory	International retail organization	✓	✓	✓	
7	Inspirational workshop on curiosity	Project organization	✓	✓	✓	✓
8	Leadership trajectory	Organization on industrial safety	✓	✓	✓	✓
9	Reflective training on mindfulness	Municipality	✓	✓	✓	✓
10	Training for secretaries	Municipality	✓	✓	✓	
11	Training for professionals to learn to recognize sexual abuse	Organization for youth care	✓	✓	✓	✓
12	Training for professionals to learn to deal with emotion and aggression	Organization for youth care	✓	✓	✓	
13	Serious Game that aims to improve collaboration between different departments	Municipality	✓	✓	✓	
14	Training for professionals to learn to deal with emotion and aggression	Municipality	✓	✓	✓	
15	Training for managers to learn to deal with absenteeism	Municipality	✓	✓	✓	
16	Short leadership trajectory	Governmental learning and development institution	✓	✓	✓	
17	Leadership trajectory	Municipality	✓	✓	✓	

Table 2:
Examples of generative moments

No	Quote of the researcher involved
#3	*"I remember that during the interviews with some of the participants, generative moments emerged. This happened while looking back upon the coaching sessions with help of the questions that I prepared with help of Brinkerhoff's book. With several people this led to new ideas on how they could go on with things that they learned in the coaching."*
#22	*"I clearly remember that working on the impact map together with the trainers was an eye-opener for them. I think because they found out that they never had thought about these things. Now we had a conversation on what should the training yield, and what concrete work behavior do I want to see after the training. Especially the latter was new."*
#34	*"The presentation definitely was a generative moment! That was a very special moment with 'the whole system' in the room. Various people from the organization involved in absenteeism, with each a different perspective, were there. Working on the posters to collect new ideas was very nice. When we looked at the posters of the two groups at the end of the meeting, we saw that they developed similar ideas. That seemed to be a validation of this new direction. We also wrote a blog about this moment."*
#42	*"During the intake for the impact study I had to give a presentation for the members of the board. In total, there were six of them who attended the meeting. My presentation triggered a conversation about the added value of the impact study. I wanted to respond to this, but the general manager himself already did. He started to explain the possible added value of the proposed evaluation research. What started as questions-and-answers turned into a fruitful and nice conversation."*

FINDINGS

Table 3 shows the results of the analysis of the generative moments. The findings that emerge from this matrix, and the findings that are taken from the interviews, are listed below:
- In total, 42 generative moments were tracked down. These moments took place during 16 of the 17 impact studies.
- One generative moment arose from a predicament. The other 41 generative moments had their origin in moments of harmony with not more than minor perturbations.

- Most of the generative moments refer to situations in which the people involved were searching for something. There was an unsolved puzzle, an unanswered question, or a new direction that could be explored. This process of puzzling, searching and generating ideas, created energy.
- Generative moments take place during all phases of the research process: during the intake, during the development of instruments, during data-gathering, analysis and while presenting findings. There are, however, research activities that are more often referred to than others, in the generative moments.
- Most generative moments (14 out of 42) take place during the presentation of the research findings. During these moments, almost always, various stakeholders are present such as the initiator of the impact study, trainers or facilitators of the learning intervention and other stakeholders. An example is generative moment #12: *"The presentation was followed by a design session. In that meeting we also spoke together with the principal about the way we could use the insights from the evaluation study for next year's group. In my evaluation study I found that the participants found it hard to take time for reflection. In our conversation about this, immediately we developed new ideas of how this could get shape."*
- The design of the impact map is an activity in the research process that many generative moments refer to too. In total, 8 of the 42 generative moments refer to the activity of constructing an impact map. Almost all of these moments take place either with the initiator of the impact study on the client side, or with the trainers or facilitators of the learning intervention that was subject of the study. An example is generative moment #38: *"The impact map appeared very useful for our principal in order to find out where the learning program was not completely congruent. This became more and more obvious. There was one piece that they wanted to have in the impact map but that had no place in the learning program yet."*
- Next to this, the in-depth interviews are often referred to in the generative moments. In total, 6 generative moments took place during these one-on-one moments in which the researcher asked questions to a participant of the learning intervention that was subject of the study. An example is generative moment #15: *"The interviews definitely generated energy. It was more than just data gathering. The interviewees showed that they took something out of the conversation themselves. One participant said 'I tried this but did not see results yet' about one work behaviour item. During the interview that person realized that he hadn't tried this again. During the interview he decided to take this up once more."*
- Although these conversations appear to have generative qualities, writing the interview report apparently does not easily possess this quality. In fact, none of the generative moments refer to this activity.

- All four initiators of the impact studies on the client side that were interviewed, refer to the difficulties that they experience in turning the recommendations into actions for improvement in action. In particular, the ownership of follow-up is a recurring theme. The interviewees experience that they feel the need to implement concrete actions, but that it is difficult to activate people to take responsiblity. One of the interviewees expresses this as follows: *"Being the HR-manager, I took initiative for this impact study. What I find hard is that by being the one who started this, I also feel the responsibility to do something with the results. This gives me the feeling that responsibility is taken away by the employees themselves and their manager."* Another respondent declares that she experiences impatience because she clearly sees what can be done to improve the training and the work environment. She says: *"[…] and again, nothing happened. Another colleague too, did not take it further. Then I offered to do some things because I started to become impatient."*
- Two of the four initiators that were interviewed, refer to the usefulness of the impact map. Especially the process in order to design an impact map brought them a lot. One of them says: *"We used the impact map in the design phase of a completely different learning intervention, the legal training. Making an impact map helped us to know what the learning intervention should address. [..] We brought everything together in one map. I was typing on my laptop, while it was connected to the beamer. We worked this way three times for one morning*

Table 3

Analysis of the generative moments

No	Contract conversation with the client	Document study that precedes a first version of the impact map	Discussing and refining the preliminary impact map	Developing and sending out the questionnaire and reminders	Analysis of the questionnaires and interviews	In depth-interviews to track down learning stories	Making the interview report	Discussing the research and writing the research report	Discussing and writing the management summary	Presentation of the research findings	Other researchers	Initiator for the impact study on the client side	Stakeholders (one or more) from the organization	Trainers or facilitators
1			✓								* *			
2				✓							* *			
3						✓							*	
4										✓	*			
5									✓		*			
6						✓							*	
7										✓	*			
8					✓						* *			
9								✓			* *			
10										✓	*	*	*	*
11									✓		*			
12										✓	*	*		*
13			✓									*		
14		✓									*			
15						✓							*	
16									✓		*			
17										✓		*	*	
18								✓			*			
19						✓							*	
20										✓	*	*	*	
21		✓									*	*		
22		✓												*
23										✓	*	*	*	* *
24		✓												*
25		✓									*	*		
26				✓							*			
27										✓	*	*	*	*
28										✓	*	*	*	* *
29										✓				*
30						✓							*	
31					✓						*			
32						✓							*	

33				✓	*	*	*	
34				✓	*	*	*	
35		✓						*
36			✓		*			
37	✓					*		
38		✓				*		
39			✓	✓		*	*	
40			✓			*		
41				✓	*	*	*	*
42	✓					*	*	

CONCLUSIONS

The main question of the study was: *What is the extent to which evaluation studies that focus on work behavior and organizational impact carry learning potential?* In order to be able to answer this question, we investigated generative moments. Below, first the sub questions are answered. The section ends with an answer to the main question and implications for practice.

What generative moments take place during evaluation studies that focus on work behavior and organizational impact?

During the evaluation studies that were part of the present study the researchers experienced moments that gave them energy, new ideas, and opportunities to learn. In total, during 17 impact studies in 11 different organizations, at least 42 generative moments took place.

What characterizes these moments in terms of the moment in time they take place and the persons who are involved?

The generative moments are characterized by a searching process that the people involved, in that moment, collaboratively undertook and that created an energetic atmosphere in which new insights could emerge. In most of these generative moments, the people involved were actively making something. The most generative moments took place during the construction of the impact map, during the in-depth interviews, and during the presentation of the findings of the impact study. This relates to findings of research into innovation that shows that in order to learn, creating something together is an important activity (Verdonschot, 2009). The construction of the impact map refers to a setting in which the researcher collaborated with the initiator of the learning intervention or the facilitators. In this encounter the impact map is the tangible product that is created. Researchers report that they saw that for trainers, facilitators, and internal initiators of learning

interventions it was insightful to connect the organization goals, the work behavior and the competences with one another in one line of reasoning. Either because they did not think of the relationship between the learning intervention and organizational goals before, or because they discovered 'leaps' that needed attention. This is in line with findings of Brinkerhoff and Gill (1994) who state that using an impact map helps key players understand how learning interventions can affect the organization and why their roles are necessary to make it work. The in-depth interviews refer to settings in which the researcher and a participant of the learning intervention that is evaluated reflect upon the follow-up actions in the work environment. The story is what is constructed in this encounter. Researchers report that these moments were experienced as reflective conversations by the interviewees. The presentations refer to a setting in which, often, different stakeholders (e.g. learning and development professional, manager of employees who participated in the intervention, trainer or facilitator) were present. The presentation session consisted of a presentation of the findings, followed by an active way of working. For example, a brainstorm on follow-up actions took place, and a creative design session to use the findings of the evaluation study to develop interventions that different stakeholders could initiate. In this meeting often, a tangible product is made too. This product consists of a set of ideas on paper, on flipovers, or on posters.

What is the extent to which these moments are followed up in the organization after the evaluation study has finished?

From the experiences of the interviewees it becomes clear that it is not easy to follow-up the ideas and recommendations that result from an impact study. They find it difficult to involve people who work in line functions to take responsibility. However, several times the activity of impact mapping was mentioned as something that they went to do more often, after the evaluation study was finished. There is one example of someone who applied this method for the design of a new learning intervention together with several stakeholders.

The conclusions with respect to the sub questions help to answer the main question of the research at hand. Based on our investigation we conclude that evaluation studies that aim to measure effects on the level of behaviour and impact, carry learning potential. This learning potential mainly shows itself in small moments of worthwhile interaction during the evaluation process. Several parts of the evaluation process in particular carry learning potential: the moments in which the impact map is designed together with relevant stakeholders, the moments in which in-depth interviews take place, and the moments in which the final presentation took place. Using the learning potential of this generative moments is in particular possible when the people involved work on a concrete product that then serves as a boundary object (Akkerman & Bakker, 2012; Star & Griesemer, 1989) and thus connects

stakeholders with different backgrounds. The findings show that generative moments have two types of yields. One yield is the direct gain, the other yield is the *potential* for new actions that the generative moments harbor. The direct gain is reflected in the tangible products that are being made such as the impact map, learning stories and plans. The potential for action is shown in the energy and insights that arise during the moment, and the ideas and plans that are developed that need follow-up action in practice. With respect to the latter we do not know much about the extent to which follow-actions take place. Yet our review shows that it is not always easy to actually follow-up the ideas after the evaluation study.

Implications for further research and for practice

Our review shows that an evaluation study on the level of work behavior and impact has the potential for the people involved to learn from. It is worthwhile to take this into account when designing an evaluation study. In order to favor generative moments to take place, one could consider organizing several moments in which different stakeholders work together on a question, a 'puzzle', and develop a tangible product together. Creating an impact map is a promising activity, just as a collaborative idea generation and design during the presentation of results. Knowing that these moments might harbor generativity, it becomes relevant to think about the people to invite. Who do you want to involve in the learning process that is started by this evaluation study? The answer to this question could motivate the choice that is made for the stakeholders to invite. Interesting would be to further explore what it would mean to shape the analysis of survey and interview results as an activity that several stakeholders could contribute to too.

The follow-up of ideas and insights after the evaluation study appears not to be self-evident. We have planned a new research to learn more about the actions that are undertaken after an evaluation study. The aim is to learn more about the way the 'learning potential' is acted upon in practice. Moreover, the idea is to give voice to the stakeholders within the organization. Especially because the present study described generative moments through the eyes of the researchers and not from the perspective of for instance learning professionals, participants, management and internal or external facilitators of the learning interventions.

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GRADUATE MEDICAL EDUCATION CLINICAL TEACHER TRAINING PROGRAM TO SUPPORT CLINICIANS IMPROVING THEIR TEACHING SKILLS

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ABSTRACT

Clinical education is at the center of medical education. Indeed, education is defined as the heart and soul of medical centers. Clinical teacher works in the field of service, education and research. A good clinical teacher should help the students in the learning process and show different learning strategies. Although there is not sufficient clinical teacher training program in Turkey, there is a great need for clinical teachers to become more qualified by means of teaching knowledge and skills. Therefore, the first purpose of the research is to develop a program to improve teaching skills of clinical educators. Besides, by implementing the program to a group of clinicians the effectiveness of this program based on participant views is determined. The results of the study showed that the developed program met the expectations of clinical educators. The participants stated that this training is useful from the professional point of view and that they could have transferred the knowledge and skills that they would go through to their own clinical settings. 'Neither talent without instruction, nor instruction without talent, can produce the perfect craftsman.'Vitruvius, c.25 BC (26)

WHY CLINICAL TEACHING HAS AN IMPORTANT ROLE IN MEDICAL EDUCATION?

Medical education is the process of teaching, learning and training of students by bringing together knowledge, experience, skill, quality, responsibility and values. Medical education includes basic undergraduate medical education, graduate medical education, and continuing medical education (CME)/continuing professional development (CPD). Basic or undergraduate medical education refers to the period that begins with a student entering medical school and ends with the final exam for basic medical proficiency (McKimm, Forrest and Thistlethwaite, 2017).

Graduate medical education is the phase of medical education where doctors develop their competencies after completing of basic medical qualification, and it is the final preparatory stage for the specialized certification and/or mastering (WFME 2018, WMA 2018).

The third phase of medical education is CME-CPD. It consists of all activities that doctors endeavor, formally and informally, in order to advance, update, broaden and increase their knowledge, skills and attitudes in answer to the needs of their patients. CME-CPD expresses continuing education in the field of knowledge and skills of medical practice. It goes on the rest of career (WFME 2018, McKimm, Forrest and Thistlethwaite, 2017).

Clinical education is at the center of undergraduate and graduate medical education. Indeed, education is defined as the heart and soul of medical centers (Skeff, Bowen & Irby, 1997). In clinical education, the learning and teaching process is carried out in the clinical settings. The knowledge, skills, attitudes and professional competencies are given to students and residents by the clinical teachers who are experts in their field. Clinical teacher can be defined as a physician with formal training in medical education, they also provide consultative advice for educational projects (Sherbino, Snell, Dath, Dojeiji, Abbott and Frank, 2010).

WHAT IS THE ROLE OF CLINICAL TEACHERS?

Clinical teachers have several roles in hospital and university divisions and departments as directors of education programs. They act as curriculum designers, innovative teachers, and expert assessors. They apply their skills across traditional boundaries (e.g., between programs), sharing their expertise with others, and disseminate their original ideas and projects in a scholarly manner (e.g., conference presentations, grand rounds, publications, etc.) (Sherbino, Snell, Dath, Dojeiji, Abbott and Frank, 2010).

The quality of the teachers is at least as important as the content of the course and the topics discussed (WHO, 1973; Fraser, 1991). The concept of "training of medical teachers" was first widely advocated at the Edinburgh Declaration, in 1988. It was emphasized to train doctors not only clinically in their field of specialty but also as trainers in their field and underlined that this was of primary importance for the success of the teaching effort (WFME, 1988). The roles of clinical teachers are defined after that. According to Harden and Crosby (2000), ''medical teacher'' should have 12 roles which are grouped in six areas, including the information provider, role model, facilitator, student assessor, curriculum and course planner, resource material creator and study guide producer (Figure 1). Prideaux et al. (2000) and Frank (2005) have interpreted CanMeds qualifications as a framework for the conceptualization and analysis of good clinical training roles. Accordingly the following roles were defined: medical expert, communicator, collaborator, manager, advocate, scholar and professional. Odabasi et al., (2007) conducted a study in Turkey to determine medical faculties' attitudes towards the teaching characteristic of teachers and teacher training programs. According to results the most important teaching characteristics for medical faculties: being open minded about learning, acting as researcher, teacher and practitioner, following innovations, being receptive to discussing, having communication skills, having passion on teaching. Additionally, %90 of the respondents considered courses or workshop for learning to teach would useful. Results showed that faculty members were aware of their needs for learning to teach and had high desire for improving their teaching skills.
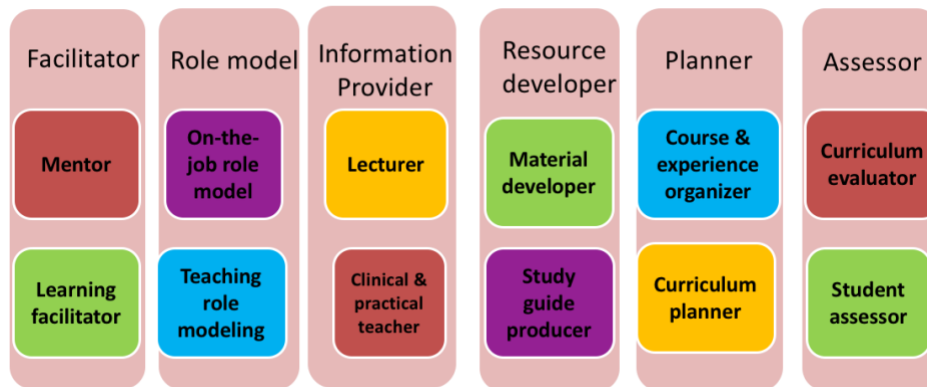

Figure 4: Roles of Medical Teachers (Harden and Crosby, 2000)

HOW CLINICAL TEACHING SKILLS CAN BE IMPROVED?

Clinical teachers often gain teaching skills by experiment and apprenticeship relationship and mostly clinical expertise is considered adequate for good clinical teaching. Although teaching is related to the content of what is taught, it is different skill. Wilkerson and Irby (1998) defined faculty development as a tool for improving the educational vitality of the institutions through attention to the competencies needed by individual teachers and to the institutional policies required to promote academic excellence.

There are different lengths of courses based on institutional requirements to gain clinical teaching skills. Several studies were showed that the training courses for medical teachers improve teaching skills of the participants. It is emphasized that trainings to trainers in medical education is extremely important and participants has underlined such training courses should be disseminated (Craig, 1988; Gibson and Campbell, 2000; Wall and McAleer, 2000; Kaplan and Frankel, 2001; Brown and Wall 2003; Godfrey, Dennick ve Welsh, 2004; Baral et all, 2007; McLeod, Brawer, Steinert, Chalk and McLeod, 2008; Foster and Laurent, 2013; Pololi, Clay, Hewson, Geyik, 2013). The positive effect of these courses (Yolsal et al. 2003; Godfrey et al. 2004; Amin, Hoon Eng, Gwee, Chay Hoon and Dow Rhoon, 2006; Foster and Laurent, 2013) and satisfaction of the participants (Baral et al., 2007; Brown and Wall, 2003; Geyik, 2013) were also reported widely.

As requirements of institution are different there is not a single prescription proper for all. But it is certain that the clinical teachers have an important role in the clinical learning. Therefore, regular faculty development programs to maximize their teaching skills and to increase the quality of their educational experience is needed (AlHaqwi and Taha, 2015). Academic institutions should also develop institutional policies that enhance the competence of teachers (Evans, 1997).

THE CONTEXT OF CLINICAL EDUCATION IN TURKEY

In Turkey, graduate clinical education is available in universities and education and research hospitals. Academic staffs who work at universities constantly improve themselves with courses organized in the academic development process. Their participation to undergraduate education also enhance their experience in education as teacher. However, in education and research hospitals, most of the clinical teachers have no formal teaching or educational qualifications. Although, service, research and teaching are claimed to be equally important, research and service qualifications are always placed more importance in the process of selection and promotion as an academician. Another challenging for them is to learn about how to teach or to develop and practice their teaching skills in busy teaching hospitals where

patient care takes priority. Clinical teachers are usually clinicians first and teachers second (Hays, 2006). Busy clinical teachers usually have little time to attend development initiatives and have little interest in education. Therefore, it is important to develop programs for clinical trainers and to make them aware of its importance.

To aware of these needs, a research and education hospital clinical teachers, Ankara Sami Ulus Pediatrics and Gynecology Education and Research Hospital, demanded to work cooperatively to develop a clinical teaching skills courses. The aim of this paper is to describe the process of development of the program and assess the effectiveness of the program based on the participants' views.

DEVELOPMENT OF CLINICAL TEACHING PROGRAMME

Clinical teaching programme was developed on the basis of the Taba-Tyler model. The model is simple, practicable, applicable and easily evaluated. It includes the following stages:

I)   Analysing the needs
   - Diagnosing needs
II)   Defining the objectives
   - Formulating General Objectives
   - Formulating Spesific Objectives
III)   Designing the programme
   - Selecting Content
   - Organizing Content
IV)   Implementing the programme
   - Selecting Learning Experiences
   - Organizing Learning Experiences
V)   Assessing and evaluating the outputs
   - Evaluating
   - Checking for Balance and Sequence

The overall goal of this program was to strengthen the participants' knowledge and skills as clinical teachers. Importantly, they would have got both a sense of interest about why they do what they do pedagogically and a theoretical framework through which they could better inform their understanding of teaching, learning and wider educational issues. The aims of this paper are to describe the process of program development for clinical teachers and to show participants' views.

PARTICIPANTS

28 participants from 6 clinical departments (Pediatrics-22, Anesthesia-1, Obstetrics and Gynecology-1, Pediatric Surgery-2, Radiology-1, Cardiovascular surgery-1) have joined the program for learning how to teach effectively in clinical environments. They were all volunteer. The group was divided into 3 groups according to their seniority. It was planned that each course would continue with participants who were in the same position. So, the course was conducted with this three groups, three times. Each course consisted of three submodules.

In order to form the program contents, literature search was done first. We looked into lots of training programs as mentioned above that were applied before.

ANALYSING THE NEEDS

To determine and analyze the needs of Ankara Sami Ulus Pediatrics and Gynecology Education and Research Hospital about clinical education focus group interviews were planned. To eliminate the status effect of the teachers, those focus group interviews were conducted with 28 clinical teachers in three sub groups. All participants received a letter of invitation summarizing the purpose of the interview. We developed four open-ended questions to explore needs, expectations, experiences and opinions of participants. The questions were as follows:

-What are the roles and responsibilities of the clinical teacher?

-What kind of information, skills and attitudes do the post-graduate clinical teacher need?

-Which topics or themes should be included in the clinical education training program?

- How should clinical education training program be implemented?

We were guided the group through the discussion and kept them focused on the topics. In these interviews, which lasted from about 60 to 90 minutes, all the participants contributed to the discussion with their suggestions and opinions. While taking note, the note taker did not interact with the group and noted all the opinions. Then, all of the notes were reported and analyzed. As a result, participants' needs, and expectations were become visible.

DEFINING THE OBJECTIVES AND DESIGNING THE PROGRAMME

According to the focus group interviews' results, the needs were determined, then program's goals and objectives were defined and programme was designed. In summarizing, they indicated that they have needs on the following subjects: A variety of teaching and learning methods, clinical training skills, focused teaching methods, becoming a good teacher, giving academic consultancy, to gain more skills in clinical teaching, how learn residents, program development and evaluation, clinical skills assessment technics. We prepared a blueprint table and shared with some of the participants interested to attend the course. And we reviewed the program contents with their suggestions. It was seen that giving information about the goals and contents of the program and shaping schedule collaboratively before the modules, increased participations' interest about the program. Course program entitled: Clinical teacher training.

IMPLEMENTING THE PROGRAMME

Participants were divided into 3 groups. Each group participated 3 modules. The first module focused on essential training skills in clinics, the second module was developed for clinical training and measurement applications, the last module was structured for the development and evaluation of education programs. In this program design, each training module was planned for different weeks and for 10-15 participants. Totally six medical education experts from medical education department participated as trainers in this course program. The first and second module were 3 days long; last module was programmed for 2 days. In these modules, we employed a mixture of short presentations, interactive techniques such as group work, role-playing, case study, small-group discussions, simulation, microteaching, brainstorming and experience-based learning.

The whole process was structured interactively and practically. At the beginning of morning and afternoon sessions, various warm-up exercises were used to enhance group energy and motivation, as well as to strengthen group communication, which allowed for a positive educational atmosphere. There were coffee and tea all session. In the period of break time participants disengaged from the rigors and refocused on educational topics. Some of the participants could not participate in some sessions because of work intensity in the hospital, but they compensated for their missing lessons with different module groups, thus all participants attended all modules.

The first day of the first module started with meeting session. At the beginning of the course the participants wrote of their expectations about the module and they wanted to learn: A variety of teaching and learning methods, clinical training skills,

tricks for focused teaching, how to become a good teacher, to gain more skills in clinical teaching, how residents learn. It was seen that participants' expectations were nearly same with the course objectives.

COURSE EVALUATION

Although it was difficult to allow time for clinicians to join a course they all fulfilled their promises. Some techniques were employed for the evaluation of the program. The participants filled in an evaluation form for each module. They were asked to assess sessions by a questionnaire which consisted of choices presented with a Likert scale as follows: 'I definitely agree'(5), 'I agree'(4) 'I am not sure'(3), 'I do not agree'(2) and 'I definitely do not agree'(1). The course was successful and we continued to improve the content and teaching methods based on participant evaluation.

At each days' final session was devoted to evaluation of the content and quality of the day's work. This evaluation exercise was done together with the trainers and the participants. Through these meetings, the negative and positive aspects of the day's activities were identified and critiques on content were noted. At the end of the course, the participants were asked to assess all modules with an evaluation form which consisted two open ended question. According to the qualitative data obtained, the participants stated that this training is useful from the professional point of view and they will transfer the knowledge and skills to their own clinical settings (Figure 2). They also noted that there are many points to be learned about pedagogy and that it is necessary to participate in such trainings for this reason. The averages of quantitative results obtained were quite high. Mean score of items were 4.92 for achieving session goals; 4.92 for relevance of the training methods and techniques applied; 4.93 for content compliance; 4.90 for session length; 4.96 efficiency of trainers and 4.88 usefulness of educational materials (Figure 3).

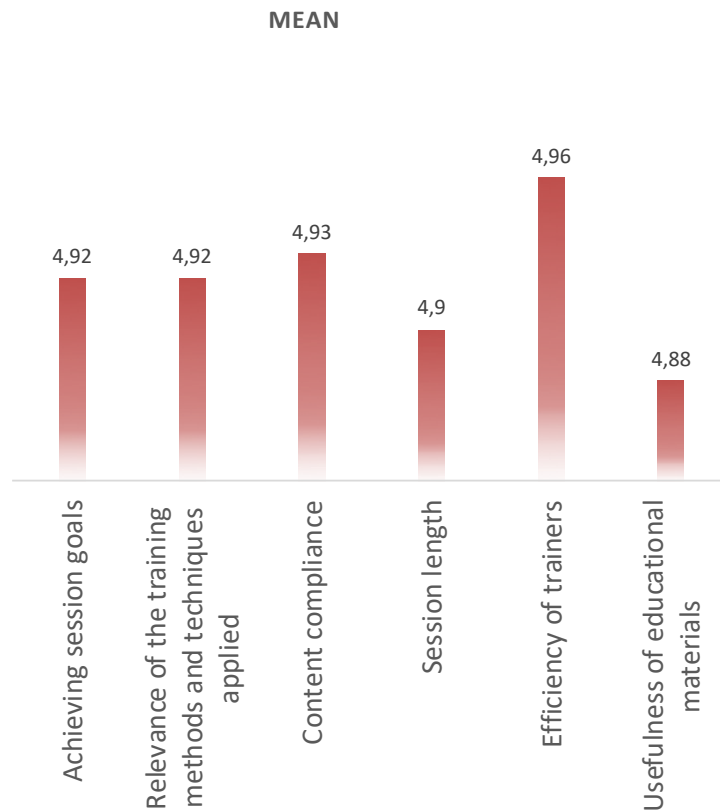*Figure 5:* Participants' views about program

MEAN

Figure 6: Participants' views about effectiveness of the program the program

CONCLUSION

The experience gained in this process has shown that participatory processes play an important role in the adoption of the program and the educational process in the curriculum development process in clinical education. Transferring skills after developed training to real life will make a significant contribution to the realization of the function of raising doctors adequately enough to meet the health needs of the ultimate goal society. It is planned that participants will be monitored and supported in the ongoing process to maintain their clinical training skills.

Being a good physician is not enough to become a good clinical teacher. So there are so many doctors who have carried on the apprenticeship tradition and have little interest in education. Through this training, participants have acquired the knowledge and skills that can transform health care settings into a true educational opportunity as it should be. This will enable them to realize that one of their core

role is instructor, and they will begin to study the process more deeply to manage the process effectively. In fact, all these efforts are aimed at increasing the level of health of the society by providing the training of qualified doctors. Therefore, education programs like this and such should be widespread.

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HEALTH CARE STUDENTS THEORETICAL UNDERSTANDING IN FALL PREVENTION AMONG OLDER PEOPLE

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ABSTRACT

Globally, there is a high annual fall rate among older people. In this research area, there are plenty of studies on fall prevention, but there is a lack of research on teaching methods among health care students related to fall prevention. More effective teaching methods are needed to encourage health care students to study fall prevention and work with older people. The aim of this paper is to explore health care students' knowledge and understanding about fall prevention at the beginning of a Gerontological Nursing course. The participants were 30 health care students, who studied the course in spring 2016. The data was collected using small group thematic discussions at the beginning of the course. The students were asked to discuss and write down their previous understanding of intrinsic and extrinsic factors related to falls and fall prevention. The data was analyzed using qualitative content analysis. Students' theoretical knowledge of fall prevention was commendable. Students described both intrinsic and extrinsic fall related risk factors. Especially students knew the intrinsic risk factors because of earlier theoretical studies and clinical practice experience. At the beginning of the course the evidence-based fall risk assessment methods and tools were not well known among students. This study showed that health care students had a good level of theoretical knowledge on fall prevention, at the beginning of the Gerontological Nursing Course. In the future, more studies are needed to explore how students are

able to use evidence-based knowledge and fall risk assessment methods in authentic patient situations.

INTRODUCTION

Fall prevention is an essential part of evidence-based healthcare (Luk et al., 2015; Pearson, et al., 2005) and an important development topic in Finland, EU and other western countries (EIP on AHA, Bousquet et al., 2016). Globally, it is estimated annually, more than one third of people aged 65 or older fall (World Health Organization, 2019) causing many humane problems and economic costs in health and social care (e.g. National Institute for Health and Welfare, 2016). Fall are associated, among other things, with functional decline, increased need of health services, premature institutionalization and even increased mortality rates (Stenhagen et al., 2013; Stel et al., 2004; World Health Organisation, 2019. Even though falls usually occur unexpectedly, they are often preventable, for example, by increasing resources for fall prevention in primary care (Phelan et al., 2015).

Previous studies and systematic reviews show that using multifaceted and tailored strategies can improve nursing staff members´ competence in fall prevention and decrease older people's risk of falling (Breimaier et al., 2015; Goodwin et al., 2014; Cameron et al., 2010; Stern & Jayasekara, 2009; Stubbs et al., 2015). Therefore, many countries already have clinical practice guidelines for fall risk screening, assessment and management, for example Panels on Prevention of Falls in Older Persons (2011), Falls in Older People: Assessing Risk and Prevention (2013) and How-To Guide: Reducing Patient Injuries from Falls (Boushon et al., 2012). These guidelines are included in standardized fall prevention tools, for example, the Algorithm for Fall Risk Assessment and Interventions, Time Up and Go (TUG), Measuring Orthostatic Blood Pressure, The 4-Stage Balance Test or the Peter James Centre Falls Risk Assessment Tool (PJC-FRAT) to assess the risk of fall (Coppedge et al., 2016; Smith, 2015; Haines et al., 2004). Despite this, some studies argue that better fully-evaluated fall prevention programs, screening protocols and tools are needed (Carpenter et al., 2014; Lukaszyk et al., 2016).

In health care education, fall prevention has not been highlighted enough even though nursing professionals are the most important group in guiding patients at risk of falling. During their studies, nursing students should learn evidence-based practices in fall prevention and gain sufficient understanding about fall related risk factors. Fall related risk factors are classified as either intrinsic (e.g. poor muscles strength, functional and cognitive impaired, visual deficits) or extrinsic (e.g. polypharmacy) and environmental factors (e.g. poor lightning, slippery flooring or lack of handrails) (Dionyssiotis, 2012; Hartikainen et al., 2007; Guidelines for the Prevention of Falls in Older Persons 2001). In addition, the World Health

Organization's (2007) risk factors model for falls in older age describe four risk factors groups; behavioural (e.g. lack of exercise), environmental (e.g. loose rugs), biological (e.g. age) and socioeconomic risk factors (e.g. low income).

During their studies, students are supposed to develop from novice to experts and learn to use theoretical knowledge in different kinds of patient situations. Therefore, coherence between theory and practice, from the beginning of the studies, should be strengthened (Hatlevik, 2012). This requires the use of suitable pedagogy and teaching methods in health care education. Integrative learning and connective training offer a theoretical basis for such development (Griffiths & Guile, 2003, Tynjälä, 2008). Integrative pedagogy is a teaching principle that connects the basic elements of expertise. On an individual level, these elements are theoretical knowledge, practical expertise, self-regulation skills development and socio-cultural information, which are manifested on a wider scale in the workplace. (Tynjälä, 2008.)

In health care, theoretical knowledge is an important part of evidence-based practice e.g. in fall prevention (Stevens, 2013; Titler, 2008). Integration between theoretical knowledge and practice can be promoted by using simulation (Jeffries, 2005; Bambini et al., 2009), which is an authentic learning situation for health care students. In addition, clinical practice, inter-professional learning sessions, and courses where students work with older people, increase their knowledge and skills of fall prevention. (Dauenhauer et al., 2015; Sullivan et al., 2015; Gray & MacRae, 2012; Bonner et al., 2007).

The aim of this paper is to explore health care students' knowledge and understanding on fall prevention at the beginning of a Gerontological Nursing course.

METHODS

Study design and participants

This study, referred to as the 'AKESO-study', is an ongoing research and development project. The purpose of the study is to develop effective teaching methods to support health care students learning in fall prevention among older people. Savonia University of Applied Sciences (SUAS) is a coordinator of the study. SUAS collaborates with RFPNetwork which is an inter-professional group operating in the region of the Kuopio University Hospital (KUH) district. The main purpose of the RFPNetwork is preventing falls through different campaigns and promoting inter-professionals and population awareness of fall prevention (www.psshp.fi/rfpnetwork; Tervo-Heikkinen et al., 2016). The basic description of

the AKESO-study has been published earlier by Äijö et al. (2016) and is only briefly mentioned here. The year 2016 was a preliminary phase of the AKESO-study.

The AKESO-study included three development and data collection phases. The first data collection took place at the beginning of the Gerontological Nursing course. The second data collection was implemented during an authentic simulation situation at SUAS and the third data collection was carried out after clinical practice. This study describes the results from the first phase.
In this AKESO-study, gerontology teaching pedagogy is based on the philosophy of integrative learning and connective training (Griffiths & Guile, 2003; Tynjälä, 2008). This philosophy has previously been used in development work related to clinical practice situations among health care students (Koskinen & Äijö, 2012; Äijö & Sirviö, 2013).

Data collection and analysis

The data of this study were collected using a small group thematic discussions and background questionnaire (Denzin & Lincoln, 2000) during the first theoretical lecture at the SUAS in spring 2016. At the same time the group discussion was a data collection method (Denzin & Lincoln, 2000) and for the students, a learning situation where they worked together and learned from each other (Chapman 2006). The students were asked to discuss (30 minutes) about their previous understanding on personal and environmental factors related to falls and fall prevention and write down their knowledge and understanding of the online discussion. Students were especially instructed to discuss about the intrinsic (patient or client related) and extrinsic (environment related) factors that may predispose older people to fall in different kinds of environments. In addition, the students were asked to describe their thoughts and earlier clinical practice experiences on fall prevention among older people. To minimize teacher control, students formed pairs and small groups freely like naturally pre-existing pairs or groups.

The data were analyzed using qualitative content analysis described by Elo and Kyngäs (2008). As a first step, all students' answers were collected in one document. The answers to intrinsic and extrinsic factors and the students' thoughts and experiences formed different chapters in the text data. The next step was to read the text several times to get a sense of the whole. As in deductive content analysis, an unconstrained matrix was used to analyze the data according to earlier theoretical knowledge of fall risk factors among older people (Dionyssiotis 2012, Guidelines for the Prevention of Falls in Older Persons 2001). The two main categories from the theoretical background were formed which were intrinsic and extrinsic factors related to risk of falling. The subcategories were created using the ideas from the inductive content analysis.

The researchers triangulation (method?) was used in the analysis process (Carter et al. 2014). First, two researchers read the data separately and categorized the data. After the basic categorization, the researchers discussed the categorization and formed the final analysis together. The citations from the data are used to reinforce the findings.

Permission to conduct the preliminary study was obtained from SUAS. The study followed good scientific practice and procedures (National Adviser Board on Research Ethics 2002). Informed written consent was obtained from all participants after full explanation of the nature, purpose, and procedures used in the study. The participants were informed that individuals' names will not be used in any documents of the study and they are free to withdraw from the study anytime.

RESULTS

30 health care students from the SUAS participated in this study. They all were third year, female nursing students. The mean age of the students was 24 years (youngest 21 and oldest 35). Ten students had earlier practical nurse training.

The students described a wide range of fall risk factors that could be linked to two main categories formed from the theoretical background. The two main categories are intrinsic and extrinsic factors related to risk of falling among older people.

Intrinsic factors related to risk of falling among older people

The intrinsic factors main category consisted of three sub-categories, which were **1. age-related changes, 2. health status and 3. individual factors**.
1. **The age-related changes** were divided into "sensory function" and "physical factors". Students described how impaired hearing and vision could cause risk of fall, for example, in situations where an older person should have coordinated his or her moving. Students described how vision change during the ageing process distracted coordination and suggested that:
"*Good vison and attention when walking can prevent the falls among older people.*"
Students also named plenty of physical factors, which are related to fall risk such as muscles weakness, poor reaction time, balance deficit, poor coordination and lack of flexibility. Muscles strength decreased because of ageing process and lack of exercise, which additionally caused difficulties in climbing up stairs.
2. **The health status** category was divided into "diseases and symptoms" and "care and medication". Students indicated many chronic diseases, such as Parkinson's and rheumatic diseases, which increase risks of falling. They also gave examples of symptoms such as pain and fatigue, that can cause falls. Under 'care and medication',

students described both positive and negative impacts on the risk of falls, for example, good timing and proper adequate contents of rehabilitation after hip surgery can be effective way to decrease the risk of falls, like students wrote:

"...in home care more physiotherapist expertise should be used to evaluate the home environment and need of assistive devices after hip surgery".

Medication such as sedatives, diuretics and beta-blockers were highlighted in the students' narratives. Students described how diuretics cause the needs to visit the toilet during the night and how sedatives decrease the ability to walk at night, thus:

"… some medication like sleeping pills make older persons lightheaded…".

Also, students raised the difficult combinations of medication, drugs interactions and side effects among older people.

3. The individual factors subcategory was divided into intoxicants, personality and "nutritional status". Students noted the use of alcohol as a risk factor of falls thus:

"Aging can result in lower alcohol tolerance among older people over time, but they may not notice the changes themselves."

Furthermore, some students wrote that use of alcohol was associated with interactions and side effects of medication.

Students described some personality factors that can increase falls, for instance older people's own attitude and character. Students also illustrated how older people can under or overestimate their functional capacity. They may stay in bed whereas they may be able to walk, or they attempt to do something which they are not physically able to do any more, like jumping. Students also brought up the fear of falling, saying:

"The fear of falling can cause a vicious circle. Older people can decrease their walking and moving, because of fear. After these changes, the walking ability decreases and the risk of falling increases. This is fear of falling circle."

Students were unsure of how well older people are aware of the availability of different assistive devices and discussed how motivated older people are to use them. In addition, lack of motivation to keep up good functionality was mentioned as a problem in avoiding falls. An example of how nutrition status affects the risk of falls is negative fluid balance in the body, low level of energy and low blood sugar.

Extrinsic factors related to risk of falling among older people

The extrinsic factors was divided into three sub-categories: **1. indoor environment, 2. outdoor environment and 3. hospital environment.**

1. The indoor environment sub-category was divided into clothing and the living environment. The clothing category highlighted suitable shoes and properly sized clothes as affecting risks of falls. The students wrote how important, but also contradictory, shoes with studs are for preventing falls, in Finland during the winter. They help to avoid falls outside on icy roads. However, the studs can be very slippery inside environment and cause falls e.g. when visiting shopping canters.

The students listed many indoor factors that make the living environment unsafe and risky in relation to falls, for example, stairs, doorsteps, and poor lighting. In addition, students wrote:

"Older people can fall down due to pet that run around the person."

2. The outdoor environment sub-category included the built environment. Students were well aware of how snow, ice and slippery roads increase the risk of falls among older people in Finland, writing for example: *"The side-walks are not always well gritted during the winter."*

In addition, students gave examples of how the steps and pits on the roads can increase the risk of falls.

3. Students also reflected on fall prevention in **the hospital environment** and described the risks of falls from a patient and staff member perspective. A patient's weakened ability to adapt to a strange environment and to evaluate his/her own functional ability in hospital were a risk factor for hospital-acquired falls. Also, reflecting on hospital or healthcare staff roles in fall prevention brought up many negative risk factors such as lack of personnel and a constant feeling of hurry while working with the patients. Students described that:

"I have heard that they (nurses) always say to the patients that they are in a hurry, but, really, they are not."

Nurses' negative attitude towards patients also caused problems and was discussed as follows:

"The staff do not have a rehabilitative approach" or *"Sometimes fall prevention goes overboard and nurses do not allow the patients to walk alone because of their history of falls".*

DISCUSSION

The aim of this study was to describe health care students' theoretical knowledge and understanding related to fall prevention at the beginning of Gerontological Nursing Course. The results indicate that the students were able to described intrinsic and extrinsic factors of fall prevention among older people.

The results of this study showed that students had lot of theoretical knowledge concerning fall risk factors and fall prevention at the beginning of the course. Participants of this study were third study year students and they had studied a lot other theoretical courses and participated in clinical practice periods earlier. The intrinsic fall risk factors like age-related changes, diseases, symptoms and medication (Hartikainen et al., 2007; Dionyssiotis, 2012) mentioned, showed the students' learning outcomes from earlier learning activities. The results of this study indicate that students were able to reflect theoretically on different courses. Students' earlier learning experiences like simulation learning have developed their reflective skills. Like Hatlevik (2012) has presented, students' reflective skills are needed in integration between theoretical and practical knowledge.

Students were not so informed about extrinsic fall risk factors. These factors are more related to the environmental factors and clients (Guidelines for the Prevention of Falls in Older Persons, 2001; Dionyssiotis, 2012). To understand and learn these factors, requires experience from real working life which students did not have that much. Like earlier studies have shown (Dauenhauer et al., 2015; Sullivan et al., 2015; Gray & MacRae, 2012; Bonner et al., 2007) working experience from home visits and fall risk evaluation situations might increase students understanding and knowledge about the living environments of older peoples. Like Tynjälä (2008) has presented, student's experience could be the best way to integrate theoretical knowledge more deeply into content and into action in authentic learning situations like simulation or clinical practice. This kind of learning could deepen students' theoretical understanding and learning about fall prevention.

Evidence-based knowledge of fall prevention (Luk et al., 2015; Pearson et al., 2005) and work life experience is required to grow into a professional worker. The results of this study showed that students had some work life experience and quite a lot of theoretical understanding. In the future, the theoretical knowledge should be integrated more deeply into clinical practice. Combining theory and practice could be effective and natural in simulation learning, where the students practice their skills and learn to use fall risk assessment tools. Such as earlier studies have shown, (Jeffries, 2005; Bambini et al., 2009) simulation could help students to learn more theoretical knowledge and use the evidence-based fall risk assessment tools. Similarly, Sturnieks et al. (2010) showed that exercise sciences students did not have sufficient knowledge of falls when they graduated.

The responsibility of the health care educational organization is to ensure that graduate students have adequate skills and knowledge to prevent falls. In the future, the nursing curriculum should include more information on evidence-based fall prevention. In addition, students need to learn to value customers' personal views of their life situations as valid source of evidence and a starting point of reducing falls. Also, more attention should be paid into the practical placements, for example, in students guidance and consistent fall risk assessment methods.

The trustworthiness of this study can be assessed by evaluating the data collection, analysis process and the results (Tong et al., 2007; Elo et al., 2014). In this study both deductive and inductive content analysis were used. According to deductive content analysis two main categories were formed based on earlier classifications of fall risk factors among older people. According to inductive content analysis the authentic sentences from the data were presented to ensure that the data accurately presents the information that the participants provided. Small groups discussions as a method to recall theoretical knowledge is a useful way to inspire students' to remember while free expression of thoughts and feeling are encouraged and maintained (Chapman, 2006). In such process, students get inspired from each other know-how and opinions and learn to share their experiences. Also a collaborative learning inspiring the students to gain new knowledge together and learn.

There are some limitations of this study, which may affect its transferability. Students' earlier clinical practice experience was mostly gained from the hospital

environment instead of community-based health services. In addition, certain linguistic and grammatical revisions have been carried out when the English name of the categories were formed. This should be taken into account when the reader evaluates the results and their transferability.

Conclusions

Third year health care students had a commendable level of theoretical knowledge fall prevention and fall risk factors among older people. Well-planned teaching protocols and good teaching methods can help students to learn how to use fall prevention assessment tools. In educational development work, deeper understanding of the pathological mechanisms related to fall risk factors among older people must be considered. Future research should focus on how students' theoretical knowledge is integrated to practical skills in simulation situations. Furthermore, it is important to study how students are able to use their knowledge and skills in clinical practice among older people in different kind of living or care environments.

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INTERNATIONAL SHARING IN EUROPEAN HIGHER EDUCATION — CASE CO-PUBLISHING

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ABSTRACT

The purpose of this proceedings paper is to point out the impact of open access practice-based publishing activity, its benefits, and the reach and significance, in the context of higher education. In addition to the publication of research results, the publishing activity combines other effective pathways of impact such as knowledgeable people, collaboration and interaction. The number of publications is one of the performance indicators in higher education institutions, which may guide them to the inefficiency of articles without affecting their effectiveness. The quantitative impact was analysed from a bibliometric point of view based on the scale of activity, reference indicators and databases. The qualitative impact was examined from the perspective of the coverage and significance of the journal. The efficacy of the Journal of Finnish Universities of Applied Sciences is high. The number of page views and unique visitors has risen steadily over the years. The journal is open access and free of charge, and jointly financed by all Finnish Universities of Applied Sciences. The social impact of the Journal of Finnish Universities of Applied Sciences is to build on knowhow, and concepts to act as a source of prosperity and welfare, and to support the development of decision-making and practices. The similar journal could be put into practice in other educational networks to increase the impact of the practice-based research.

INTRODUCTION

The Academy of Finland (2016) has declared the societal impact of research – the main routes in which research contributes to society – to be one of the most pressing matters from the perspective of social development and progress. Effectiveness,

here, refers to the joint impact of research and other factors on society, often over the course of a long time; as such, it is ostensibly a multifactorial matter. The recommendations made by the State of Scientific Research in Finland 2016 project (Huutoniemi, Törnroos, & Mälkki, 2017) note that the most societally impactful aspects of research must be supported, monitored, and evaluated not only by traditional universities, but by other research organisations, as well. The effectiveness of research, development, and innovation (RDI) activities carried out by universities of applied sciences (UASs) in Finland has, up until now, primarily been viewed as being regional in nature (cf. Väänänen, 2013) or in the context of the integration of study modules and programmes (cf. Väänänen & Laitinen-Väänänen, 2010), and not so much from the perspective of the effectiveness of the national and international open access dissemination. Indeed, in the context of the Finnish higher education system, there has been a much more rigorous assessment of the effectiveness of publications in academic universities (cf. Ministry of Education and Culture, 2015).

Transparency is one of the core values in RDI activities and its importance is ever-increasing. This is especially apparent with the advent of publication effectiveness as a metric of the success of the funding models used by HEIs. A bibliometric approach to the analysis of publication effectiveness is typically used, with the amount of publications and their associated citations grabbing the lion's share of the weighting. This method relies on the use of citation impact indicators and the citation indices of a given academic journal. However, in the case of UASs and their publication output, the purpose of such activity is not solely that of generating scientific research, but rather disseminating their expertise more broadly, making it more transparent, developing expertise for the use and evaluation of other actors, and, above all else, benefiting society as a whole. A multifaceted approach to publications can be seen to consolidate the interaction between UASs and their stakeholders. Moreover, this approach increases societal confidence in research and promotes the utilisation of practice-based knowledge as the instigator of societal decision-making.

UASs produce a wide range of publications for a myriad of audiences via various publication fora. If we wish to consider a broad readership as an indicator of effectiveness, we may well ask the question of whether academic journals or internally published media are the best possible fora for UASs to publish their research. The Finnish National Agency for Education (2018) maintains a reporting portal for statistics pertaining to higher education in Finland. This portal is called Vipunen. In the years 2012–2017, the Vipunen recorded a total of 31,620 non-refereed and non-peer-reviewed scholarly articles, academic books, and other publications intended for a professional or wider audience. The vast majority of these (79%) were not academic publications.

This proceedings paper is based on two EAPRIL 2018 conference sessions. The beginning is based on "The impact of the publication activities of practice-based research" presentation by Väänänen, Friman & Kantola in the Present & Discuss Session, which was based on the article (Väänänen & Friman 2018) published in Ammattikasvatuksen Aikakauskirja [Journal of Professional and Vocational Education]. The latter part of this paper is based on our notes from the "International Collaboration Promoting Publishing Practice-oriented Articles in Higher Education" Workshop Session. This examination is conducted from the perspective of the three routes to impact defined by the Academy of Finland (2016, 9); namely, proficient people, cooperation and interaction, and transfer of research results in the methodological framework of measuring the societal impact of research (Boremann, 2012). The data set used in this examination consists of the content of editions of the Journal of Finnish Universities of Applied Sciences (UAS Journal) published between 2011 and 2017, site visitor numbers for the UAS Journal as collated via Google Analytics, the citation indices recorded by the Scholar database, and the statistics relating to the journal's Facebook page and some other social media applications.

UAS JOURNAL – THE FLAGSHIP PUBLICATION FOR FINNISH UNIVERSITIES OF APPLIED SCIENCES

The purpose of the UAS Journal, jointly published by Finnish UASs, is to raise the profile of UASs and the RDI activities they carry out. The UAS Journal is open access, meaning it is free of charge to its readers, and does not remunerate its contributors. Instead, all funding directly stems from individual UASs. Since its inception in 2011, the UAS Journal has been published via the Open Journal System platform (2018) and then on a purpose-built WordPress site since 2016, with the latter intended to be more readable on newer touchscreen devices (2018).

In line with the principles set out for transparent and accessible scientific research (Ministry of Education and Culture 2014), the UAS Journal functions as a consciousness-raising publication. It disseminates information not only on the RDI activities taking place at UASs to actors within the sector and those from other areas, such as from the private sector, but also on the business partnerships established between UASs and various stakeholders. In addition to providing a route to publication for representatives of UASs, the UAS Journal also offers a platform for editorials and articles authored by experts from a wide range of business sectors.

The articles published in the UAS Journal are classified as intended for professional audiences and they are issued with a parallel copyright following a four-month embargo. Each year sees the publication of four multidisciplinary, themed editions (Table 1), the focus of which is on forecasting changes in societal and international

phenomena and on the particular areas of expertise developed by UASs. The majority of the articles published are written in Finnish and contain an abstract in English.

Table 1.
The themes of the UAS Journal editions in the period 2016–2019.

Year / Number	2016	2017	2018	2019
#1	Digitalisation	Higher education institutes as reality enhancers	Circular economics and resource efficiency	Competence basics in UASs
#2	Wellbeing	UAS as development partners for wellbeing services	Attachment to work	Digitalisation and a new role for information management
#3	The culture of experimentation	Open innovation activity	Digital pedagogy	Artificial intelligence
#4	Sustainable development	Education export	Participatory regional development	New innovations in creative industries

The members of the UAS Journal's Editorial Board and the contributors to the themed editions come from different UASs. Moreover, the editorial board also has members external to UAS. In relation to the articles published during the period 2011–2017, the average number of authors from each UAS per article was 1.6 (Table 2). Of the authors contributing to the four themed editions last year, a total of 248 came from Finnish UAS, 13 from academic universities, and 23 from the private/public/non-profit organisations. In 2017, only three, and in 2018 two Finnish UASs did not contribute authors to editions of the UAS Journal.

Table 2.
The number of articles and authors published in the UAS Journal in the period 2011–2018.

University of applied sciences	Articles	Authors
Metropolia UAS	48	85
Häme UAS	42	55
Lahti UAS	40	72
Laurea UAS	36	50
Satakunta UAS	34	68
Lapland UAS	35	47
Karelia UAS	30	39
HAAGA-HELIA UAS	30	37
Turku UAS	29	55
Oulu UAS	27	55
Savonia UAS	27	50
South-Eastern Finland UAS	26	36
Seinäjoki UAS	23	31
JAMK UAS	22	33
Tampere UAS	21	30
Saimaa UAS	20	27

University of applied sciences	Articles	Authors
Diakonia UAS	18	31
Kajaani UAS	16	27
Arcada UAS	10	23
Novia UAS	9	13
HUMAK UAS	6	11
Centria UAS	6	10
Vaasa UAS	3	5

One (1) edition of the UAS Journal was published entirely in English in 2014 and in 2015. A Special Issue, published in collaboration with the European Association for Practitioner Research on Improving Learning (EAPRIL) was launched in 2016 and 2018. The theme of the 2016 EAPRIL edition was 'Bridging professionalization and working life in context of responsiveness to change in society and the workplace'. In addition to Häme and Turku Universities of Applied Sciences from Finland, Aeres and Windesheim Universities of Applied Sciences from Holland, and KU Leuven (university) from Belgium served as the contributors to this themed edition. The second international 'EAPRIL themed edition', titled "Practitioner researchers' current and future visions of education & learning" was published 2018. In addition to Häme and Turku Universities of Applied Sciences, universities from Belgium, Portugal, and Switzerland contributed authors to this Special Issue. The process of making an international special issue in the UAS Journal is provisionally outlined as seen in Figure 1.
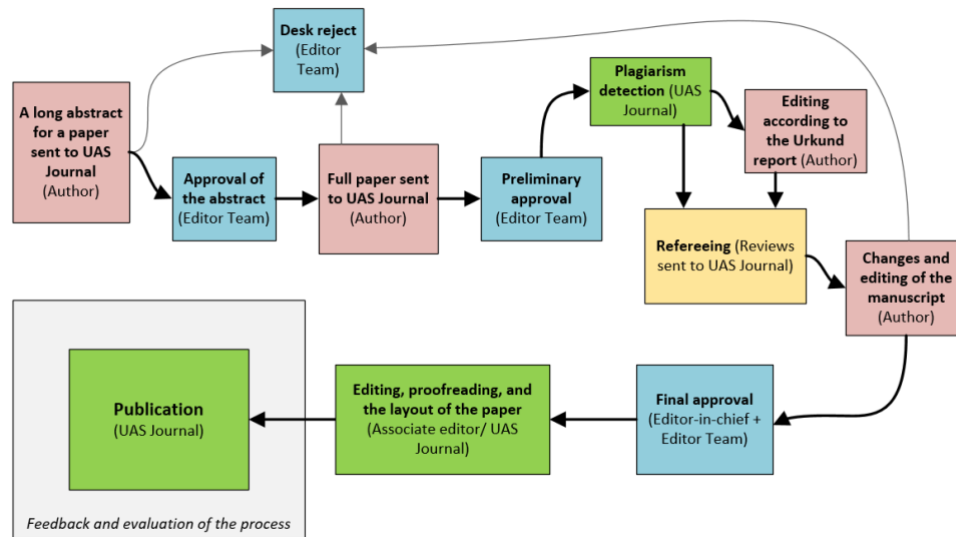
Figure. 1. The process of making an international special issue in the UAS Journal.

During the period 2011–2015, the number of visitors on the UAS Journal homepage grew almost four-fold from around 20,000 to more than 76,000 visits per year (Figure 2). In the second and third years of publication, the audience of the site grew by 59% and 75% respectively, after which annual growth has been in the region of 9–18%. Since the publishing platform for the journal was changed in 2016, it is no longer possible to compare the number of site visitors with those of previous years.
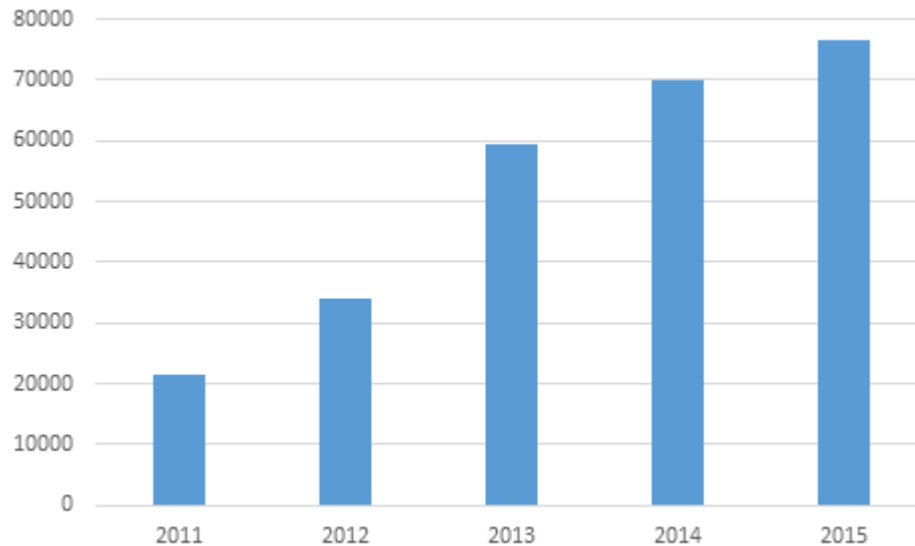
Figure 2. Visitors to the UAS Journal website in the period 2011–2015.

The number of unique site visitors on the UAS Journal website (Figure 3) has increased annually from around 4,000 visitors to almost 24,000 unique visitors, with a relative year on year growth of 20–77%. The majority of site visitors (approx. 80%) are based in Finland.
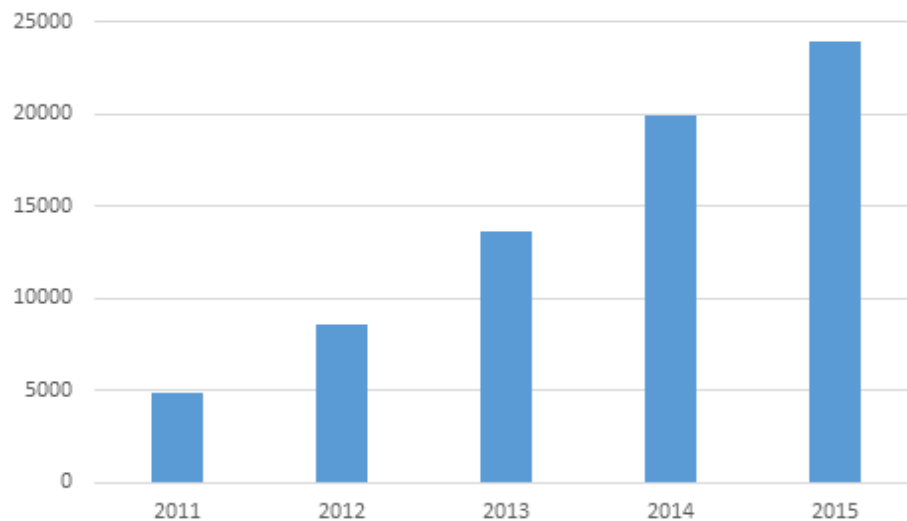

Figure. 3. Unique visitors to the UAS Journal website in the period 2011–2015.

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The average duration of each site visit varied from one year to the next, ranging from around 90 seconds to visits in the region of two minutes. The most accessed article (13,133) on the new platform (as of 21.6.2018) is titled "How do we manage interest?" (originally in Finnish: "Miten innostusta johdetaan?"). The second-most accessed article (8,798) is titled "Fiendish problem or multifaceted opportunity – the digitisation of UAS." (originally in Finnish: "Pirullinen ongelma vai monipuolinen mahdollisuus – ammattikorkeakoulujen digitalisaatio"). As of the end of 2018, the UAS Journal's Facebook page has 700 followers. Similarly, the journal's Twitter account (@UASJournal) has over 300 followers. Currently, the journal does not have profiles/accounts on LinkedIn or Instagram. A Google Scholar search of items from 2011 onwards, carried out in June 2018, yielded more than 600 results using the search term "UASJournal.fi". However, no results were yielded from searches using Elsevier's Scopus reference database or Thomson Reuters' Web of Knowledge database.

LAYERED EFFECTIVENESS

Higher education institutions (HEIs) occupy a unique role in the new types of innovation ecosystems being developed in today's societies. Here, HEIs generate new knowledge and expertise in conjunction with actors from the private, public, and non-profit organisations. Proactive communications and the advancing of exploitability constitute one of the RDI models utilised by Finnish UASs to ensure the effectiveness of their operations (Arene, 2017). The further development and effective and targeted communication of results requires a multi-channelled and broad-based approach to all related activities. Moreover, there is a need for high-quality publications and development networks both for experts in the field and other stakeholders working in this area. RDI activities and targeted communications also point to a strong connection between education and RDI activities. The RDI activities carried out by HEIs make their mark via collaboration and interaction with a host of stakeholders. Indeed, increasing effectiveness leads to a more transparent, accessible, and multi-faceted publications ecosystem.

Joint activities, such as publishing the inter-institutional UAS online journal, are also important, because the integration can be seen as an attempt of develop the activities of complex entireties of processes by supporting the interactions among experts connected to them. An important part of the integrated system is the attempt on improving the coordination between the interacting experts, which is relative to concepts such as the swarm intelligence, and the collaborative and networked learning. They are especially effective when the networked expert groups are challenged to solve very complex problems. (Huang & Liu, 2009; Kantola & Kettunen, 2012).

In accordance with the recommendations regarding the dissemination of information and the transparency of scientific and research activities laid out by the Committee for Public Information (2018) in Finland, the notion of a culture of openness can be seen to advance public debates on the applicability of research results and the nature of technological innovation. The publication of scientific findings offers society new ideas and helps us work towards the development of societal competencies and expertise. In addition to disseminating the latest results of studies, scientific communication also serves the purpose of opening up the founding principles of scientific research and the reliability of such endeavours for public scrutiny. Furthermore, this also results in the establishing of a culture of openness in the scientific community and raises confidence in science and research among a wide range of audiences. Nevertheless, in order for RDI activities to be publicly funded, they must be coherent and visible, effective, and open and accessible. Moreover, the data and other research materials, as well as the findings, must be openly available. The publication activity taking place via various publication platforms and written in the mother tongue of its primary audience has an important role to play in increasing the visibility of scientific endeavours. According to an Arene's (2017, 73) survey into the uptake and effectiveness of RDI activities, the development of publishing and publications is a development goal for Finnish UASs. Indeed, in the era of openness in science, publication practices must be developed so that their end products are more accessible, practicable, reliable, and the starting point for the uptake of scientific studies.

The typical method of assessing the effectiveness of publications is bibliometric in nature, wherein the number of publications made and citations used constitute the assessable variables. In addition, it is also possible to examine effectiveness qualitatively, based on the added value generated by the journal. In other words, has the journal affected a change, brought an issue to public attention, and/or fostered interaction and a culture of collaboration with a range of stakeholders?

In our workshop session "International Collaboration Promoting Publishing Practice-oriented Articles in Higher Education" in the EAPRIL 2018 Conference, the participants from across the Europe gave valuable insight on how they see the value of an international issue from both an author and a reader's perspective (Figure 4).

What the participants of our workshop session longed for, were universal, clear criteria for various articles to make refereeing more smooth. This, however, is returned to the essence of practice-based articles, and whether they are efficient in sharing practices in the form of a traditional scientific article. This could be a topic for a completely new research.

Figure 4. An author's and a reader's perspective on the significance of an international issue.

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. Indeed, accordingly, the journal's contributing authors, thematic contributors, and editorial board are all capable people, skilled at working collaboratively, and, furthermore, the networks they have created mirror these qualities at both the individual and organisational levels. The fruits of these labours consist of approximately twenty freely available and expertly written articles per quarter. In addition to the UAS Journal's online presence, the emails sent by its contributing authors and editorial staff, the biannually board meetings, and the wide array of expert fora at which the journal has a presenting role all constitute arenas in which the publication interacts with its audience (Friman et al., 2015). Having said this, the UAS Journal's current use of social media as an impact-making channel could be improved upon. One way in which the journal has sought to increase its effectiveness and strengthen its presence has been the invitation extended to presidents of various Finnish UASs to provide leading editorials.

The UAS Journal can be said to represent part of the strategic operations of Finnish UASs (cf. Arene, 2017). It is cost-effective, immediate, agile, and collaborative in its activities and also generates added value. In its current form, the UAS Journal can be viewed as a maintainer and developer of specialist expertise and, perhaps, even as the creative power broker and instigator of change in terms of the RDI activities

and pedagogical approaches taken at Finnish UAS. In fact, the UAS Journal is a source of institutionally generated enrichment and wellbeing for professional audiences such as lecturers and students. Furthermore, the journal serves as a medium in which different forms of change stimuli are presented for the betterment of wellbeing and competitiveness. Additionally, the studies published in the journal may also assist decision-making at the individual level. As the developer of new practices, the UAS Journal maintains and advances the professional competencies of education and applied RDI. Articles published by it can be used as learning material.

Naturally, the orientation of publications activities must be assessed not only from the perspective of audiences in the higher education sector, but also, more broadly, from the perspectives of society at large, government, and the business world. The consumers of publications orientated towards society are ordinary citizens and, hence, the job of publishing in the sphere of influence of UAS is both that of supporting a layperson's ability to understand social phenomena and functioning as a driver of social developments. Indeed, by providing a sound rationale for decision-making processes in the articles it publishes, the journal supports societal decision-making and offers guidance on and solutions to social issues. From the perspective of governmentally orientated publications, of central importance is the generation of information as a further means of supporting the evaluation of matters of relevance. Yet another target audience for the UAS journal is, for example, funding bodies in the public sector. When it comes to the RDI orientation of publication activities, there is an emphasis on the economic value of information and expertise. The RDI output of UASs results in new commercial applications, the goal of which is to be financially viable.

Of the articles published in the Finnish UAS Journal during the year 2017, the majority (87%) were authored by staff or students of UASs. Articles authored by employees of traditional universities constituted 5%, and 8% of contributions came from other organisations. From the perspective of developing the UAS Journal, it may well be necessary to increase the proportion of articles jointly authored by UAS actors and those from the private sector. Indeed, it can be surmised that by broadening the pool of writers, the journal's audience will also become more diverse. Another factor that could lead to the journal generating more added value in the future is a clarification on the extent to which HEI students contribute to the publication. Currently, joint authorship primarily consists of the efforts of staff within a single HEI or that of a project conducted with inter-institutional collaboration rather than with input from private or non-profit sector actors.

CONCLUSION

The core of this proceedings paper is to point out the impact of open access practice-based publishing activity, its benefits, and the reach and significance, in the context of higher education. In summary, it can be noted that contributing authors do not only provide the UAS Journal with stories, but rather that those stories published in the UAS Journal play their part in making visible the "big picture" of what exactly it is that UASs do, in terms of being leaders in the generation of expertise and the important role they play in developing and innovating ways and means of operationalising and applying practise based research and development in Finland. Nevertheless, the full potential of the journal is yet to be realised. Its activities are based on well-grounded interaction and the strong connections 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. 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. Also refereeing, albeit time-consuming, enhances sharing and is seen rewarding, as pointed out by participants in our workshop session.

The UAS Journal's operations are systematically developed and evaluated on the basis of the PDCA model (Kantola & Linko, 2014, Linko et al., 2017) and the European Commission's DigiCompOrg strategic framework (Kampylis, Punie, & Devine, 2015). Not only does the framework for digitally-competent educational organisations provide the opportunity for the UAS Journal to digitally connect with processes enacted at individual UASs, but also those at multiple institutions at the national and European level. However, no singular nor simple metric by which the effectiveness of publications activities can be measured in relation to the results of commercial operations exists. As things presently stand, such results are primarily utilised by the editorial board as a means of supporting future plans. While this is important from the perspective of strategically planning work, in order to consolidate and ensure the continuation of high-quality operations it would also be important to plot out longer-term trends and change factors. In any future examinations of the effectiveness of the UAS Journal, it would be a good idea to collect feedback directly from readers, as has been done in the case of, for example, the Department of Strategic and Defence Studies publications (Vähänen, 2009) and the Journal of the Finnish Association of Physiotherapy (Suominen, 2017) Moreover, the utilisation of altmetrics would comparatively provide the fastest means of tracking the profile of articles and their effectiveness in various online communications environments. Whereas it can take years to accumulate traditional citations, social media mentions rapidly accumulate over the course of a single day. The use of altmetrics can also help us monitor when articles are mentioned in conversations held via social media,

tracking, for example, the number of times an article is shared, whether it has been 'liked', and whether it has been cited in other Open Access journals and public research databases such as ORCID, ResearcherID, AcademiaEdu, and Mendeley. In reality, however, we can only truly speak of the operational impact of RDI activities carried out by UASs in addition to their strategic aims when we can clearly demonstrate a direct link between the number of visitors to an online journal, its readership, media presence (including social media), and their conversion into contacts actually leading to the instigation of new RDI projects.

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THE CONCEPT OF RATIO IN PRIMARY SCHOOL MATH: TO START WITH OR COME TO?

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ABSTRACT

Ratio-based concepts are known to be essential for Math and Science, yet it is a pain in the neck for most students of all ages. We suppose that various misconceptions and the lack of comprehension originate from treating the numbers as wholes rather than ratios. Hence, we have designed and carried out the first pilot study to see whether teaching numbers as ratios from the very beginning is feasible. During two months in the fall, 31 first-graders were taught how to use a compound unit. A 4-months delayed post-test was administered in March. All but three students scored from satisfactory to perfect. Our conclusion is that teaching ratios at the start of the 1st grade is feasible. It can be done by designing activities such as assembling various kits. We are continuing the study for the next school year to check whether the students who started with the ratios demonstrate a better progress in working with numbers and measurements as compared to those who learned the numbers as simple wholes.

INTRODUCTION

Students are known to make mistakes while treating proportions throughout all school years (Dole et al., 2012). These mistakes indicate that they deal with numbers as wholes when numbers present a ratio (Fischbein et al., 1985): for example, they add concentrations of pouring solutions to get a concentration of the mixture or make wrong statements about percent "A is 20 % less than B = B is 20 % more than A".

This interference of whole number knowledge was called *whole/natural number bias* (e.g., Ni & Zhou, 2005).

We assume that these mistakes are due to the way students are taught: from the very beginning numbers are introduced through counting separate objects, but later we want kids to understand their rational essence.

The analysis of regular elementary math textbooks shows that they all start from counting separate objects – and rely on this idea for a considerable amount of time (see, for example, learning progressions in Clements & Sarama, 2014). Even when measurement is introduced, it is applied only to one value at a time. As a result, fractions are introduced to students only from the position of part-whole relationship (Alajmi, 2012, Gorbov, 2002).

At the same time middle school teaching materials imply that students should regard numbers as ratios even when they are written as wholes: 5 % means "5 out of each 100", 3.5 times bigger means "if something is 1, than the other is 3.5 (and if something is 10, the other is 35)".

Thus, the general question is: "How to build the concept of number as a ratio?"

As we implement Davydov's approach (Davydov, 2008) we pay special attention to the early steps of concept formation. That is why, when we strive to provide a solid ground for ratio-concepts in the future, we start from the very beginning of Arithmetic – from the first grade. Based on our findings on teaching and learning proportions in middle school (Vysotskaya et al., 2016, 2017), we see some opportunities to include a special module dedicated to ratios in an elementary Math curriculum. In this paper we will 1) discuss the key features of teaching and learning ratios, 2) present our "Sets and Kits" module for the 1st grade, and 3) present some preliminary results received after the first year of experiment.

Our research question was: whether our instruction, based on making sets will be feasible for 1st graders, and whether it benefits their learning of proportions, measures and magnitudes.

BACKGROUND AND METODOLOGY

Many concepts from various areas have ratio in the core (Lamon, 2007). In an area of school Math they include, for example, proportion, fractions, percentage, and trigonometric functions; in Natural Sciences – speed, density, pressure, power, concentration; and they are here even in everyday life: exchange rates, discounts, recipes, medicine dosage and so on. Mastering ratios implies more than simply knowing what corresponding parameters are: if one knows about mass and volume, it does not automatically mean to learn about density. One has to consider changes of two parameters or even of two ratios at the same time. For example, buoyancy of an object immersed in water is a ratio between the object's density and water density. What we aim at is a work with ratios, based on the notion of portions: to preserve a ratio, its compound unit has to be repeated as many times as needed.

Our previous research shows that an effective strategy to teach proportions shares some important features:

1) Joint action is the way to grasp the sense of ratio. Coordination is the core meaning of ratio – the concept builds upon coordinated changing of two values.

2) Compound measure is a tool to coordinate actions within a pair. A compound measure (see Fig.1) consists of two measures that form a ratio. For example, 2 millilitres of water and 5 drops of ink make a desired shade of blue. Thus, to keep it we have to repeat portion after portion. If one in a pair takes two more millilitres of water, the other has to add 5 drops of ink.

3) A cultural context provides the sense and meaning of taught actions for students (Vysotskaya et.al, 2014)). In such a way a concept can be built with the students, so students do not get them in a ready-made form. To be not ready-made is important for proper application of the concept in the future. According to Davydov's approach we exploit, the reconstruction of a cultural human activity that gave birth to the concept in the past is essential to learn all internals. The context should be chosen in a way that the ratio can be directly expressed, so changes of the intensive property would be tangible for students. For example, whether the vessel float or sink (Vysotskaya et al., 2016) or who would benefit from the trade, or whether the shades of paint coincide, etc. (Vysotskaya et al., 2017).
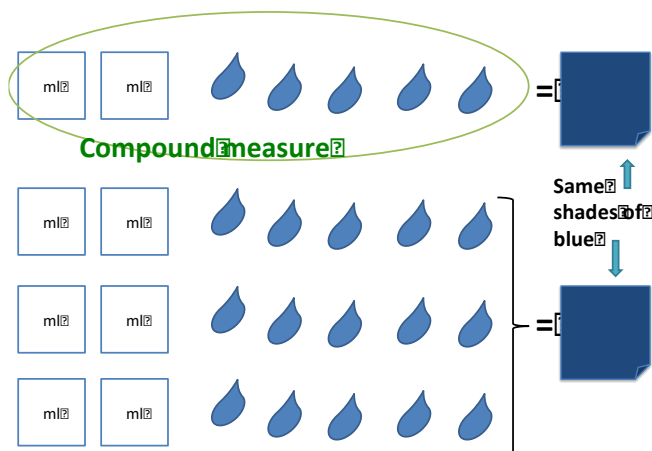

Figure 1. To maintain the shade of blue we have to keep the same ratio between water and ink. That means, that if we have the portion of 2 ml of water and 5 drops of ink, we have to take this portion as many times, as we need, but never do we change the amount of water or ink separately.

We have tested different modules designed according to the principles above in the 3rd grade and up – and they proved to be effective (Vysotskaya et al., 2016, 2017, 2018). Then our question was: what steps could be made before? We looked for what

could be rooted in the primary school Math to develop to the ratio by middle school. As we want children to control intensive values working together, using the compound measure as a tool, we decided that the compound measure itself has to be mastered at the previous step. So we chose the context of "making sets" to introduce very young children to the special situation of two parameters that should be changed together according to some rule. This rule embodies in this primitive case a sense of "similarity" or "fairness", which all children have.

> Students were working in two groups and each group was rewarded for their work with chocolates. The first group of 3 children got 2 chocolates and the second got 3 chocolates, as there were 5 children in it. Were all the students rewarded equally?

The second question was – how could that content be integrated in the existing curriculum of the first grade?

The Developmental Instruction Math curriculum (Gorbov, 2002, Alexandrova, 2009) is based on measurement. Our module, on the other hand, is based on co-measuring. We build on a research of L.F. Obukhova (Obukhova, 2011) to revise the existing curriculum and to develop our "Sets and Kits" module. Obukhova showed that to overcome Piaget's phenomena students can use measurement as the main activity. It is well-known that students make mistakes while operating magnitudes, which indicate that they do not "preserve quantity". Nevertheless, introducing measurement can cure this phenomenon. In Obukhova's research students learned to measure magnitudes, such as volume, mass, length, area, quantity, and this way they also learned to distinguish them from other object's properties. Tokens were used to mark measures. Magnitudes were compared not directly, but through tokens – placed in two rows (see Fig.2). When prompted by Piaget's situations, students argued that values of interest were not changed. Measurement made magnitudes "tangible" and "manageable" for students. They could rely on measurement to stand up against overwhelming pressure of visualisation that provoked mistakes.
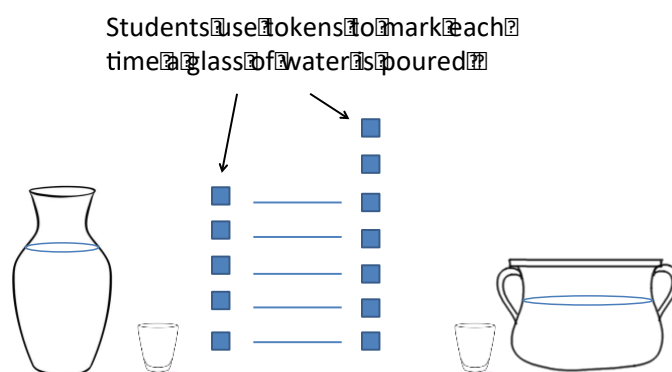

Figure 2. "Where is more water?" problem.

This point is in opposition to the regular way of teaching students from attributes to measurement, also common to Developmental Instruction curriculum (Gorbov, 2002, Alexandrova, 2009). Usually students learn how to distinguish between attributes at first, so they would know what to measure later. Introducing measures is done through comparison or construction of magnitudes that cannot be posed together to compare them directly. The idea is sort of pressed upon children, as the first way to do it is to take several different pieces that will fit in, instead of measuring with one that in real-life will never fit precisely. An alternative way is to extract the concept of magnitude as a reflection of measurement. The measures can be applied only to the corresponding magnitude, and thus the action of measurement is guided by parameters/attributes from the start. It cannot be done the other way, and if it is – children themselves notice the mistakes. Parameters it their turn appear in students' explanations. In such a way a concept can be built with the students, so students do not get it in a ready-made form.

We plan to make a step further and to ground measurement with co-measurement. We suggest that 1) the concept of attribute will be extracted from measuring (as it was in Obukhova's research) and 2) we also suggest that the concept of measure will be extracted from co-measuring. We regard measuring a magnitude with a measure as a particular case of co-measuring. When a child starts working with "fairness", which involves making and repeating similar sets, that refer to two or more different parameters, later on he can transfer to the idea of measuring one parameter with a simple measure.

> First, the student lays portion after portion to coordinate his work with the other student, who is laying his portions – in order to keep the ratio. And then this student can also lay measure after measure to coordinate his work with the other student, who is constructing the same value elsewhere. In doing so they will get exactly the same value as the first student had, instead of maintaining the ratio.

While the transfer from two parameters to one is unlikely to cause difficulties, the opposite transfer – from one parameter to the ratio of two parameters – is known to be tremendously difficult for students (middle-schoolers as well).

Thus, we had to check two hypothesis: whether it is feasible to start with making sets in the first grade and whether it will benefit learning ratios, measuring and magnitudes in general?

TEACHING EXPERIMENT

First, we have tried to introduce ratio as we did earlier for upper elementary and middle school children: through the concept of density and buoyancy (Vysotskaya et al., 2016). For two months (September and October) our experimental class (of 31 student) had an elective on "Make it float!" It is a computer simulation of a

vessel floating in water with different task series. It scaffolds working in pairs and proved to be effective from 3-4th grade and up. Our research question was whether it would suffice as a starting point in the 1st grade, but only four students could follow up the curriculum, so we had to give up the idea.

Within the educational design research framework we have formulated a new local instruction theory. Based on the ideas of Davydov (Davydov, 2008), we introduced a special module on making sets in our experimental class.

It was taught during regular Math lessons 4 times a week (5 weeks) starting November.

Students' major task was to construct one value (quantity of something) measuring the other with the compound measure.
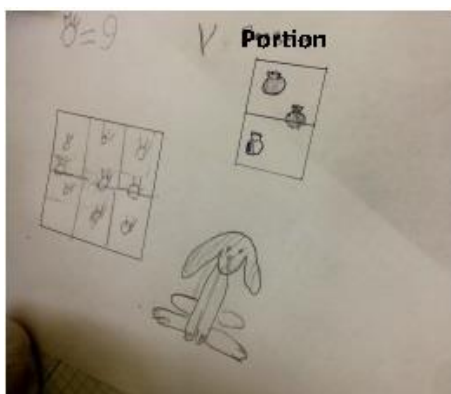

"Carrots" problem (Fig.3): as we plant carrots, we learned, that from 2 vegetable beds we can collect 3 bucketful of carrots. If we need this amount (9 buckets of carrots are drawn) of carrots, how many vegetable beds do we have to plant?

Figure 3. "Carrots" problem.

The tasks were presented as a drawing on hand-outs. The first materials that represent values of interest include: counting sticks, stones, pieces of paper, cards with objects printed on them.

Students were to work both: in pairs, each in charge of his own value, and individually. There were two parts in our module:

1) Step-by-step co-measuring: students are working together, measuring or constructing their sets at the same time. As one of the partners lays his portion (2 vegetable beds in the example above), the other immediately lays his (3 bucketful of carrots).

2) Delayed co-measuring: students are working after each other. The storyline restricts students from doing the work simultaneously – so the first one has to measure his value with his portions and than he passes the number of portions to his partner – so the partner can construct his value with this number and his portions.

After solving in pairs, there was a classroom discussion, so children could stand up for their solutions when the answers were different. In that case they stated their arguments and explained the reasoning behind the solution. Task variations

included false solutions suggested by the teacher, followed by common erroneous reasoning (i.e. additive strategy).

ASSESSMENT AND RESULTS

To test the efficiency of our module we conducted two post-test assessments: individual written one and oral interviews in pairs, which we have videotaped. No pre-test was possible in the beginning of the school year as students just came to school and part of them were not good in reading and writing then.

For the interview (Fig.4) there were three tasks, which had to be done in pairs. During the interview the researcher tried to provoke students for wrong decisions (in order to get their explanations), and also insisted on drawing their solutions in case they tried to do it in mind.

> Problem 1. Masha is making dolls that have blue buttons for the eyes and three green buttons for a dress. How much blue buttons will she need, if she has already sewed 12 green buttons?
>
> Problem 2. If Masha has 10 blue buttons, how many dolls can she make? And how many green buttons will she need?
>
> Problem 3. Masha decided to make 6 dolls and took the necessary amount of buttons. But while she carried them, she lost 3 blue and 7 green buttons. How many dolls can she make now?

The individual post-test included tasks on proportions that varied in difficulty.

> Problem 1 (Making presents). We are making presents. Each present contains 2 cupcakes and 5 sweets. How many presents can we make, if we have this amount of sweets and cupcakes? *(14 of each is drawn below the text)*
>
> Problem 2 (A hedgehog problem). A hedgehog and a squirrel are trading mushrooms for pinecones: 2 pinecones are worth three mushrooms. How many pinecones has squirrel brought, if she needed 8 mushrooms?
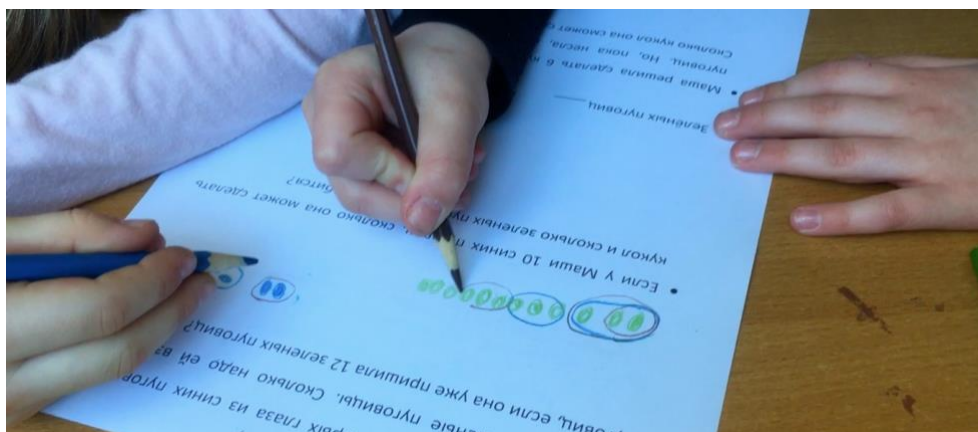

Figure 4. Two students are working over the first problem about Masha. They are laying portion after portion – one for the three green buttons, the other – for the two blue.

The interviews (see Table 5) showed that only 3 out of 31 (10%) students were unsuccessful: they could not manage the tasks even with hints from the researcher and with the help from their partner. Unfortunately, these students have problems in all school subjects, so their poor performance does not refer to the curriculum itself. All other students solved the tasks, but we assigned them 3 different levels:

1st level: the student can deal with the ratio-relationship, if helped by the teacher or the partner;

2nd level: the student can do the assignment correctly himself;

3rd level: the student can give a sound explanation to the partner or teacher in case they are going the wrong way.

As the upper level in this classification obviously includes previous ones, in the table below we also present "accumulated percent" – the percent of students of the given level and higher.

Table 5.
Interview results.

	Students (Percent)	Accumulated percent
The problem was done with the help of the partner/hints from researcher	11 (35%)	90 %
The problem was done by a student himself	9 (29%)	55 %
The solution was explained to the researcher and/or the partner (orally).	8 (26 %)	26 %

The test showed that the same 28 children could manage the simplest task (making presents in the given example), but were less efficient in other tasks (15 children in the hedgehog task, and other tasks less than 6 students). We consider this test as a pre-test to be compared with the same tasks after we proceed with learning ratios.

We collected even more evidence to support our second hypothesis: that making sets will benefit learning ratio. As we have mentioned, first we tried to introduce ratio through density-problem – and we failed. Than we introduced making sets in November and it went well. After that in Spring we started a new elective on paint-mixing (Fig.6). It is organised the same way as "Make it float": students work in pairs, each in charge of his own value (water or ink), but instead of computer simulation it works with hands-on materials (Vysotskaya et al., 2018). All students were able to keep up with the curriculum and did well. We did not have to abandon it, like buoyancy module – on the contrary, students became engaged and were eager to continue.
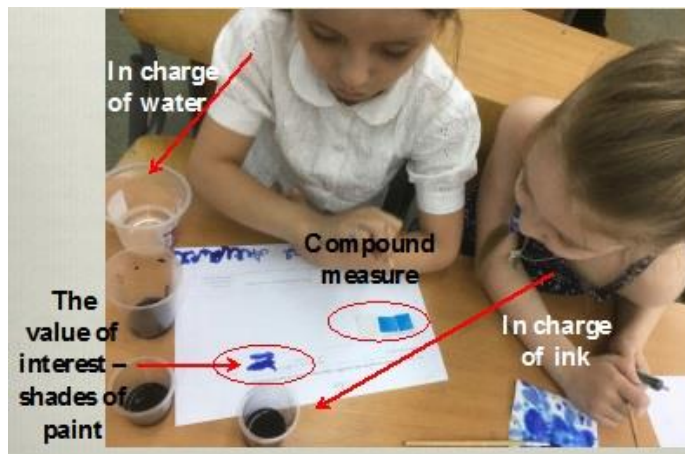
Figure 6. Paint-mixing module. May 2018.

Our experiment is on-going. We have not yet collected data on our last hypothesis: that making sets will benefit measuring. We will have a post-test this spring of the second school-year to see if there are indeed benefits in terms of knowing measures and attributes. Task examples of the post-test that we plan are presented below.

Task 1. Misha has measured his height with pencils and said that he is 12 pencils tall. Lena has measured his height with pens and said that he is smaller: only 10 pens! What is bigger – Misha's pencil or Lena's pen?
Then Lena measured her own height in textbooks – and said she is 7 textbooks tall. Who is taller – Misha or Lena?
Task 2 (see Fig.7). A corked bottle half-filled with water was turned upwards. What bottle contains more water: the one before, or the one after the turn-up?
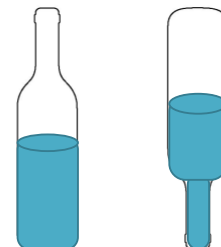
Figure 7. "Bottle" problem.

CONCLUSION

For now we can conclude that the making sets activity is a good starting point for 1st-graders to learn and master the idea of a compound unit. Students were able to solve problems on making sets and explain how and why they were done. Children became very attentive to what exactly their numbers refer to at the moment. The engagement and motivation stayed high. Students also were able to start learning intensive values (concentration) in the first-grade.

Our research leads us to other questions. If starting Math with ratios is possible, can it be integrated tightly in the existing curriculum? What changes have to be made then and what benefits can be expected?

There is still much to add to "Sets and Kits" module, but for now it is at least feasible. We also hope that it will benefit number-concept in general, but a thorough research here is needed.

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THE USE OF THEORIES IN THE ASSESSMENT OF THE SCHOOL-BASED PART OF THE TEACHER EDUCATION PROGRAMME

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ABSTRACT

The purpose of this paper is to highlight how theories are used in assessment dialogues during the last period of a practical, school-based education. The result is based on 13 assessment dialogues conducted in the school-based part of the swedish teacher education programme and where one of the course objectives is to "in a scientific way, analyse teaching situations based on learning theories". The assessment dialogues were analysed drawing from Bernstein's concepts of 'classification', 'framing', and 'horizontal and vertical knowledge'. The result shows that theories are used in an instrumental way to legitimise what is considered the "right way" to teach. Only in a minority of the assessment dialogues students are expected to use theory as an analytical tool and critically examine their teaching practice. Although the swedish teacher education have been an academic education for 40 years, the reproductive elements still appear clearly today. If a professional approach presupposed to be based on theoretical reasoning, then the normative use of theory bocomes problematic.

RESEARCH BASED TEACHER EDUCATION

The development of an abstract theoretical knowledge base is regarded as a key characteristic of all professions (Abbott, 1988, Evans & Donnelly, 2006). It is argued that teaching is a complex activity and teachers need to theorize about their practice in order to enhance their professionalism (Cochran-Smith, 2004). This presupposes that teachers have access to intellectual tools to develop their thinking about teaching and school activities. Swedish teacher education was formally incorporated into

higher education in 1977. The academisation of teacher education was intended to develop the professionalism of teachers and contribute to professional practice by ensuring a critical attitude towards both current knowledge and practice (Goodwin, 2009). However, research-based education requires that the scientific foundation for education is made visible so that students can integrate a scientific and critical approach into their professional skills. To find out to what extent the Swedish teacher education programme is considered to be research-based, the Swedish Research Council conducted a survey of course literature on the national level. The results show that research genres are represented in teacher training differently, and teacher educators and students perceive the education to be largely research-based because the course literature is based on research (Wahlström & Alvunger, 2015). However, it is not enough to simply study literature lists to determine the issue how students meet and use the research included in the programme. Attention must also be given to how the teacher educator presents different theories and design assignments in which students are expected to apply a scientific approach.

Tuomi-Gröhn & Engeström (2003) indicates that the relation between theory and practice is a question about a transfer in process of learning and shows how different learning arenas generate different perspectives but not automatically just because the education implements in different contexts. Knowledge acquired by students at campus must be recontextualized and interpreted to become useful in practical work. How the education, the supervisor and the university teachers facilitates the students' boundary crossing and develop their abilities to recontextualize knowledge between the contexts of education and professional practice seems to be crucial for enabled skills and abilities.

Research shows that in teacher education, the link between general academic knowledge and more school-based contextual knowledge is not made visible for the students (Jedemark, 2007; 2015; Hegender, 2010; Smeby & Heggen, 2014, Sjölie, 2014), no or sporadic reference or access to literature or theories in the campus based part of the education (Jedemark, 2007) and seminar discussions about students' experiences from the school-based training often lack of references to research or theory and the students have great difficulties transforming theoretical knowledge into pedagogical strategies (Gustavsson, 2008; Nilsson, 2008). Students' motivation for their chosen teaching strategy is seldom based on theoretical concepts (Ottesen, 2007). The assessments focus mainly on the relational, emotional and caring aspects of teachers' skills, although the formal learning objects also include other areas (Goodwin & Oyler, 2008; Fernandez & Erbilgin, 2009)

Studies show that assessment has a major impact on student learning (Ramsden, 2003; Segers, Nujhuis, & Gijselaers, 2006) and that assessment determines what constitutes the course's actual syllabus (Marton, 1997; Ramsden, 2003, Sambell & McDowell, 1998). Research on assessment and grading in teacher education has mainly highlighted the university-based part of teacher education (Darling-

Hammond & Snyder, 2000), and studies of assessment within the school-based part of the teacher education are rare (Goodwin & Oyler, 2008; Hegender, 2010). The assessment has multiple functions, including giving feedback to the students and the staff who run the courses in addition to granting qualifications to the stakeholders and future employers. Therefore, there are severeal reasons to draw attention to issues relating to assessment and examination on the the school-based part of the teacher education (Goodwin & Oyler, 2008; Kennedy, 2010; Raths & Lymna, 2003)

PURPOSE

The purpose of the study is to highlight how a theoretical approach is used in assessment dialogues during the practical, school-based period of teacher education. To distinguish what is addressed in the assessment dialogues and how research-based knowledge and abilities are expressed, the data have been analysed from three questions:
  (1) How are different assessment dialogues implemented?
  (2) Which theories are used to analyses teaching situations in the assessments dialogues?
  (3) How are a theoretical approach expressed in the assessment dialogues?

DATA COLLECTION AND ANALYSIS

The study is based on an analysis of 13 assessment dialogues conducted at the third and final period of the practical, school-based training course in the teacher education programme. The school-based training is five weeks long (7.5 credit points) and the teacher students receive graded marks. The course module has three learning objectives:

> The independent and goal-oriented planning of teaching situations
> and taking responsibility for all teachers' duties.
>
> In a scientific way, analyse teaching situations based on learning
> theories and thereby critically relate to the teacher's assignment
> as well as their professional role.
> To have developed a professional approach in their profession by applying
> professional language and professional ethics in the practical, school-based
> training.

Three examiners were asked to record five assessment dialogues each. The assessment dialogues have been transcribed verbatim, read through several times with the aim of revealing variation in the ways in which the various content was delimited and noted without a predetermined sorting into categories. The first

research question about the implementation of the assessment dialogues has been answered with help of Bernstein's concept framing. 'Framing' is a key concept which provides information about who – teacher, supervisor or student – has control of what is discussed and what is seen as valid and relevant to consider. Bernstein's concept of 'classification' and his distinction between 'horizontal knowledge' and 'vertical knowledge' (Bernstein, 2000) have been used in the analysis to answer the second and third research questions about which theories are used to analyses teaching situations and how a theoretical approach are expressed in the assessment dialogues. Bernstein's concept of 'vertical knowledge' can be described as abstract, conceptual and theoretical. Through its general character, skills can be used in different contexts and to answer questions about *how* and *why* something is. Vertical knowledge is a prerequisite for analytical thinking and can prepare one for a life with the ability to identify, formulate and solve problems. The concept of 'horizontal knowledge' is designated as local, segmented and contextualised everyday knowledge that gets its meaning in relation to specific uses and practices that answer questions about *what* it is (Bernstein, 2000). The concept of 'classification' is used to study the ways in which different content emerges and are made visible. In this study, the term 'classification' is used to visualize how the horizontal knowledge and vertical knowledge is expressed in the assessment dialogue and how boundaries between the two types of knowledge are established and exceeded in the different assessment dialogues.

As a result of this reading, various types of content could be discerned and thereafter formalised into a set of categories. The different categories were then analysed with respect to the content of the assessment, how this content was treated and who was active in the dialogue.

FINDINGS

The assessment dialogues take place after the student has completed a lesson or activity. What is noted in the dialogues provides information about what the examiner regards as relevant for the assessment of the student's knowledge and professional approach. In the analysis of the dialogues, attention is paid to the variation in content. From the data, six categories have been identified: (1) Information about the assessment, (2) Reporting, (3) Evaluation, (4)Reflection, (5) Ideological valuation and, (6) Analysis.

The distribution of content varies vary, however, between the examiners, but not in relation to a variation of student's vocational orientation (pre-school – secondary school). In the assessment dialogues, there is no or rarely expressed expectations – or requirement – for the students to use different theoretical perspectives to analyse the teaching practice as such In nearly half of the assessment dialogues, references to theories occurs none, or just one or two times, which corresponds to 5–8% of the

entire speaking time. Different learning theories names as the starting point for teaching, but in the dialogues, only the socio-cultural theory is noted. It is the examiner, rather than the student, shows how a certain type of teaching can be motivated based on the theory. When the student does not apply what the examiner regards as the correct theory, the examiner corrects the student and shows how the student is expected to reason.

In the majority of assessments dialogues reflection occupies a great part of the assessment dialogue, but with no requirement to motivate the position based on theories or scientific studies. In two of the assessment dialogues, only two types of content occur: *evaluation* and *reflection,* while in four of the assessment dialogues, no content can be categorised as *analysis*. The *ideological valuation* takes place only in the dialogues conducted by Examiner 3, and two of these assessment dialogues only have content that can be categorised as *ideological evaluation.* The examiners ideological valuation focuses what should be regarded as ideal and correct teaching without any reference to theoretical perspectives or research, but no content that can be termed *analysis*. Analysis occurs to the greatest extent in the assessment dialogues conducted by Examiner 2.

A theoretical approach are used in two different ways:

(1) As an instruction manual for the correct way to teach

Strong classified assessment dialogues are characterised by a strong communicative framing. The roles are clear: it is the examiner who asks questions and corrects the student when the answers are not considered satisfactory. In this assessment practice, it is not primarily about the student's ability to *analyse* teaching in relation to learning theories which is examined, but rather it is the student's ability to *motivate* her teaching design based on theories of learning which is key here. Although the students often state that they apply different theory in their planning, the examiner leads the dialogue to make it clear that the student is expected to use one special theory, socio-cultural theory, in their teaching planning. In this assessment practice, socio-cultural theory becomes key in evaluating the lesson. According to Bernstein (2000) vertical knowledge answer questions about how and why something is. However, it is not apparent from the dialogue why the socio-cultural theory was the most relevant theory. The theory is used as an instruction, a manual for 'correct teaching' rather than as analysis tools to critically review the relationship between the intended learning outcomes and how the teaching is conducted. Therefore, the dialogues are conducted mainly within the horizontal knowledge. The vertical dimension of knowledge thus risks being lost and the dynamics between the vertical and horizontal knowledge are not made visible for the student.

A strong classification between pedagogy and subject didactics makes it difficult to create assessment dialogues that move between the horizontal knowledge and vertical knowledge as stipulated in the syllabus. By the way the examiner categorises, the learning object and teaching methods are separated, and the

relationship between the two categories are not noted in the assessment dialogue. The teaching method constitutes the actual teaching objective, while the assessment is not focused on the skills and abilities that the pupils will develop based on the teaching.

(2) As an intellectual tool

In the assessment dialogues that can be said to be weakly framed in terms of communication the amount of time spent speaking is relatively evenly distributed between examiner and student. But the assessment dialogues is at the same time strongly framed according to the assessment; the examiner often refers to the syllabus and its learning objectives. In the assessment dialogues, the student is given the opportunity to reflect and analyse in relation to learning objects. The student is given the opportunity, with help from the examiner, to analyse the relation between the intended learning goals and how the teaching method has created the conditions for pupils to achieve the intended learning goals. Here, a link can be found between horizontal knowledge and vertical knowledge, where the learning object is related to the teaching object.

CONCLUDING REFLECTIONS

When researchers describe teachers' professional knowledge, these descriptions often contain knowledge with a scientific basis (Darling-Hammond, 2008; Lawson, Askell_Williams & Murray-Harvey, 2009). Although the learning objectives in the syllabus require both analysis and critical review, only in a minority of assessment dialogues are students expected to use different theories to analyse and motivate their chosen teaching design. The results show that the students are expected to show how theory is applied in practice rather than use theories to analyse the teaching practice as such. The socio-cultural theory risks being used more like an ideological tool than as an analytical tool to review and develop the curriculum in the local school activity.

These assessment practices differ from the university's critical tradition. The transfer between different educational contexts, the campus-based part and the school-based part of the teacher education, thus becoming more limited – if they take place at all. This is in line with Gustavsson's (2008), Nilsson's (2008), Hegender's (2010), and Hatlevik and Smeby's (2015) results about how, in the practical, school-based training, the students' experiences often lack any reference to research or theory. Thus, the link between general academic knowledge and more school-based contextual knowledge is missing or not made visible by the students or the examiner. The dynamics that exist between horizontal knowledge and vertical knowledge risk being lost, along with the possibility to deepen teachers' professional skills.

The assessment dialogues are realised in the form of different practices where different acts and tools are employed to choose, formulate and develop different assessment. The assessment that is chosen and how this content is shaped in the assessment dialogues are to be understood from how the university teachers conceptualise their task of assessing future teachers. The university teacher has a

central significance for what knowledge and values are made possible for the student to learn during their practical, school-based studies. The study shows that how the university teacher designs the assessment dialogue is crucial for what is visible and in what ways and to what extent the teachers student is given the opportunity to demonstrate the ability to analyse and critically review his own teaching practice. The academisation of teacher education raised great hopes and was intended to develop the profession and also counteract normative attitudes (Fransson, 2009; SOU 2008:109). This study shows that although teacher education has been an academic education for 40 years, the reproductive elements still appear clearly today. If a professional approach means that reflection and evaluation is based on theoretical reasoning, then the normative use of theory becomes problematic. This presupposes that teachers have access to the intellectual tools to develop their thinking about school activities as well as good preparedness to act in relation to pupils' changing prerequisites. More attention must be paid to how the teacher educator facilitate the students' recontextualising between different contexts. It appears to be crucial for the kinds of skills the students have the opportunity to develop.

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NON-DIGITAL GAME-BASED LEARNING: THE DESIGN AND IMPLEMENTATION OF AN EDUCATIONAL ESCAPE ROOM IN HIGHER EDUCATION

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ABSTRACT

Education is moving slowly but surely into the 21st century and as it does educators in higher education need to look for ways in which to develop the competencies that today's students will be called upon to use in their future professional lives. Developing such competencies calls for innovation in educative practice, sometimes pushing the boundaries. This paper looks at non-digital game-based learning as a way in which this can be successful. An educational escape room was designed for third-year Bachelor students working on their final dissertations (n=20) in order to explore the process of reviewing the literature. Findings, going from the creation to the use and impact of the escape room are presented. The entire process is detailed, and the student feedback analysed. Finally, suggestions for educators interested in pursuing this path are provided.

INTRODUCTION

Educational paradigms are currently undergoing change and this due to several factors. Two of these, and not the least of which, are: ease of access to information and the evolving time-distance conundrum. The impact on student motivation and engagement is unequivocal. Without entering into the intrinsic versus extrinsic motivation debate, the onus in the Western European higher education classroom is largely on the shoulders of the educator to provide motivation and provoke the kind of engagement that will result in learning. Game theory gives us some insight into student perceptions (Barata, Gama, Jorge, & Gonçalves, 2013; Cheong, Filippou, &

Cheong, 2014), on how participation might be improved. Within the realm of games, one finds serious games, simulations and more recently classroom escape rooms. This practice-based research focuses on the latter for the development and implementation of an escape room.

LITERATURE REVIEW

The past few decades have seen a number of instructional design initiatives aimed at diversifying and ultimately improving learning (Barata et al., 2013). These include forays into blended learning, flipped classrooms, and MOOCS among others. Yet surprisingly as it may seem, much of what is proposed stops short of "any further efforts to make the experience more engaging and rewarding for the students" (Barata et al., 2013, p. 1). Other techniques, however go further looking at how instructional design can impact student motivation and engagement. One of these, which has provided the background for this research, is that of gamification.

Gamification

The concept of applying game principles and design elements to learning has become increasing popular in the past ten years (Cheong et al., 2014; Deterding, Dixon, Khaled, & Nacke, 2011; Kapp, 2012). At the start the focus was on "the use of video game elements (rather than full-fledged games) to improve user experience and user engagement in non-game services and applications" (Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011). Interest grew, however, and the idea of gamification went past the use of video to spill over into areas from business to education in the hopes that for the user, whether customer, client, or student, engagement would increase (Deterding, Dixon, et al., 2011; Zichermann & Cunningham, 2011).

With this increase in interest came a need to define what exactly gamification and game elements were. One of the most frequently referred to definitions in the academic literature is that of Deterding et al. "gamification is the use of game design elements in non-game contexts" (2011, p. 10). A subsequent analysis provided by Groh (2012) draws largely on this same source (Deterding, Dixon, et al., 2011; Deterding, Sicart, et al., 2011). As gamification, or at least the use of the term, has entered into other circles, see for example Huotari and Hamari (2012) who look at gamification in relation to services marketing, Deterding et al. go one step further suggesting that it might be more appropriate to use the term 'gameful design' (2011, p. 13). By this they suggest that gamefulness can be seen as a complement to playfulness in the way it is now being used for the design of the overall experience. This idea of overall experience has in turn led the way to the gamification of learning. The underlying idea being "to stimulate the same motivation and engagement that

gamers have towards games in learners towards education" (Cheong et al., 2014, p. 233). One direction that this has taken has been the development of pedagogical escape rooms.

Escape rooms

Escape rooms have become popular in recent years, after the introduction of first video escape game *Crimson Room* in Japan in 2004 by Toshimitsu Takagi (Lock Academy, undated), the concept was adapted for use in a live escape room in 2007, also in Japan. From there the trend spread across Asia, Europe and North America. After their initial use, primarily as a leisure activity, escape rooms began to make their way into the classroom and are now increasingly used as a pedagogical tool. One can say that an escape room "follows the principles of gamification wherein the features of games (e.g. rules, challenges, immediate feedback, permission to fail) are applied in contexts normally not associated with games and play" (Carrion et al., July 2018).

This type of activity is meant to be used with one or more teams and is conducive to the development of soft skills (Clarke et al., 2017) such as collaboration and team-work (Zhang et al., 2018). An escape room can also be used in preparation for a more technical exam (Carrion et al., July 2018; Vörös & Sarkozi, 2017).

Given the versatility of an escape room it seemed an obvious choice for this project. The objectives were two-fold: to find a way in which to increase both student engagement and motivation in the dissertation process with a focus on the development of a literature review and at the same time develop their research skills. In order to reach these objectives, the design of a bespoke classroom escape game was called for after which the practice-based research questions addressed were:

a. To what extent might the use of a classroom escape room increase student engagement / motivation?
b. Can a classroom escape room help to develop students' online research skills related to the use of:
   i. Article search
   ii. On-line libraries
   iii. Data-base usage
c. What were student perceptions of game-based learning in this specific context?

METHODOLOGY

Three basic action research steps: *intention*, *action* and *review*, (Dick, 1993; du Preez, 2011), all of which are detailed below, were followed in the construction of this project. A Business school at the University of Applied Arts and Sciences of Western Switzerland (HES-SO) was the field with the sample being third-year Bachelor degree students (n=20). Data collection was carried out in a Bachelor Dissertation Workshop part of an optional series offered to third-year students. Attendance for these workshops was, unfortunately, very low with sometimes less than ten, out of a possible 50, individuals signing up.

The research design went through two main phases. The first one called for the design and development of a pedagogical escape room where the literature on educational game design proved to be invaluable (Annetta, 2010; Arnab & Clarke, 2016; Clarke et al., 2017; Nicholson, 2015). The process of designing the escape room prior to its implementation, all part of the *intention* phase, went through several key steps, explained below.

Intention: Designing the Escape room

As mentioned previously, the intent was to increase student engagement and motivation all the while developing their research skills. To this end it was decided that an escape room format might not only provide an answer but also increase attendance.

An escape room implies the creation of puzzles to be solved by the participants and, its design calls for going through a number of steps as set out below. One thing to keep in mind is the path of puzzles that will be created. There are three main options: a linear path, an open path or a multi-linear path (Wiemker, Elumir, & Clare, 2015). This means that in the case of a linear design the puzzles must be solved one after the other; in the case of open design the puzzles can be done in any sequence but generally lead to a final 'meta' puzzle which integrates solutions already found; and in the case of the multi-linear path a combination of the previous two. In the case of the pilot class it was planned to have three different scenarios going on simultaneously and so the first option was chosen as the simplest. Once that was set, the first step was to establish the objectives.

1. Objective setting

Probably the most important of all the steps is that of setting the objectives. In the case of this project the theme of the escape room was reviewing the literature. The sample comprised students in their 3rd year of study just starting on their Bachelor dissertations. Despite the project work and on-line research called for throughout the programme, information-seeking remains key albeit often under-developed,

competency for the successful completion of a dissertation. Closely linked to information-seeking are related competencies including those of critical thinking and problem-solving. Finally, it seemed appropriate to encourage collaboration through the implementation of a team activity.

For each objective there was also the question of what skills the students were expected to put into practice as shown below in Table 1.0.

Table 1
Objectives and skills to be put into practice during the Escape room

Objectives	Skills called upon
Use of the internet as a search engine	Problem solving
Use of the school library web-site	Information-seeking
Use of the on-line data-bases	Critical thinking
Team activity	Collaboration

Having established what the students would be expected to do the next step, and not the least, was to imagine a way in which to link these activities together whilst at the same time familiarizing students with the skills that they would need for the literature revue component of their dissertation. Which takes us to the next step.

2. Scenario creation

Escape rooms, whether pedagogical or just for fun, tend to have a theme or a story line running through them which not only adds interest but links all the pieces of the puzzle together for the participants. In order to come up with a suitable scenario the starting point was previous student dissertations. Three topic submissions from previous years having to do with marketing, strategy and, human resources, were chosen. These provided the basis for the three scenarios that were then developed.

3. In search of clues

Once the outline for three separate scenarios had been done, the next step was to think of what kind of clues would allow the students to use the skills that had been identified as desirable. As an example, if one takes the case of the strategy scenario, is that students were told that they would need to find a management guru to help them. They had been given a basic instruction from the start that the workshop would call essentially for on-line searching coupled with clues in the room itself. An on-line search gave rise to many gurus but only one born on the day on the birthday card and having the correct name. In order that they narrow down the search, one clue in the team area was a birthday card with the person in question's first name and just the day of his birth e.g. May 24th on it.

4. Consider lock options

As things start to come together, one must think about lock combinations, what numbers, colours or symbols might be used. To continue on with the same example a four-number lock was used and the combination that the students needed to find was the management guru's birth year. As this was not on the birthday card, nor directly on much of what was found on-line finding the answer called for both further search strategies and team collaboration. It is important to think about what type of clue for what type of lock. If one is going to be using symbols, shapes or colours it is important to keep this in mind from the start.

Action: Taking it to the classroom

Information was sent out to the students that a workshop related to reviewing the literature would be held and that it would be in the form of an escape room. Although the workshop was optional, sign up was mandatory with a maximum of twenty places available. Success! The workshop filled up quickly and was carried out successfully. In order to finalize the activity, step 5 of the escape room design process was conducted immediately after the escape room activity but still during the allocated class time.

5. Extend with follow up activities

In the above example one can see how one group of the students started out by searching for management gurus online. They must work together as a team in order to figure out which guru is the one that they are looking for. This starts them down the path of searching for something precise online whilst collaborating.

It is of utmost importance to extend the escape room experience with follow up activities so as not to leave too much of a game connotation in the minds of the students and in order that the skills be really put too use. In the case of this example the action of searching was gone over, students were asked how they had gone about their search, what worked and what did not. This was just the first clue in one of three scenarios. The debriefing, which covered much of what had been done during the escape room, took a considerable amount of time yet was invaluable.

FINDINGS

Results from this pilot class, based on classroom observation, discussion with the participants, and followed up with a short feedback questionnaire support the idea that:
- Student perception of the use of game-based learning was positive;

- Such as approach can make a difficult or uninteresting subject easier to present;
- Student motivation to come to an elective workshop was positively impacted.

The findings were compiled before being coded and clustered resulting in three axes of interest for a future iteration and in relation with our research questions. Some of the most representative comments from the questionnaires and the debriefing sessions are shown below:

Impact on motivation or an "Attention getter"

Keep the idea of an escape room to introduce the subject
It got me to sign up
I ended up doing things that I had not done before
I liked doing things differently
It was good to work as a team
Could have spent more time on it
Needs to be more developed, why did we do this?

Despite being an *attention getter* it was interesting that the students had high expectations on both the 'wanting to have fun' as well as the learning fronts. In other words it is not enough to get them into the classroom if one hopes that the skill and competency development road that the students have been sent down does not come to a dead end.

Impact on online research skills

Made me use new resources
I used the library data-base for the first time ever
Would have been good to have done this earlier on
Becoming aware that this kind of thing takes practice
Difficult to see the link to my topic
I didn't know we had access to those articles

Whether there was any impact on research skills in the long term is impossible to say. What is clear is that the students did engage in practices that were, even at this stage of their education, new for some. This suggests that such workshops need to be held early on in the curriculum and perhaps with greater frequency in order to ingrain some of these competencies in the students learning approach.

Student perceptions of game-based learning in this context

Fun to do things differently
Need to make the link to the dissertation process clearer
More time needed after the activity for follow up
Not clear how this will help me with my dissertation

Was not at all related to my topic

From the above comments it became clear that insufficient time had been allowed to debrief and go over the what and the why of the exercise. For a future iteration this will definitely be taken into account.

DISCUSSION

The literature often provides educators with suggestions on the use of various tools but addresses the question of their creation or successful implementation much less frequently. The scenario-based approach taken here shows how a particular tool, in this case an escape room can be used to:

- Develop selected competencies;
- Motivate students to work on a subject in which they often have little interest
- Push students to go past the basics.

Findings from the pilot class suggest that an escape room can indeed engage students and encourage the development of selected skills. The design and implementation of an escape room is extremely time-consuming but allows for the creation of a bespoke game which can, in many instances, be used over again. There are also a number of options now available commercially, however, the choice of scenarios for those in higher education is rather limited. In this case not one classroom escape room relating to reviewing literature was found. It is worth noting, however, that many of the free online games are worth looking through forgetting ideas.

The findings presented here address the issue of innovation in education as a means to improve student motivation and engagement. They suggest a way in which educators can add value to the classroom experience for their students based on actual practice. Emerging issues that we are dealing with today are related to changing student expectations of what the higher education classroom should offer. Clearly students want added-value from attending classes otherwise, in many instances, there is no need to come on campus. What is suggested here not only increases student involvement but is collaborative and practice-based and can positively impact the learning experience.

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THALES™ C & M
NEW PROGRAMME FOR THE DEVELOPMENT OF SKILLS AND ABILITIES IN MATHEMATICS: CASE STUDY

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ABSTRACT

This case study presents the THALES method, evaluation and the results of an experimental application of a new model for the development of analytical thinking and competence as well as communication skills in students of age 8-15 in the subject of Mathematics. The experimental results show significant improvement in the performance of the students who participated in the experiment. The method and experimental results are described. The experiment is taking place since 2017.

INTRODUCTION

This paper presents the THALES method, evaluation and the results of an experimental application of a new model for the development of analytical thinking and competence as well as communication skills in students of age 8-15 in the subject of Mathematics. The experimental results show significant improvement in the performance of the students who participated in the experiment. The method and experimental results are described in this paper. The experiment took place in the year 2017 and in 2018.

Thales is an innovative model programme that aims to develop student's skills in mathematics as well as the deductive ability between the ages of 8-15. The aim is to stimulate the interest of students of all potentials and to help them develop analytical thinking. Related training meetings are adjusted to the knowledge and needs of the particular student or small group of students. The programme follows its own philosophy and differs from the usual practice of teaching Mathematics which is lecture-explanation-practice-memorization and focuses on exploration-understanding-implementation-review.

We accept the standard definition of analytical thinking to be "the critical component of thinking that gives to an individual the ability to solve problems quickly and

effectively. It involves a methodical algorithmic approach to thinking that allows you to break down complex problems into single and manageable components".
The student, in order to acquire the mathematical knowledge, should be involved in a discovery process and not memorizing mathematical formulas. At the experimental stage the Thales Programme and method is applied to small groups according to their results in the THALES test, usually up to 3 people of the same test result.

THALES TEST

This test is developed to correspond to four levels based on the age groups 8-9, 10-11, 12-13 and 14-15. The Test was developed with the collaboration of the THALES Foundation and the ISON Psychometrica organization as an online item bank of problems/questions. The online item bank generates two different tests with 20 random questions each. The completion time is 10 minutes for Thales C, with the letter C standing for Competence and 12 minutes for THALES M with the letter M standing for Mathematics. The item bank was normalized through a Cyprus national sample of 1000+ students of ages 8-15 in 2014. Each new student who is taking a test is added to the norm.

Description of the Tests

Thales™C: It refers to the deductive ability, which is the ability to organize and systematize data in order to arrive to conclusions. It is related to the learning potential, namely the ability of people to acquire quickly new knowledge. The test attempts to capture the ability of the learners to generalize the changes they find in functional principles, in which they are asked to be able to apply according to the data presented. Complexity increases with the aim of increasing the difficulty in the reasoning that the examinee needs to do in order to find the right answers.

Thales™M: It refers to the inclination in mathematics and mathematical skills which refer to the understanding of mathematical relationships and the ability of perception of numerical concepts. The importance of this factor lies in the fact that one can be trained to improve his/her performance. Thus, Thales™ M can be used to identify educational needs. The test is achieved by recognizing the ability of the examinee to solve mentally and with high speed numerical problems.

By "aptitude" we mean the predisposition of one to acquire through education a specific knowledge or skill. Aptitude is a result of a complex interaction of heredity and the environment, and can be considered as a skill in progress. The tests measure a particular inherent ability, the aptitude to perform certain functions needed in some professions and life in general. It is important to remember that with these tests only

one area of potential was examined for the participant. Many other skill areas, which may be their strong points, have not been included in this test. Also, as we all know, all skills are improved with practice. The methodology used for the development of the THALES test with the collaboration of ISON Psychometrica is found in a related literature that is listed in References in this paper.

THE EXPERIMENT

The experiment was designed to experiment the ability to improve mathematical skills and analytical ability when the deductive ability is high. Thus, four students with high deductive ability were selected, the first student was 10-11 years old and the second 12-13 years old, the third student was 10-11 years old and the forth student also 10-11 years old. They were also given the THALES M test in which their performance was relatively low. The experiment consisted of a total of 20 training meetings with a duration of 60 minutes each for the first two students in year 2017 and a total of 14 training meeting with a duration of 60 minutes each for the third and fourth student in year 2018. After the completion of half of the meeting (10 meetings in 2017 and 7 meetings in 2018), THALES C and M tests were administered again. The tests were again administered after the completion of the 20 meetings in 2017 and of the 14 meetings in 2018. The results are presented below.

Characteristics of the Experiment

The three factors on which the 20 training meetings(2017) and the 14 training meetings(2018) were based on and their content are described below. The content that was used for the training meetings was taken from different publications which are listed in the Reference list of this paper.

The training meetings as well as homework were based on three learning and training factors, the development of skills for word problem solving in mathematics, the development of memory and speed and the development of mathematics communication skills. Students were taught to analyze verbal problems and practiced for it with homework which they had to present themselves and explain orally in front of the teacher.

The aim was to convince the student that mathematical knowledge has to be discovered and has to be communicated to non-experts. The training took place in a pleasant environment with the use of new technologies and internet. Additionally, an opportunity is given to engage mathematics through games.

Factor1-Word Mathematical problems and Communication

The word problems helped the students to develop their analytical and critical thinking as well as their modeling skills, meaning the transformation from word to symbolic algebraic or symbolic representation mathematical problem.

For the problems that the student was given to do at home, it was expected of him/her to explain and present the solution in the classroom and answer questions by the teacher(s) and sometimes other students. This has helped both in-depth understanding and exploration of the word problems as well as in the development of communication skills for mathematics and science in general.

Factor2-Short solution Mathematics Problems

These are mathematical problems whose solution can be found orally or graphically, meaning there is very little use or no use of writing and the student is asked to respond quickly, smart and correct. This is applied with problems which can be solved without doing much calculations and sometimes the answer needs to simply be estimated that lies between two options. Problems like this are based mainly on logical and oral thinking. For example, these include among others problems relating to patterns, backward induction, or even a random prediction and then verification.

Factor3-Memory enhancement exercises

For this purpose there are many different memory exercises that can be found on the internet. These are just applied with an approach of success and performance motivation from meeting to meeting in order to develop memory ability which can be helpful to the learner in increasing the speed of thinking and speed of solving word problems. Good memory is useful for the analysis of word problems.

Duration and Structure of the Programme

The programme in 2017 consisted of 18 training meetings of 60 minutes each plus 2 meetings of group presentations for problem solving and discussion. In 2018 there were 14 meetings with presentation and discussion taking place in almost every meeting. Meetings can be held once a week or at most twice as an accelerated programme. The programme could last up to 20 weeks with one hour of meeting per week but could also be completed in 10 weeks with two different (non-consecutive) meeting hours per week or 14 weeks and 7 weeks relating to the 2018 format. For each student, a relevant recording of work and evaluation calendar was completed for each meeting. When the student completed successfully the programme for a certain level then s/he can start over again on the next level.

THALES Test Results and Conclusions

Student 1 was 10-11 years old and student 2 was 12-13 years old

2017 Results before the programme started

	Thales™ C			Thales™ M		
	Answered	**Corre ct**	**Grade**	**Answered**	**Corre ct**	**Grade**
Student 1	20/20	20	10	14/20	8	5/10
Student 2	19/20	18	9	8/20	3	3/10

2017 Results after the first 10 meetings

	Thales™ C			Thales™ M		
	Answered	**Corre ct**	**Grade**	**Answered**	**Corre ct**	**Grade**
Student 1	20/20	19	10	20/20	13	7/10
Student 2	20/20	19	10	18/20	5	3/10

2017 Results after the 20 meetings

	Thales™ C			Thales™ M		
	Answered	**Corre ct**	**Grade**	**Answered**	**Corre ct**	**Grade**
Student 1	18/20	18	9	19/20	11	6/10
Student 2	19/20	18	9	19/20	18	9/10

2018 Results before the programme started

	Thales™ C			Thales™ M		
	Answered	**Corre ct**	**Grade**	**Answered**	**Corre ct**	**Grade**
Student 3	18/20	18	9/10	10/20	2	2/10
Student 4	19/20	18	9/10	12/20	3	2/10

2018 Results after the first 7 meetings

	Thales™ C			Thales™ M		
	Answered	**Corre ct**	**Grade**	**Answered**	**Corre ct**	**Grade**
Student 3	20/20	19	10/10	20/20	7	4/10
Student 4	20/20	20	10/10	18/20	6	3/10

2018 Results after the 14 meetings

	Thales™ C	Thales™ M

	Answered	Correct	Grade	Answered	Correct	Grade
Student 3	18/20	20	10/10	20/20	12	7/10
Student 4	20/20	20	10/10	19/20	16	8/10

Results of THALES C show that the four students have high competence skills from the very beginning until the end of the programme. Results of THALES M in the tables above indicating before the programme started, show weakness of all students in mathematical ability and speed. The results in the tables above showing the progress in the half of the programme and later after the programme ended, indicate substantial increase in mathematical ability and speed.

Differentiation of the speed growth rate for different ages or gender is not analysed at this stage.

The results show trends suggesting that the method and this proposed programme and experimentation could bring positive results. The experiment is undergoing application on a larger scale, like students with lower ability showed in THALES C in order to determine if the programme can contribute to the development of general competences and mathematical skills at the same time.

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HOW CAN HOMEWORK SUPPORT STIMULATE SELF-REGULATED LEARNING?

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Abstract

Homework support has rapidly grown since the turn of the century. As a result homework
institutions have to consider how they can deliver and maintain high quality services focused on better study skills of students on the one hand and better study results of students on the other hand. Studiekring delivers homework support and subject specific tutoring. This research focuses on the question how homework supervisors at Studiekring can improve their teaching practices.
The study connects the concept of autonomy, derived from self-determination theory to self-regulation regarding cognition, metacognition and motivation. It focuses especially on supervisor interventions such as providing instruction and feedback.
This study has been conducted as a mixed method research, including semi-structured interviews among homework supervisors, a structured questionnaire among students and an analysis of the feedback given by homework supervisors to their students.
The results show that homework supervisors should give more focused feedback on the process and self-regulation level. In addition they need more knowledge about the use of different types of feedback. At last supervisors should focus their guidance on the cognitive as well as the meta-cognitive learning strategies and specifically on concentration as a motivational learning strategy.

INTRODUCTION

In the last decade emphasis on study results of students has grown. Parents and society have higher expectations and demand more from students (OECD, 2010). Parallel to this development in the Netherlands homework support has grown rapidly since the turn of the century (Berdowski, Berger & Bal, 2010).

Although The Dutch government did not have a deliberate policy for commercial homework support until 2013, the government facilitated homework support in making a budget available to parents. Since 2013 the government introduced a law on inclusive education, known as "passend onderwijs" (OCW, 2014). In accordance with the intentions of this law and to strengthen the special educational needs policies of schools, the government has shifted the budgets for extra support to the joint ventures of collaborating schools. In recent years Studiekring had a share in providing this extra support, because schools can decide to use the money meant for "passend onderwijs" by hiring services from Studiekring or other commercial partners. Studiekring explicitly chose to be a partner for schools in facilitating "passend onderwijs".

Meanwhile this development challenged Studiekring to professionalize the effectuation of the homework support. Studiekring already formulated a pedagogical model back in 2003. However, research showed that, within the framework of this model, the support of autonomy development could be improved (Krijnen, 2016). Besides, the supervisors seem to lack a clear understanding of how they can explicitly guide the development of autonomy of their students.

The main goal of this study is to determine what this autonomy exactly is, second how the development of autonomy of students can be embedded in the pedagogical model and at last how supervisors can explicitly guide the development of autonomy of students.

The Self-determination theory

Studiekring has founded their pedagogical model on the concept of self-determination theory (SDT) (Deci & Ryan, 2000). Deci and Ryan (2000) define three levels of motivation: lack of motivation or a-motivation, extrinsic motivation and intrinsic motivation. They discern three facilitating components which combined will result in different levels of motivation: *competence, relatedness* and *autonomy. Competence* derives from the feeling of being able to perform adequately during a learning activity. *Relatedness* refers to the sense of belongingness and connectedness to a person, and to the feeling of being respected and cared for by the teacher. Finally *autonomy* refers to the extent to which the student can control the regulation of his learning process and has the ability to think about the way he is learning (Deci & Rayn, 2000). In 2003 Studiekring developed the SMW-model ("studiekring manier van werken" - Studiekring way of working) based on SDT, to describe the facilitating conditions to motivate and stimulate students towards self-regulation as a more practice oriented model for daily use (Studiekring, 2015).

According to the SMW-model *competence* focusses on the cognitive skills the students need to acquire to full-fill his homework. For example, the students have to develop study-skills like *memorizing*, *analysing* and *summarizing*. Studiekring added one meta-cognitive skill to this component: *planning*. Studiekring supposes

that students, by learning these skills, get insight in the *how* and *when* of knowledge acquisition. Although one can say that by learning study-skills, the student can get the feeling of being competent, according to SDT competence is more than learning mere study skills. In SDT competence refers to "one's ongoing interactions with the social environment and experiencing opportunities to exercise and express one's capacities." (Deci & Ryan, 2002, p. 7) Though one can say that by learning study-skills, the student can get the feeling of being competent. *Relatedness* as seen by Studiekring, refers to the *learning-environment*. Studiekring aims that teachers creates a safe environment in which the student feels respected, and fits the definition as given in the SDT, though Studiekring added the categories *structure* en *physical environment*. These categories define the environment where the tutoring takes place. Finally Studiekring translated a*utonomy* into *independence*. Studiekring aims for development of self-knowledge and responsibility by tutoring on this component in order students to learn how they can regulate themselves. In the SDT autonomy refers to "being the perceived origin or source of one's own behaviour." (Deci & Ryan, 2002, p. 8) As such it includes making one's own interest and values the starting point for actions (Deci & Ryan, 2002). Studiekring tries to do this by setting personal goals with the student, though these goals are mainly connected to school. By consequence these goals may not be related to the personal interests of the students. Besides, Studiekring doesn't have a clear vision on how *independence* can be tutored. In general, whereas SDT emphasizes that competence, relatedness and autonomy are socially defined characteristics of the individual, the SMW model reduces these components to pragmatic and instrumental aspects of the learning environment.

Self-regulation

Ryan and Deci (2006) sharply distinguish between autonomy and independence, because in their view autonomy is by definition socially embedded, while independence is interpreted by them as free from constraints imposed by others. However, in this paper we interpret independence as more related to self-directed learning. Self-directed learning refers to the number and the kind of the decisions learners take regarding their learning process. In this process of decision making they can and need to be supported by others (peers, parents, teachers) (Van Hout-Wolters, Simons & Volet, 2000). Self-regulated learning can be explained as students who can independently and with own responsibility guide their own learning process (Boekaerts & Simons, 1995). It demands student to think about their own way of thinking or, in other words, addresses the meta-cognitive capacities of the student (Garner, 1987; Flavell, 1979). Since Flavell (1979) introduced the concept of metacognition it has been operationalized in different ways using terms like metacognitive- beliefs, awareness of knowledge, executive skills, learning strategies or self-regulation (Veenman, & Van Hout-Wolters, & Afflerbach, 2006). This arises the question how self-regulation is related to metacognition. Schraw,

Crippen & Hartley (2006) describe a model based on three sub-components of self-regulation: cognition, metacognition and motivation (see figure 1) . In this model metacognition is an aspect of self-regulation.
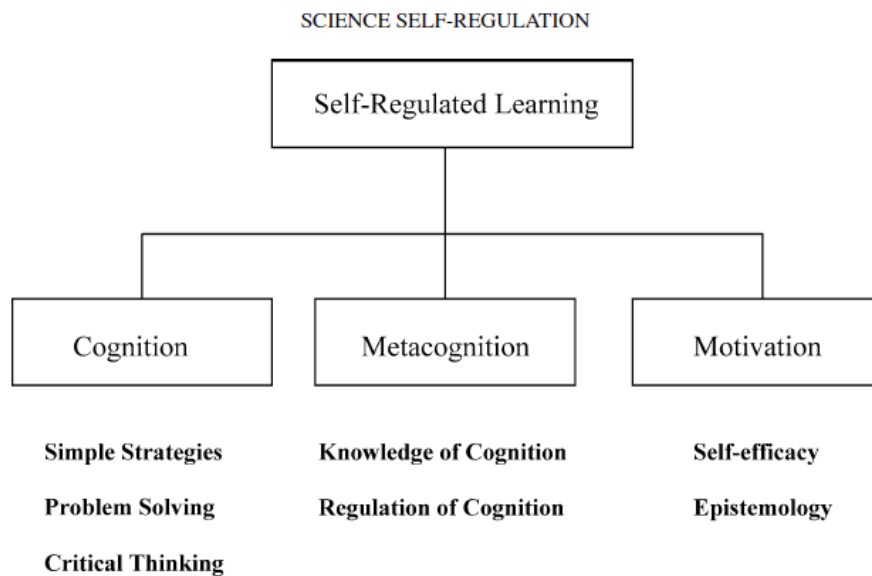
SCIENCE SELF-REGULATION

Figure 7 Components of self-regulation (Schraw, et el. 2006)

Cognition can be described as a mental action or process to gain knowledge and understanding by thinking, experimenting and experiencing (Pressley &McCormick, 1995). The obtained knowledge is divided in declarative, procedural and conditional knowledge (Schraw, 1998). Declarative knowledge refers to facts, definitions or descriptions. Procedural knowledge describes how to apply this gained declarative knowledge (Ryle, 1949). On a metacognitive level, declarative knowledge is knowledge about knowledge (knowing what you know) and procedural knowledge is knowledge about learning strategies needed to develop problem solving ability (Schraw, 1998). At a metalevel the student develops an understanding of what he needs to know, a so called Feeling of Knowing (Metcalfe & Shimamura, 1994).
The Conditional knowledge is about when, where and for what kind of reason declarative and procedural knowledge can be used (Garner, 1990) which can be described as metacognitive activity in itself (Flavell, 1979; Garner 1987). The challenge for the student at the metalevel of metacognition is the question of the way the knowledge is used also is effective, the Judgement of Learning (Dunlosky & Nelson, 1992).

Finally, according to Schraw motivation plays a role in self-regulation as well. In the context of metacognition, motivation is defined as beliefs and attitudes that affect the use and development of cognitive and metacognitive skills. Two subcomponents can be distinguished (Schraw et al, 2006): 1) self-efficacy, the belief of the student in his own capabilities (Bandura, 1977) and 2) epistemological beliefs, beliefs about how people come to know and about what knowing exactly is (Hofer & Pintrich, 1997). In the context of self-regulation it refers to students' understanding that having cognitive and metacognitive knowledge, enables them to regulate their own learning process. Besides, also the affective state of the student may influence motivation (Cross & Paris, 1988; Martinez, 2006), which can be connected to the component relatedness in SDT and to the importance of facilitating a safe environment and giving feedback.

Study skills for self-regulation

In order to achieve self-regulation the student needs to obtain study skills, as can be red in above paragraphs. Lai (2011) distinguishes three different kind of approaches. At first there are implicit or tacit theories. In this approach metacognitive processes are learned at an unconscious level by observation, modelling and imitation, at an unconscious level. Second, there are informal theories. In this approach knowledge, for self-regulation is fragmentary constructed, partly conscious, but there is not an explicit structure for organizing knowledge. And third, there are theories which are highly systematised and structured.

The cognitive study skills can be distinguished in subject specific cognitive strategies, like selecting and memorizing to develop declarative knowledge and more general cognitive strategies, like applying or critical processing to develop procedural knowledge (Boekaerts & Simons, 1995). Ten Dam & Vermunt (2003) discern cognitive, metacognitive and motivational study skills (see table 1). Note that the metacognitive skills are ordered according to the phases in the learning process, whereas the cognitive and motivational study skills are not. The use of the latter is depending more on the learning task respectively the state of mind of the learner.

Table 1
Cognitive, metacognitive and motivational study skills (Ten Dam & Vermunt, 2003)

Cognitive study skills	Metacognitive study skills	Motivational study skill
Memorizing	1 Orientating	Attributing
Relating	2 Planning	Motivating
Critical processing	3 Monitoring	Concentrating
Concretizing	4 Diagnosing	Judging oneself
Applying	5 Adjusting	Appreciating the will to learn
Analysing	6 Testing	Making efforts
Structuring	7 Evaluating	Evoking emotions regarding learning
Selecting	8 Reflecting	Generating expectations

Tutoring self-regulation

To develop self-regulation cognitive study skills have to be explicitly instructed. The tutor has to emphasize the way to use the strategies, and at which moment they are important (Schraw, et al., 2006). Metacognitive skills should be tutored at a metalevel to increase the awareness and mastery of control about these skills. Explicit instruction of each phase in the form of a checklist is most appropriate (Kuhn, 2000). From literature three fundamental principles can be derived: 1) metacognitive instruction has to be integrated in the instruction of disciplinary content 2) students have to be instructed about the usefulness and necessity of metacognitive activity in order to make the extra effort meaningful to them and 3) training of metacognitive skills has to be maintained over a longer period in order to secure sustainable application. (Veenman, Van Hout-Wolters, & Afflerbach, 2006). Metacognitive instruction at the beginning will be most effective when it is based on the direct-instruction model (Veenman, 2001) The teacher decides which skills the student have to learn and presents those skills by modelling (Van Gog, & Rummel, 2010). Only later on, the focus can be moved to self-directed learning, gradually shifting the levels of responsibility form the teacher to the students (Pearson & Gallagher, 1983). Finally, students learn independently with provided materials (Alfieri, Brooks, Aldrich & Tenenbaum, 2011). In this phase the teacher as well as the materials can provide scaffolding (Kostons et al, 2014). In tutoring self-regulation feedback plays an important role. Effective feedback is based on three

questions: 1) Where am I going, what are my goals (*Feed-up*), 2) How is my progress (*Feed-back)* and 3) How should I continue, what are the following steps (*Feed Forward*). These different forms of feedback can be related to for levels of the learning process: task-level, process-level, self-regulating-level, and self-level (Hattie & Timperley, 2007).

Research question

The main research question is: How can Studiekring improve the development of self-regulation of students during homework supervision?

This question is divided in three sub-questions:

1. Which cognitive, metacognitive, and motivational knowledge and learning strategies do students of Studiekring already use, according to their own insights, and those of their supervisors?

2. How do homework supervisors of Studiekring according to their own insights, offer students the cognitive, metacognitive, and motivational knowledge and learning strategies to support the development of self-regulated learning?

3. Which factors within the homework supervision inhibit or promote the development of cognitive, metacognitive, and motivational knowledge and learning strategies of students?

Conceptual model

On the next page is seen the theoretical approach in a schematic overview according the literature. The SDT has been used as the basis, just as seen in the theoretical approach. From the concept of self-regulation arrows are used to make clear which knowledge and skills the student need to obtain at object- level as well as at meta-level.
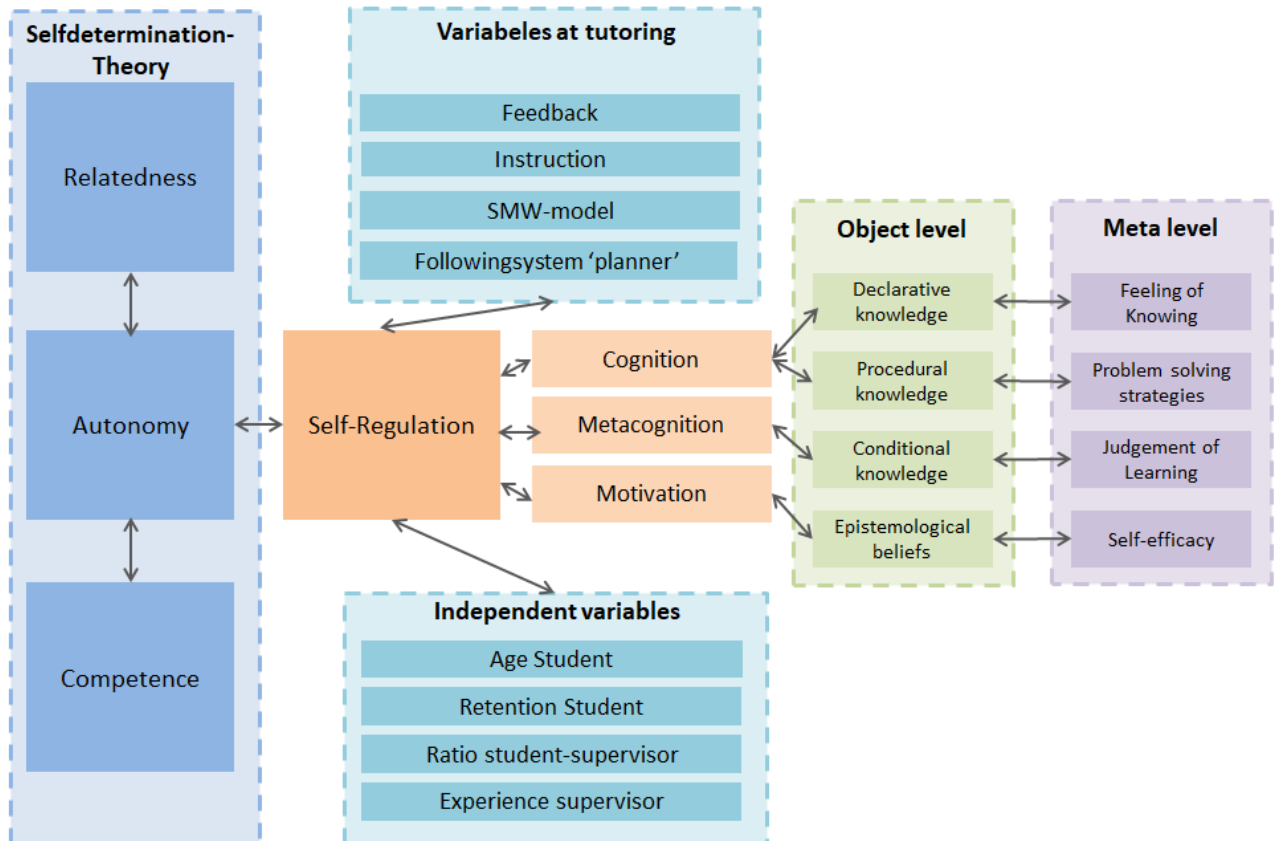
Figure 8 Conceptual model

Methodology

This study can be described as a mixed method research. In the quantitative part of the research students of Studiekring filled in a questionnaire to investigate which cognitive, metacognitive and motivational strategies they already use (sub-question 1). The questionnaire was derived and deducted from theory by the researcher and has a 5 point Likert-scale, knows as 1= always, 2= often, 3= regularly, 4= seldom, 5= never. An example of a question is: "*When I am learning for a test, I repeat the learning in more days, so I know the content better*". Testing the questionnaire on reliability showed a Cronbach Alpha of $\alpha=.89$. The questionnaire has been send to the students on behalf of the executive secretary and 280 (out of 1892) students filled in the questionnaire, which gave a reliability-level was 93%. The non-response can

be explained by from the size of the questionnaire or a lack of motivation of students to fill in a questionnaire. The outcome of the questionnaire was analysed using SPSS. Also feedback expressions of homework supervisors administered digitally to their students were analysed to answer sub-question 2 and 3. To analyse the feedback expression administered to the students by the homework supervisors in the digital following-system 32 homework supervisors were selected. The feedback expressions were labelled and processed quantitatively afterwards. In total 995 feedback expressions were analysed.

For the qualitative part of the research eight homework supervisors were interviewed using a semi-structured interview about sub question 1, as well about the way they support the development of self-regulation (sub-question 2) and about the factors at Studiekring that inhibit or promote the development of self-regulation (sub-question 3). To label the given answers of the homework supervisors a codebook was derived and deducted from the theory. Subsequently the interview data were analysed qualitatively using MAXQDA.

To ensure the external validity in both as well the semi-structured interviews as in the given feedback expressions the, the homework supervisors were selected by the quality manager of Studiekring to ensure the independence of the researcher. To ensure the internal validity of the research, every research instrument has been operationalized by using a operationalization schedule and three research instruments are chosen for making triangulation possible.

RESULTS

Sub-question 1 focusses on the cognitive, metacognitive, and motivational knowledge and learning strategies students of Studiekring already use. The results of the questionnaire show that students use memorising the most followed by analysing and applying as cognitive strategies to acquire declarative knowledge (see table 2). These results are confirmed by the outcomes of the interviews. Supervisors say to put emphasis on memorising, selecting, analysing and applying. One supervisor mentioned *"Memorising is important, so I say they need to cover the words to learn, and then to hear themselves"*. Another supervisor mentioned *"Especially the making of a summary. They never learned it"*.

Table 2
Most used cognitive learning strategies as perceived by students

Cognitive learning strategies	M (1-5)	SD	N
To memorise	2,02	0,79	236
To analyse	2,53	0,78	210
To apply	2,65	0,94	252
To select	2,71	0,86	280
To concretize	2,84	0,85	220
To process critically	2,88	0,74	244
To structure	2,98	0,88	232
To relate	3,16	0,89	280

* scale items (M) 1=high 5= low

Regarding metacognitive skills it appears from the questionnaire shows that *to reflect* is the most used strategy by students (table 3). On the contrary to plan is the most mentioned metacognitive skilled mentioned by supervisors, which is only fourth in the ranking of the students.   An experienced supervisor said "*planning, I think that is something I tutor the most in, so they learn to look ahead". Another e*xperienced supervisors adds to *monitor* and to *reflect.* Inexperienced supervisors don't name much metacognitive learning strategies, but when they do it is to test. One said "*by example to encourage them to make test questions themselves".*
Table 3

Most used metacognitive learning strategies as perceived by students

Metacognitive learning strategies	M	SD	N
To reflect	2,31	0,69	232
To monitor	2,42	0,79	236
To test	2,44	0,83	232
To plan	2,50	0,88	210
To evaluate	2,94	0,81	236
To orientate	2,95	0,85	280
To diagnose	3,01	0,74	252
To adjust	3,08	0,82	252

* scale items (M) 1=high 5= low

Regarding motivational skills in the questionnaire students report the use of the skill *to value* the most (see table 4). To *concentrate* (2.97) is less used by the students, possibly because they find it difficult as is suggested by the supervisors. To *concentrate* (2.97) is less used by the students, possibly because they find it

difficult as is suggested by the supervisors. A supervisor said about concentration "*they know what they need to do, but find it difficult from the start, or after one hour they may think they have already done enough for the day".* The interviews shows that the supervisors particularly emphasize *motivation* and *concentration*. A newly started supervisor mentioned "*students often don't like things they are not good at. So the first thing you have to do, is to motivate them".* Supervisors also refer to the importance of evoking emotions in this process and to make the students feel comfortable: "*when they start I ask about the day and offer them a cup of tea".*

Table 4
Most used motivational learning strategies as perceived by students

Motivational learning strategies	M	SD	N
To value	2,24	0,82	220
To make efforts	2,27	0,79	280
To judge yourself	2,32	0,78	244
To motivate	2,38	0,86	236
To expect	2,50	0,80	252
To evoke emotions	2,60	0,92	216
To attribute	2,69	0,85	207
To concentrate	2,97	0,90	202

* scale items (M) 1=high 5= low

Finally, the questionnaire overall showed the highest students' scores on the motivational study-skills (2.43), followed by the metacognitive skills (2.77) and cognitive skills (2.83). When the relation between the age of the student and the state of self-regulation is analysed there is seen a significant correlation between age and de development on the cognitive (r =,018), and motivational study-skills (r =,002) and self-regulation (r =,007). Also is seen that till the age of 14, self-regulation is going up, and then goes down with the age of 15 and 16, when it continuous to go up. There is not a significant correlation between the school level of the student and self-regulation. Though the level VWO-athenaeum, does score the highest (2,60) followed by VWO-gymnasium (2.66), HAVO (2,69) and finally VMBO-T (2,75). There is seen a correlation, $r(279) = -1,27$, $\rho=,034$, between de development of motivational study skills and the overall duration of the stay of the student at the homework class. In which students, who stay 6 till 8 months shows the most self-regulation (2.61), followed by 8 till 10 months (2.63). Students who just started in 2 months scored the lowest with (2.76). When looked to the size of the department, there is not seen a significant correlation between the amounts of students and the score on self-regulation. Though the small departments, with 1 to 5 students during a homework day, score the best (2.54) followed by the busiest departments whit 15

or more students during a homework day. The lowest score departments whit 6 to 10 students a day (2.76).

Sub-question 2 is regarding the way homework supervisors do offer students the cognitive, metacognitive, and motivational knowledge and learning strategies to support the development of self-regulated learning, according to their own insights. Supervisors use different instruments to instruct the students, like guided exercising, asking questions or hearing. They offer the more self-regulated student supports like scaffolding or checklists. The supervisors had difficulties to answer questions about the balance between direct-instruction and self-directed learning. But from their answers it can be derived that they unconsciously use an approach which shifts form direct instruction at the beginning of the learning process to more self-directed learning in more advanced stages of the learning process. The results of the interviews show that all supervisors agree they need more knowledge about study-skills. Most of them say they derive their knowledge from working in daily practice. They also mention documentation and training as a source of information, but most supervisors add that the influence of this information is limited. One supervisor mentioned she needs more instruments to teach motivation and concentration. Another supervisor mentioned needs more training in supporting study-skills. Finally it's noticeable that supervisors lack knowledge about the SMW-model. Experienced supervisors mentioned that the SMW-model should be formulated more focused.

The feedback the supervisors give their students was, besides the interviews, also measured by analysing there feedback expressions in the digital student tracking system "Planner". Most feedback expressions (*243 occasions)* in the "Planner" can be typified as feedback on task-level (Hattie, 2007). The second category (185 occasions) could not be labelled according to the feedback-types of Hattie (2007). These expressions can be typified as encouragement, like "*Looks good, fine*. Also feed-forward (*103 occasions)* and a more neutral comment *(75 occasions)* at task-level occurs. Next comes feedback (40) and feed-forward (33) at process-level, which was given, and at last feedback at self-regulated- (27) and self-level (20) was given. According to the interviews feed-up is mostly given during an intake- or an appointment with parents. The feed-forward is mostly given at the start of a homework class to determine what the student needs to do. The feedback at task level is mostly given during and at the end of the homework class and focusses on made homework or learning for a test. The supervisors mentioned that during the time of the homework class there is not that much time to give, feedback on process-level in any form. The experienced supervisors seem to be able to give effective feedback on the self-regulated level, though this doesn't happen often. Feedback on the self-level is much given, but has a more encouraging motive like like "*come on, you can do it*". Finally according the supervisors the role of the "Planner" is mostly to inform the parents. They also use information, tracked from the "Planner" to

periodically analyse the progress of the student. Also the supervisors assume the student themselves doesn't really uses the given feedback from the "Planner".

DISCUSSION

Regarding sub-question 1 students score high in applying *memorising* as cognitive strategy, but stay behind in strategies like *to select*, *to structure* or *to apply, which* are needed to gain the procedural knowledge. The consequence may be that students don't improve in the ability of problem-solving (Schraw, 1998). Besides Flavell (1979) states that students need these cognitive strategies to acquire procedural knowledge to develop the ability of using metacognitive learning strategies. So homework supervisors at Studiekring should put more emphasis on the strategic cognitive strategies in order to improve the problem-solving abilities of students (Lai, 2011. As far as metacognitive strategies are regarded it is noticeable that *planning* scores relative low among students, while *planning* plays an important part in a homework day. An explanation can be found in the amount of feedback the supervisors give on task-level which stimulates the student *to reflect,* while the supervisor is doing the *planning* for the students, instead of letting make the student make his/her own planning. Finally overall the students have the highest scores in using motivational strategies. Maybe this results from the personal approach of the homework supervisors. However, the supervisors emphasize mainly to address *concentration* and *evoking emotions in their guidance,* while students score relatively low regarding these strategies. Supervisors themselves stress they lack instruments to guide the student regarding these strategies. Boekaerts and Simons (1995) advocate that concrete instruments should be available to teachers, with clear behavioural parameters in which students learn how to be focused on their goals and being persistent.

Regarding sub-question 2 it becomes clear that overall, homework supervisors lack knowledge about learning strategies. Homework supervisors themselves demand Studiekring to provide them more knowledge, skills and instruments targeted to support learning strategies. In daily practice they use different instruments to tutor the students among which *hearing, guided exercising, asking questions, thinking out loud and modelling* are mostly mentioned. Though these instruments are connected with the direct-instruction model (Veenman, 2001), the supervisors work from an intuitive approach, based on knowledge gained from personal experience. Supervisors fail to offer more experienced students, which are able to profit from a self-directed approach, the checklist and scaffolds to develop their metacognitive knowledge and skills (Veenman, 2001). While homework supervisors mostly give feedback at the task level, feedback and feed forward at the procedural level may be more appropriate to develop the metacognitive skills of students (Hattie & Timperley, 2007). When supervisors integrate also feedback at the self-regulated level, students can develop better internal feedback mechanisms (Paris & Winograd, 1990).

Finally, sub-question 3 is of a more diagnostic character. According to the supervisors the pedagogical model of Studiekring has to be rewritten to make it more targeted on desired feedback practices and on the provision of useful strategies and tools. Also supervisors ask for the implementation of training possibilities on a regular basis and the stimulation and facilitation of learning communities in which homework supervisors can learn from each other. Regarding the digital student tracking system it can be concluded that the standard feedback expressions can be labelled as unfocused feedback and that they can be improved according the model of effective feedback (Hattie & Timperey, 2007)
.

By implementing the recommendations of this study, Studiekring can make a lot of progress towards the professionalization of homework supervisors and of the homework industry as a whole. As homework industry is growing and has to meet the needs of a growing number of students and parents (Elffers, 2018), Studiekring can gain competitive advantage if it succeeds in strengthening self-regulation of students. Besides, in doing so, Studiekring will contribute essentially to the lifelong learning competences of those students.

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USING A VALUES BASED INCLUSIVITY GAME TO MOVE FROM DURESS TO PROWESS

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ABSTRACT

This paper introduces a values based inclusivity game, launched to delegates at the EAPRIL International conference 2018 in Portoroz. The paper highlights factors which informed participant's perceptions and understanding of practices and terminologies relating to inclusivity, determined through playing the game. Results and feedback are summarised and influences on workload prioritisation are identified.

BACKGROUND AND DRIVERS

Teachers, researchers, permanent, casual and part-time staff employed in educational establishments internationally are expected to have at least a working knowledge of what inclusivity means, both to themselves and their learners.

We are working in a troubled world where discourse is commonplace and political and economic tensions are running high. World leaders, Government departments, service providers, educational establishments, and private households each have their own opinions, prejudices and unique practices. This can lead to constrained or often linear ways of working which do not always take into account the diversity of stakeholders. Such institutionalised and rigid customary practices have a significant and often detrimental effect on the learners of today, the practitioners of tomorrow.

FORMAT AND METHODOLOGY

The game consists of five components (Quintiles) which when played, analysed and discussed provide an indication of the participant's understanding and experience of inclusivity terms and strategies. The scores and findings from each quintile inform

each participant's analysis of their personal Strengths, Weaknesses, Opportunities and Prejudices and promote multidisciplinary discussion and collaboration.
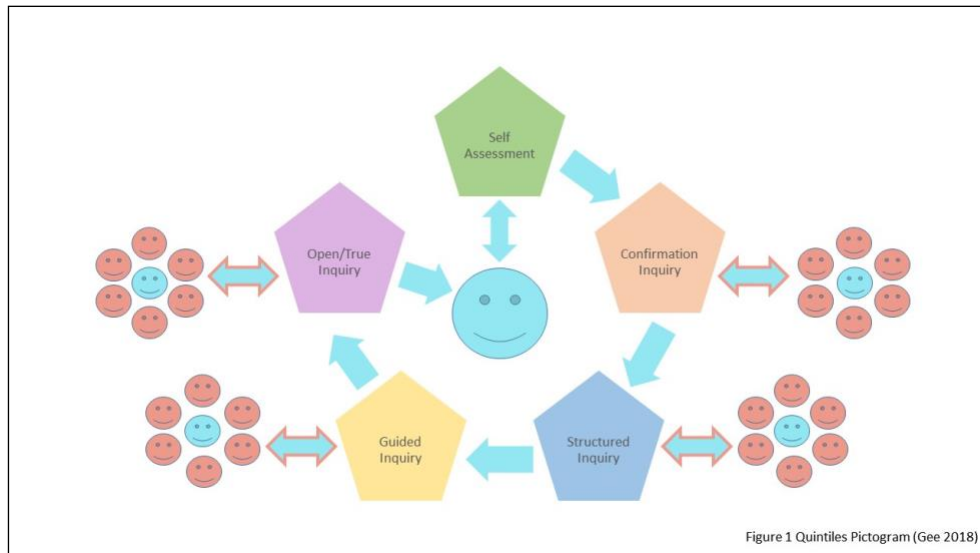

Figure 1 Quintiles Pictogram (Gee 2018)

The first quintile takes the form of a three stage values based self- assessment tool, which must be completed at the start of playing the game but is designed to be repeated limitless times. This is followed by the remaining four quintiles which each take the form of an inquiry based learning scenario with varying levels of guidance. The inquiry based learning quintiles are informed by the following inquiry levels.

Level 1: Confirmation Inquiry

The teacher has taught a particular science theme or topic. The teacher then develops questions and a procedure that guides students through an activity where the results are already known. This method is great to reinforce concepts taught and to introduce students into learning to follow procedures, collect and record data correctly and to confirm and deepen understandings.

Level 2: Structured Inquiry

The teacher provides the initial question and an outline of the procedure. Students are to formulate explanations of their findings through evaluating and analysing the data that they collect.

Level 3: Guided Inquiry

The teacher provides only the research question for the students. The students are responsible for designing and following their own procedures to test that question and then communicate their results and findings.

Level 4: Open/True Inquiry

Students formulate their own research question(s), design and follow through with a developed procedure, and communicate their findings and results. This type of inquiry is often seen in science fair contexts where students drive their own investigative questions.

THE QUINTILES

Quintile 1 – Who are you, how do you think and what are your priorities? (Three Stage Self-Assessment Tool)

Participants are provided with 3 sets of resources to promote responses based on their values. This component is completed individually.
Stage 1 – A list of 48 pre-written statements to be rated in terms of priority or how strongly each statement is agreed with or valued (1-10 scale)
Stage 2 – A list of 30 teaching and learning terms to rank in order of importance or value (1-10 scale)
Stage 3 – A list of two-part emotionally intelligent process pathways to prioritise (single choice)

Quintile 2 – What happened, what was done and what do you think? (Confirmation Inquiry)

Participants are provided with a problem-based case story and are guided through the steps taken to achieve the final outcome. They are only required to read the story, reflect on it and make notes as they wish.

Quintile 3 – What happened, what resources are available and which would you choose? (Structured Inquiry)

Participants are provided with a synopsis and are given access to a range of established teaching and learning resources and strategies. They are required to identify one or more resources to consult in this instance and offer an underpinning practical rationale as to why they made the selection they did.

Quintile 4 – What happened, to whom and for whom, which methods and resources will you choose for each person involved? (Guided Inquiry)

Participants are provided with multiple (usually 3-4) problem-based scenarios and personal profiles and are required to identify the teaching and learning resources they would use which would best suit the needs of each of those mentioned. They are able to pick and choose all or part of any of the resources and to begin to merge or create new resources.

Quintile 5 - What happened, who was involved, what was your personal involvement, what successes or challenges are present, what patterns can you identify and what challenges do you anticipate going forward? What strategies and methods will you design to account for this? (Open/True Inquiry)

Colleagues are asked to reflect on both their teaching experiences over the past module/semester/year and to examine student grades and student feedback. They are required to review and develop their own inclusive teaching and learning strategies taking into account all factors.

Why a game?

A game based format was selected as it is important when striving to gain a deeper emotionally intelligent understanding of diversity and inclusivity that participants do not to feel pressured to comply, or strive to pre-empt correct and incorrect answers. A quiz or lecture based format would not have been appropriate as answers and values will differ between participants, and that is a key concept which participants need to grasp if the exercise is to succeed. This is also the reason why the game commences with a self-assessment tool which participants complete on their own, without conferring with other players as this preserves the patency of the dataset collated to inform later discussions during the group elements.

Applying a game based format, played in both a self-directed and peer facilitated style promotes feelings of autonomy, and facilitates freedom of all participants to contribute, collaborate and share ideas and experiences without striving to agree on a panacea to everyone's inclusivity related challenges.

Game play

Participants at the conference were facilitated in playing the first quintile in the series in order to gain a greater awareness of their emotionally intelligent responses and values through answering several questions.

Firstly, each participant consulted the 48 pre-written statements and were advised to spend no longer than 10 seconds considering each before rating it on a scale of 1-10 where 1 equals 'entirely disagree' and 10 equals 'entirely agree'. The reason for the minimal thinking time is to accurately gauge one's innate persuasions and perceptions of certain phrases and statements when presented to them in a specific way, and as a result begin to understand factors which influence one's own thought processes and prejudices.

Immediately following this task, each participant received a list of 30 teaching and learning terms to rank in order of importance or value on a scale of 1-10 where 1 equals 'not important at all/irrelevant' and 10 equals 'of the utmost importance/relevance'. Again a maximum of 10 seconds per answer was recommended.

Lastly each participant was to consider a list of two-part emotionally intelligent process pathways to prioritise. This was rated using a single vote system whereby they were required to simply prioritise one process pathway over the other.

Examples

The figure below contains sample questions from the first set to be rated in order of dis/agreement by the participant.

The most important thing for me to do is ensure my students complete their course of study and are not lost along the way.

It is my role to educate my students by imparting knowledge and answering questions along the way.

It is my primary goal to ensure that targets and benchmarks are reached.

I feel offering alternative assessment methods is important to maximise student engagement.

I worry about students who don't attend for tutorials.

I worry about students who are frequently requesting tutorials.

It is my role to facilitate students to learn.

I treat all my students equally.

I believe all students must reach the prescribed learning outcomes.

I am a creature of habit.

I like to provide my students with variety.

I like variety.

I like to provide my students with routine.

I like routine.

Figure2 Sample Questions (Gee 2018)

The figure below contains sample questions from the second set, to be rated according to importance or relevance as perceived by the participant.

Integrity

Openness

Student satisfaction

Staff satisfaction

Opportunity for challenge and debate

Academic License / autonomy / freedom

Freedom of speech and opinion

'Real world' relevance

Structure and control

Life skills

Employability

Risk management

Figure 3 Sample Questions (Gee 2018)

The figure below contains sample questions from the third set, to be rated according to priority for the participant.

Wellbeing, then success.

Success, then wellbeing.

Speak, then listen.

Listen, then speak.

Figure 4 Sample Questions (Gee 2018)

Once participants had marked each card with a numerical score, they were asked to group the cards together in piles of each number. Then each participant was asked to lay all the cards out in order from 1-10 to show them how many items they had scored high and low, and everything in between.

Following this, each participant was then asked to re-arrange each set of scored cards in a further streamlined order, so re-ordering all cards scored as '1' and placing them back down, then all which they scored with '2' and so on, until they have the most accurate picture of their priorities that they can.

During usual gameplay, participants would then move on to complete the remaining four quintiles.

Participants are encouraged to rearrange their values cards during and after each stage of the inquiry process to see how their values may have changed and to consider how their emotionally intelligent responses to the scenarios introduced throughout the remaining quintiles may have influenced their strategic thinking.

The game can be played with others and repeated numerous times (although the initial values component needs to be played individually in the first instance to capture an unbiased initial view).

Participants can add new statements, particularly once they have reached stage 3-4 in the process.

On this occasion, due to limited time at the conference, participants completed only the initial self-assessment quintile and were then facilitated to engage in professional discussion and rationalisation of their answers. Participants shared with each other what led them to allocate the values that they did, and the results from practitioners and researchers from different backgrounds were significantly different.

FINDINGS

The answers and scores provided by participants varied considerably and trends were identified as follows:

Participants from science backgrounds tended to relate to, and therefore prioritise the more structured and (seemingly) straightforward answers.

Conversely, participants from Health and social care backgrounds tended to rate highly the 'softer' and (seemingly) more flexible answers. Those from a legal background tended to prioritise answers which put the process before the emotion, whilst teachers and health professionals opted to look at personal factors first, and then look at subject matter thereafter.

The figures below show the top 3 response categories participants from different professional backgrounds selected in relation to the questions sampled earlier in this paper.

Figure2 Sample questions with responses (Gee 2018)

Figure 3 Sample questions with responses (Gee 2018)
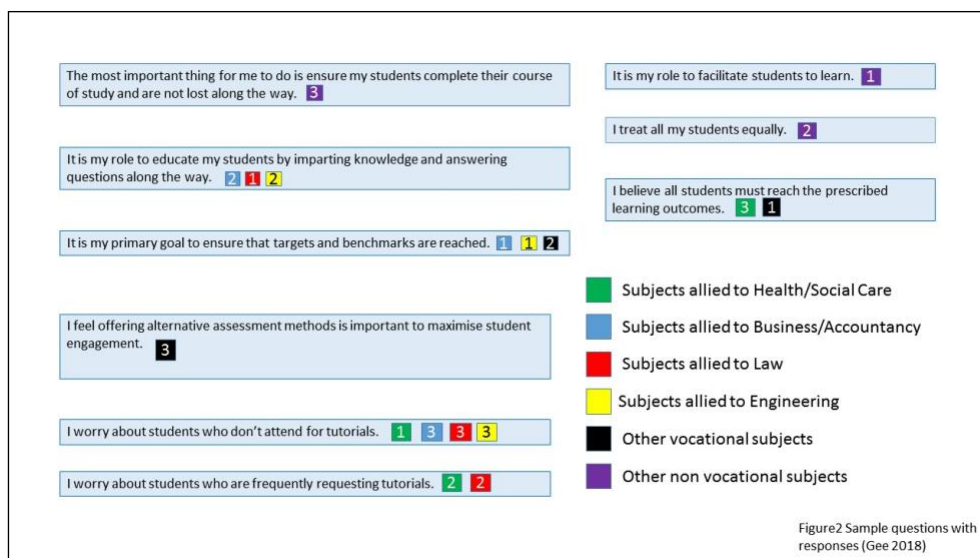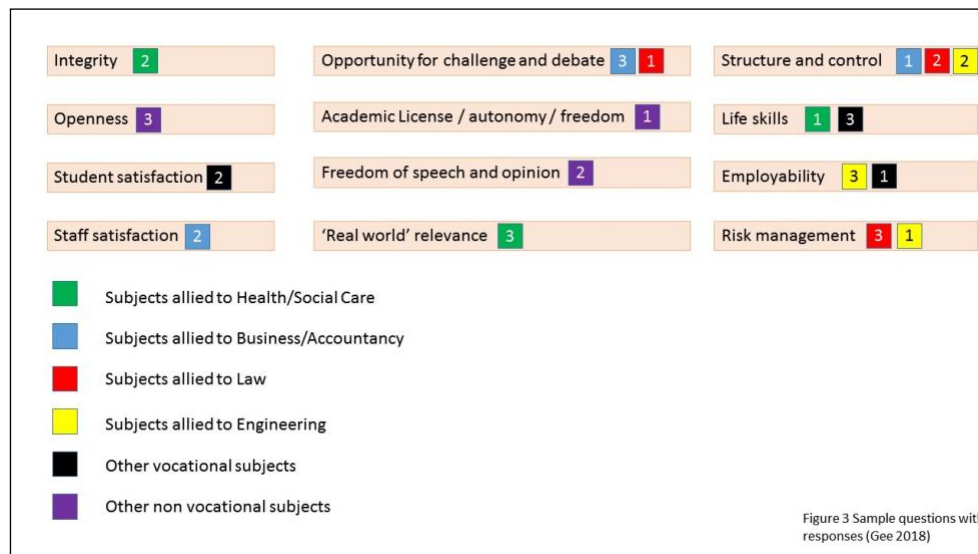
As the figures show, there is a marked difference in the innate way in which practitioners from different professional backgrounds think, view their roles and prioritise their actions.

The responses to the questions sampled in figure 2 show that almost all practitioners worried about students who do not attend for tutorials. However during the professional discussion it became apparent that those from a Health/social care background feared for the students' welfare as they may have come to some harm or otherwise disengaged due to the pressure of their practice experiences, whilst those from business, legal and engineering based subjects feared their students would not perform well in their assessments.

There appears to be a surprising response from Health and Social care practitioners in figure 2 whereby they rated meeting prescribed learning outcomes as their third highest priority. This sounds odd at first, as in 'life and death' subjects one may automatically expect that all students must meet the learning outcomes in order to practise. This was in fact, the reason why the priority was lower as the respondents explained that not every student must meet the learning outcomes, as it is fitness for practice which overrides as opposed to merely succeeding on their programme of study at any cost.

This is perhaps better demonstrated by their responses to the questions posed in figure 3 whereby they rate a mixture of life skills, integrity and 'real world' relevance as of highest priority.

In relation to the process pathways, responses were mixed amongst all participants. This is to be expected as these pathways are easier to answer after more quintiles have been completed, as the scenarios are designed in such a way as to promote the need for each process pathway to be used interchangeably as the case stories unfold and interventions are planned.

CONCLUSION

In conclusion, the Values-based Inclusivity Game has demonstrated that inclusivity is by nature very diverse and open to varying degrees of interpretation. In many cases, what is fair, reasonable, safe and appropriate is often in the 'eye of the beholder' and we each hold vested interests, prejudices and biases in different contexts.

Whilst the game is currently in its first edition and is undergoing further development it succeeds in promoting deeply analytical and reflective practice as it poses difficult questions and aligns them to scenarios which increase in complexity as the players progress through each quintile. This in turn promotes professional development and encourages collaboration and strategic planning with other professionals in a multidisciplinary context, which is the cornerstone to achieving fully inclusive emotionally intelligent practice for today's diverse learner base, workforce and society.

CASE STUDY – A NEW COGNITIVE SKILLSET FOR THE ACADEMICALLY EDUCATED LAWYER

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ABSTRACT

Academic legal education is traditionally mostly concerned with the reproduction of knowledge and applying it to specific, narrowly-defined cases. The ability to mechanically apply law to facts, however, is rapidly becoming obsolete in our modern world. The digitalised society of today calls for an academically educated lawyer with a different mindset and higher-order thinking skills.
We therefore ran a pilot project in two courses with the objective of enabling students to develop higher-order thinking skills such as categorised by Bloom's taxonomy. The changes we implemented are loosely based on Dochy's HILL-model. In this paper, we discuss these changes, their implementation and their results in greater detail.
Evaluations of the pilot project show that student engagement and interest in the subject matter have increased, leading to more self-study hours being integrated into the course. This allowed us to devote more time to practicing the desired skills and increasing test difficulty accordingly. However, some questions and challenges remain.

ACADEMIC LEGAL EDUCATION – DESIRE FOR CHANGE

Traditionally, the legal discipline has found itself in a somewhat awkward position in academic circles. Some question whether legal studies are, in fact, academic at all (e.g. Stolker 2011). The reason for this is – in a nutshell – that the law is very much society-dependent. The law is, simultaneously, a reflection of societal norms, a policy instrument, and a technique for organising societal conduct. It is also inherently subjective. Compared to more 'traditional' academic disciplines (such as

those in the STEM fields), the law lacks a 'higher truth' that can be measured or otherwise pursued in any meaningful way. Instead, the 'right' answer to a legal question depends on the legal system under which the answer is to be sought. Any answer to a legal question is based on arguments drawing from legislation, precedent, and (personal and societal) preferences, each of which can in turn be founded on a plethora of arguments (fairness, efficiency, tradition, predictability, ease of use, etc.). Different legal experts can (validly) have widely differing opinions of what the right answer to a difficult legal issue is, depending on their societal views and their perception of (the rationale of) the law on a given subject. Since the right answer to a legal question is the result of consensus girded by underlying societal norms, this answer may evolve along with the society that forms the legal norms that are used for answering it.

As multifaceted as the law is, so is – at least in theory – legal education. In an ideal world, at the end of their studies, students should be able to not only apply the law in a given situation, but also reflect on the norms underlying the law and the legal system that is used to provide the answers sought. This requires higher-order thinking skills as categorised by Bloom (1956). In practice, however, much of legal education in the Netherlands is geared towards the first of these skills: applying the law to a set of facts. For many students, this mode of thinking about legal issues suffices; it allows them to enter legal practice, where they spend most of their time resolving legal questions in a similar manner. For legal educators, this 'practical' approach to the law offers short-term benefits. Offering courses geared towards mechanical application of (existing) law to fact-patterns commonly found in legal practice allows them to claim the relevance of their subjects for any students interested in such a career path. It also allows them to simplify their own workloads, because they can select fact patterns that do, in fact, have a 'right' (mostly undisputed) answer. This makes for easier grading and teaching. Instead of having to explore every possible angle of a question, one can simply explain how the relevant legal norms and case law lead to the conclusion sought. An additional 'benefit' is that any underlying societal issues can be avoided in most cases. Instead of debating whether a certain answer ought to be right, the debate is restricted to whether that answer follows from existing legislation and case law. Finally, and most mundanely, teaching courses in such a manner is simply cheaper. The less discussion and debate between students is required, the more students can be placed in seminar groups together.

In practice, therefore, seminar lecturers are confronted with large groups of students who are mostly interested in learning the correct legal provisions to apply to the fact-patterns that they are asked to solve during their exams. Because seminars are geared towards preparation for the exam, lecturers use their seminar time not for discussion, but to explain the law, often in the form of a mini lecture. After the legal provisions and the steps in which they are to be applied have been covered, little time is often left to discuss more elementary matters. In addition, the introduction of the internet

and social media has made it easier than ever before for students to share and copy answers to the homework assignments (as these can largely be found online), leading to student disengagement and reduced incentive to study the materials for themselves. Students are therefore less engaged in their courses, leading to a lower retention of study materials.

The above (somewhat over-generalised) current state of academic legal education is problematic for at least two reasons. The first is that the mechanical application of law to facts can hardly be called academic. As a result of the expectations lecturers have of their students and the way in which students meet these expectations, legal education has become more and more practice-oriented. It is focused on remembering, understanding and applying the law instead of being able to analyse and evaluate existing law or even propose new law. Students' skill sets are, in other words, single-issue: they memorise answers to certain fact-patterns, but are not necessarily able to devise answers of their own to related fact-patterns. They lack a more general understanding of (the function of) the law, the capacity to find similarities and distinctions between cases, and the ability to give expression to the law's underlying personal and societal preferences, each of which would allow them to imagine new solutions to new problems. The fact that legal education itself has become less academic is not a concern for most students; as long as they go into practice after leaving university, they do not have to compete for research grants or face governmental visitation committees. However, for the students who are interested in deepening their understanding of their field of studies (and perhaps go into legal research later in their careers), it can be quite frustrating to be tasked with rather mundane assignments that do not allow them to develop any meaningful cognitive skills to that end. Enthusiasm for more academic aspects of the legal profession can be snuffed out without students and lecturers even being aware of it. This is not only detrimental to research departments at universities, but for society in general. The fewer talented lawyers have obtained the skills to critically analyse and evaluate legislation and the legal system as such, the harder it will become to find people who will be able to create law to encompass new solutions for new legal issues and challenges in the future.

The second reason why poorly honed critical thinking on the part of law students is problematic ties into this. In the past, the mechanical application of law to facts only made academically-inclined students worse off (mostly because of – in their minds – dull seminars). In the (very near) future, however, practically-inclined students will be much worse off than before. The ability to mechanically apply law to facts is rapidly becoming obsolete in a world driven by Artificial Intelligence (Van Oostrom-Streep, 2016; Van Klink et al., 2017). Do-it-yourself platforms that generate legal documents and tailor-made advice through interactive questionnaires are overtaking a large part of the legal profession. Consumers can find legal information more easily without a lawyer, because of the possibilities that artificial intelligence offers. DoNotPay, for example, is an online robot lawyer via an

application that can help individuals with law disputes in more than a thousand different legal areas (see for a short introduction https://www.youtube.com/watch?v=PHZobnM2wlw).

Another example is ROSS. ROSS is an advanced artificial intelligent system that gives precise answers to legal questions. The consumer can pose their question online, as if talking to a lawyer, and receives pin-pointed answers from published and unpublished case law within seconds (see http://rossintelligence.com/). This is not to say that lawyers, judges or legal scholars are becoming obsolete. Artificial Intelligence can search through case law, but cannot (yet) think critically, evaluate the law or even give an answer to a case that has not yet been discussed in case law. The added value of hiring an academically-educated lawyer is to be found in having that lawyer be able to perform tasks that artificial intelligence cannot (Ahsmann, 2018). These are exactly the types of higher-order thinking skills – analysing, evaluating existing law, offering proposals for new law – that are currently underdeveloped in academically-educated lawyers.

Furthermore, the arrival of the internet calls for a whole new skillset. Many years ago, it was not that difficult to keep knowledge of the law up-to-date, because there were only a handful of books, magazines and cases to keep up with. Nowadays, it is almost impossible to keep track of all legal doctrine and case law. The information flow is much larger than before. The handful of offline information has been replaced by an (almost) constant overload of online information. An important skill of an academically-educated lawyer is to deal with this large flow of information, to critically evaluate the information, and to distinguish between primary and secondary issues.

This new (digitalised) world therefore calls for an academically-educated lawyer with a different mindset and a new cognitive skillset (see also Ahsmann, 2018; Elzinga, 2018; Van Klink et al., 2017). Again, he or she needs to have well-developed higher-order thinking skills (as categorised by Bloom's taxonomy, Bloom 1956), such as being critical, being able to analyse, discuss and argue, etc. Though it has been clear for many years in educational science that a passive transmission of knowledge is not the best way of reaching higher-order cognitive learning objectives (e.g. Kanselaar, 2002), legal education has been slow to address this (Stolker, 2013; Van Oostrom-Streep, 2016). We believe it is now incumbent upon legal educators to, more than ever before, experiment with new forms of education so as to meet the prospective challenges facing our students. Academic legal education is the foundation for the future careers of students, regardless of whether they become lawyers, judges or legal scholars. In order to make seminars more valuable and rewarding to both students and lecturers, much more time should be spent on developing higher-order thinking skills that cannot be performed by Artificial Intelligence.

PILOT PROJECT IN TWO COURSES

To achieve these goals, we have implemented a number of changes in two courses that are part of the law degree at our Faculty of Law in the Netherlands. First, together with a few colleagues, we ran a pilot project in a major third-year Bachelor's degree course (11 ECTS). With the positive results of this project, we decided to also make changes in a fourth-year Master's degree course (7 ECTS). Both courses are in the field of property law, so more or less the same lecturers were involved.

The third-year course: 'Burgerlijk recht I'

Approximately six hundred students were enrolled in the third-year mandatory course on property law. We adapted portions of the course within the parameters of the Bachelor's degree curriculum, meaning that the number of credits remained the same, as did the schedule and the obligation within our faculty for Bachelor's degree students to attend and prepare seminars. The course lasted thirteen weeks, with two lectures and one seminar every week. In the lectures, all students were taught simultaneously, while the seminars were conducted in groups of thirty students. The lectures retained their traditional format and focused on one-sided knowledge transfer.

In the pilot project, we aimed to modify the way the seminars were held to stimulate the exercise of higher-order thinking skills. Our ideas originated from a brainstorm session, in which we pooled our ideas on an ideal education through seminars, considered how we could bring that about and what incentives might be required. In hindsight, we recognised that the changes we implemented were loosely based on Dochy's HILL-model (Dochy et al., 2016) and on the theories of constructivism (see Kanselaar, 2002) and self-determination (see Ryan & Deci, 2000).

Law is traditionally viewed as a field of study that attracts students that want to obtain an academic degree, but have no specific interest in the subject (cf. Stolker, 2013). Therefore, it is our impression that many students lack intrinsic motivation for this mandatory course. We therefore tried to create a sense of *urgency* (cf. first building block of Dochy's HILL-model), by working on realistic, but largely fictive cases and case files, which nevertheless draw from true cases. By dealing with cases that students may actually encounter in their later professional lives, we tried to stimulate the students' curiosity and motivation.

The assignments and cases that are covered in seminars, are also often deliberately 'fuzzy' and give rise to discussions; following a certain position (what would the student's argument be if they were an attorney of Party A?); or to weighing up the 'pros and cons' of arguments. 'Grey areas' are also included in assignments. This

not only helps to develop students' analytical and critical thinking skills, but also help them grasp the necessity of studying not only for the upcoming examination, but to truly attempt to thoroughly comprehend and process the issue at hand, and benefit later in life from the skills one develops through this process. This also enabled students to practice skills that a lawyer needs; such as filtering relevant facts from a sea of irrelevant information that is provided by a client or in court, and noting that certain information is missing and needs to be provided before a recommendation or solution can be presented. In the past, students would usually only be provided with the relevant facts, and all the facts they need to solve a case. The answer could almost be logically derived from this, and there was only one correct answer. In the new design, however, students experience that multiple perspectives on a single problem are possible and are encouraged to be creative in their solutions and make the links to other issues.

Secondly, we place greater responsibility on the students to practice and develop the desired academic skills and stimulate deep processing. True *learner agency* (refer to the second building block of Dochy's HILL-model) cannot be fully achieved under the conditions law is presently taught at our university. Many courses are compulsory, because certain courses within the law degree are required to practice law and become an attorney at law (*advocaat*) later on (*'civiel effect', see for discussions also* Ahsmann, 2018; Soeharno & Winter, 2018). The number of compulsory courses is therefore large, and consequently, the number of optional courses are limited. Within this framework, we encouraged students to think for themselves and formulate their own opinions and possible answers, instead of turning to us for answers to their questions. Lecturers adopted the role of moderators and asked students open-ended questions without immediately classifying the answer that the students gave as 'right' or 'wrong'. The goal was to allow the students to reach a conclusion themselves, with only minimal steering in the right direction by the lecturer. Occasionally, we put students to work in groups on a similar but slightly different problem to the prepared one, to encourage them to practice their higher-order thinking skills. We also asked them to hand in a short text or prepare a presentation on the subject. To do this properly, it was necessary for students to be well prepared for the seminar. In accordance with the theory of constructivism and the fifth building block of Dochy's HILL-model, we stopped giving 'mini lectures' during seminars and refrained from summarising or repeating what was covered in that week's literature or lecture. This stimulates students to actually prepare and actively participate, rather than just showing up and receiving the main points and answers to cases from their lecturers.

To conclude, we used methods of blended learning (or 'hybrid learning'; cf. building block four of Dochy's HILL-model), such as recording short videos with an explanation on difficult topics, or short, online, formative knowledge tests. This opened up more time in seminars for discussion and interaction. Prior to this, we were using Blackboard, an older digital learning environment that was relevant at

the time – we have now switched to Brightspace – merely to highlight announcements about examinations and changes to the schedule, and to make PowerPoint presentations available. We were still working with a paper-based syllabus. This didn't match the student's environment, in which they are constantly online on a laptop of smartphone. Most students already brought a laptop to class. We therefore decided to get rid of our paper-based syllabus. Our increased use of a digital learning environment, combined with the aforementioned fictive cases and case files made it easier for us to change the cases and assignments every year, so the answers to them could no longer be found online.

Fourth-year Master's degree course: 'Goederenrecht verdiept'

The fourth-year optional Master's degree course used to consist of around twelve weekly seminars. Approximately sixty students are enrolled on each course intake, so two parallel seminars were held. Those seminars consisted partly of explanations by the lecturer and partly of discussion of cases students had prepared.

Inspired by the success of the pilot in the third year and by the book: 'What the Best College Teachers Do' by Bain (2004), we turned this course into a project, in which the students worked in a team to stimulate student urgency, but also to create a 'network' in which students can learn from each other.

We simulated a law firm, in which the students worked as lawyers. This (simulated) law firm was asked by an administrator or liquidator in insolvency for advice on how to deal with six issues concerning an insolvent company. These issues are the six major themes of property law that were the course's key topics. The issues are realistic, but 'fuzzy' and very difficult to solve, given that they involve several subtopics, lack a single clear solution, the problem is 'new', or because literature is divided on the subject, and/or because numerous parties are stakeholders and the problem demands a very high level of abstraction and analysis. The administrator's role was played by one of our colleagues, who also works as an administrator and liquidator in bankruptcies.

The course kicked off with three lectures that do not touch upon the case, but in which some general concepts and principles of property law were discussed to assist the students in solving the case. After that, six seminars were held. The students that enrolled in the course, were divided into two main groups. Within the group, the students formed six teams. Each team was assigned one of the themes and was responsible for the seminar on 'their' topic. We provided no literature or case law, just as in real-life. The team did research on the problem and presented their tentative conclusion in the seminar to the rest of the class, just as if it was a meeting at the law firm, in order to update the responsible partner on the case and request input. During

this presentation, the students of the other teams were requested to ask questions and comment on the presented conclusion. The lecturer had a supporting role and remained out of the students' way as much as possible during the first half of the seminar. During the second half of the seminar, the lecturer assumed a more active role and was devoted to clarifications and summarising what the team had found, and pointing out logical 'gaps' in their reasoning, if they hadn't already recognised them, the goal being to find solutions to these gaps through class discussion.

After the seminar, the team made references to the relevant literature they found and case law available to the other students on Brightspace. The teams were encouraged to put their recommendation to the administrator on paper, taking into account the feedback they received during the seminar. The teams were encouraged to hand it in, so the lecturer could provide even more feedback. In a final meeting, each team pitched their final recommendation in a short presentation to the administrator, who was present and asked additional critical questions or offered comments on whether the proposed solution would be feasible in practice. A professor who wasn't previously involved in the project was also present as an expert to discuss.

Students were asked to commit to participation in the seminar. The seminars were not compulsory, but once they committed to participation, they were expected to be present for the entire course and could not let their team down. The exam was open book and consisted of two essay questions on new topics, in which students could show they now possessed the higher-order thinking skills to solve new complex and 'fuzzy' problems on their own.

OUTCOME – POSITIVE RESULTS

The evaluations of the pilot projects (based on surveys and discussions with students) are promising. They show that student engagement and interest in the subject matter have improved and additional self-study hours were invested in the course. That is a huge improvement, because legal education isn't about learning a simple trick that can be applied to any case, it's about investing time in the matter to develop the higher-order thinking skills, including critical thinking, being capable of analysis, discussion and debate. These are all skills students must have to be a successful lawyer, judge or legal scholar in this new technology-filled world. More engaged students allowed us to spend more time on practicing those desired skills and increase test difficulty accordingly.

Related to the previous: students seem to be more actively involved with the material and we achieved more interaction and discussion in the seminars at a higher level than before. In the third-year course, students surprised us by asking highly pertinent questions in seminars and highlighting weak spots in reasoning in legal literature or

case law. We believe a lot of the students were able to acquire a more critical stance towards the law and took responsibility for their own learning.

We learned that when students are challenged, they can truly develop themselves as academically adept lawyers. For example, in the Master's degree course, we expected the students to solve the part of the (very difficult) case that was assigned to their team up to 70% on their own. However, as it turned out, the teams were mostly able to solve the case to around 95%, only requiring the lecturer's help with the very last part. The pilot projects truly placed the onus for the students' learning process with the students. Again, the Master's degree course may serve as an example: students were encouraged to ask the coordinating lecturer of the course for help whenever they got stuck in preparing their seminar. Several teams actually did this, mostly to ascertain whether they were on the right track, which they usually were, so our job as lecturers was mostly confirming that a certain issue was indeed tricky and encouraging them to keep doing what they were doing. In short, the students developed a more academic mindset that befits an academic education.

We expected that the teamwork in the Master's degree course might prove to be a hassle, fearing students may drop out during the course given that it was optional. It seems, however, that the warning we gave them at the beginning of the course to commit truly worked. About 40 of the 60 students who enrolled actually committed themselves to working in the team and there were virtually no dropouts during the course.

In hindsight, it might have been better to have started with a first-year course. For a lot of students, the 'regime change' came as a shock and they had a hard time adjusting to it. After all, they were already used to two years of education in 'the old-fashioned way'. Some students were used to being able to pass their exams with just a cursory knowledge of the law and a mechanical application of this knowledge to a fact pattern. Now, they were required to evaluate, analyse and more. Thus, what made the projects a success, also proved a pitfall: because the project was initiated bottom-up, by lecturers that were committed to the idea and plan, it was successful, but, due to the lack of top-down control or supervision, the pilot perhaps did not run at the best possible point in the curriculum. We also encountered a lot of resistance by students because a necessary consequence of the changes is that we needed to put the students to work much more than they were used to.

OUTCOME - CHALLENGES

Some challenges remain, including on a more fundamental level. First of all, the changes caused much insecurity among the students; they felt insecure about their preparation for the written exam, since the seminars were so different from what they

were used to in previous years and the exam was adjusted to the new learning objectives. We tried to overcome this by reassuring students that the exam would be comparable to the level of the seminars. In the year following the pilot, we used old exam questions for the students to practice with as examples. Still, our impression is that students – perhaps because of their experience in taking exams in other courses – are more focused on reproducing knowledge, even though we explained, and it is clear from the practice exam that it is impossible to pass the exam in this way. Evaluations also show that many students fail to grasp the importance of developing and practicing the higher-order thinking skills. This may be another reason why they stick to the security provided by having a lot of knowledge and why they are focused on getting the right answer from the lecturer, instead of trusting their own and each other's capabilities. How can we best deal with the insecurity the focus on skills instead of knowledge generates among students? How can we make students feel comfortable with the ambiguities of the law?

A more important – but closely related – challenge is how to make sure we do not 'lose' a great number of the students along the way, due to the high demands we place on them. The focus on the higher-order skills has increased the level of the courses and not all students are capable of keeping up with that. How should we deal with students who have difficulty adapting to a more free-flowing learning environment? We are still working out how we can best help the students that are struggling. How can we actively train the desired skills in students to whom these skills do not come naturally?

A related challenge is that of motivation and preparation. In order to be able to practice the skills in seminar, students need to prepare and take responsibility for laying the knowledge foundation necessary to be able to discuss, debate, evaluate, etc. Although, in general, we believe students are better prepared for seminars than before, ill-prepared students certainly remain. We are under the impression that especially students who are in the 'danger zone', often fail to prepare for class (in the right way) or focus primarily on knowledge. Because the format of having students presenting the cases and assignments to each other in groups worked so well in the Master's degree course, we implemented the same in the third-year course last year. This was the third year the course was taught along these new lines. This seemed to work very well. However, we did encounter two challenges. First of all, (and this is also something we are struggling with in the Master's degree course) having the students prepare a presentation works very well for the students who are to present that week. But how do we get the other students, the audience so to say, to be actively involved as well? Secondly, when rehearsing exam questions halfway the course, we noticed that students hadn't mastered the skills after all. Only after rehearsing the problem, so going through the problem a second time, the penny seemed to finally drop. Unfortunately, we do not have the means to practice everything with students twice. That is exactly why we expect students to prepare themselves, by attending the lecture, reading the relevant literature, taking the

formative knowledge test, watching short clips on the subject, doing the assignment for themselves, among other good habits. How do we motivate students to actually do this and make the most effective use of seminar time?

CONCLUSION

Several developments gave reason to adjust two academic courses with the objective of enabling students to develop higher-order thinking skills. We believe that students should be able to not only apply the law in a specific situation, but, for example, also to critically reflect on the underlying norms. Being able to remember, understand and (mechanically) apply the law can hardly be called academic. Furthermore, this skill is becoming rapidly obsolete in a world driven by Artificial Intelligence. This development calls for an academically-educated lawyer with a different mindset and a new cognitive skillset. To help students achieve this new mindset and skillset, we have implemented a number of changes in two courses that are part of the law degree at our Faculty of Law in the Netherlands. The two courses (on property law) functioned as pilot projects.

In short, we modified the way the seminars were held to stimulate practice of these higher-order reasoning skills. We tried to stimulate the students' curiosity and motivation by working on realistic, but largely fictive cases and casefiles or by even simulating a law firm. Furthermore, we asked students to solve 'fuzzy' problems that give rise to discussions, we placed greater responsibility on the students to practice and develop the desired academic skills and we used methods of blended learning. In hindsight, we recognised that the changes we implemented were loosely based on Dochy's HILL-model and on the theories of constructivism and self-determination.

The evaluations of the pilot projects are promising. Students are well prepared for class, actively involved and we achieved more interaction and discussion at a higher level than before. Students can truly develop themselves as academically adept lawyers, they just need to be challenged. We are convinced that strong teamwork has greatly contributed to the success of the project. Everyone in the team of lecturers acknowledged the importance of the goal and strived to achieve the objective that had been set. Of course, some challenges remain. Presumably, the challenges we meet are inherent to education in general. They continue to receive our attention. By continuously evaluating and finetuning the design of the course and the seminars we strive to help the students reach the higher-order learning objectives in the best possible way, given the parameters of the curriculum. Overall, we believe the result of the changes is very positive and we are more certain than ever that this is the way to go.

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CAN STUDENT TEACHERS' PEDAGOGY BE ENHANCED BY HEEDING CHILDREN'S THOUGHTS ABOUT THEIR LEARNING?

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ABSTRACT

Through two case studies, each incorporating action research in student teachers' classrooms as part of a Primary PGCE course in the UK, bespoke pedagogical tools (a 'Thinking Fish') created a dialogic space, by scaffolding exchanges, to enable student teachers to understand children's learning from a socio-cultural perspective, mediate children's reflection on their learning and feedback to the student teacher about their learning. This practice-based project enabled Primary student teachers to engage with children's views to construct classroom learning. The assumption was that learning is socially constructed.

The results indicated:
- *enhanced student teachers' understanding of how children learn,*
- *enhanced learning by the children owing to exchanges on the interpersonal plane,*
- *mentors of student teachers require development to support student teachers with children's learning.*

Whilst, outcomes cannot easily be generalised from case studies. This study found:
- *children express learning needs when appropriate scaffolds enable them to articulate thinking,*
- *student teachers adapt practice after children talk about learning,*
- *Initial Teacher Education should:*
  - *highlight the importance of children's voice,*
  - *model the creation of dialogic spaces,*
  - *develop mentors of student teachers to support student teachers' understanding of children's learning.*

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INTRODUCTION

This is an overview of the work that I have done with a small group of student teachers about changing their practice after listening to children's views about their learning. It considers a specific pedagogical tool that I devised to enable this.
I begin with the principle of McIntyre, Pedder and Ruddock (2005) who described children as 'expert witnesses' to their own learning and asserted that their views should be considered valid in any discussion about their learning. It therefore seems logical that Initial Teacher Education (ITE) should be the starting point for teachers to think about this. The principle behind it is rooted in Vygotskian (Vygotsky, 1978) social constructivist views of learning where the feedback that student teachers, on teaching practice, receive from children enables them to learn and develop through their Zone of Proximal Development (ZPD) and therefore to construct further meaningful learning experiences in the classroom.

CONTEXT

The project explored the following questions:
- what do pupils think helps/hinders their learning in their classrooms?
- how can heeding children's views of barriers to/facilitators of their learning be used by student teachers for lesson evaluation, planning and reflective practice?
- to what extent can children's views support student teachers' understanding of children's learning and the development of their pedagogical practices (this includes both curriculum planning and teaching)?
- how does this impact upon the development and learning of the ITE students as student teachers engaged in reflective practice?

Teaching is accepted as being a complex activity. Teachers, including student teachers need to understand the process of children's learning. This is not currently emphasised in the Teachers' Standards (DfE, 2012) in England, indeed to the notion of taking account of children's voice is also not included in the Standards. Thinking about learning (metacognition) is an abstract concept and even the experienced teacher appointed as mentor to the student teacher may not fully understand the process of learning themselves. Furthermore the new Standards for mentors of student teachers on teaching practice in schools (DfE, 2016) do not emphasise a role in helping student teachers to understand children's learning, which may limit further the possibility of student teachers acquiring knowledge about the learning process.
The emphasis in all teacher training should be on teachers to providing space for the children to reflect on their learning and where this is not the case there may be limited opportunity for the student teacher, and the children themselves, to really understand the children and their learning needs. In England student teachers develop towards a set of Teachers' Standards (DfE, 2012) which implies a specific

skill set of competence which they have to attain rather than student teachers gaining a deepening understanding of pedagogy. This approach is further emphasised in the current preferred school based models of ITE where great focus is placed on gaining experience of practice in the classroom. In this way student teachers learn alongside professionals (mentors) in school which is effective if the professional is right type of the role model but begs the question what if they are not? Thus there may be dissonance between the work in ITE to help student teachers' to understand children's learning and what may be emphasised in practice, particularly as schools are currently driven towards understanding children's learning through achievement data.

UNDERPINNING PEDAGOGY

The underpinning pedagogy in this real context is rooted in a social constructivist view of learning. A principle premise of social constructivist theory is that learning is a social process (Vygotsky, 1986), and that social interaction precedes cognition. Learning and development are interrelated. Important to understanding the learning process from a social constructivist perspective is the process in the Zone of Proximal Development (ZPD) (Quay, 2003, Mahn, 1993). The ZPD is the distance between the actual development of the learning and what can be achieved in collaboration with the More Knowledgeable Other (MKO). Initially there is practical activity with the MKO in the interpersonal plane moving into, with elaboration of personal understanding through reflective activity, the intrapersonal plane (within the person) which is turn leads to appropriation and cognitive change, enabling the learning to move forward (Vygotsky, 1978). Therefore this research gave time to this process.

Essential to an understanding of the learning process in the ZPD is the notion of scaffolding. Scaffolding is cognitive support required by, and tailored to, each learner which is gradually withdrawn over time until learning is appropriated as the learner becomes autonomous. In this project the teacher scaffolds (mediates) the learning (Warwick et al, 2010) by providing the necessary cognitive support through dialogue and the set-up of the task. A social constructivist view of learning mirrors this idea (Vygotsky, 1978, Kozulin et al, 2003). The MKO scaffolds the learning of another in their ZPD. Scaffolding originated in the work of Wood, Bruner and Ross (1976) as a means of tailoring support and personalising it to the needs of the learner and gradually withdrawing it over time. In addition vicarious (indirect) scaffolding is the result of the vicarious presence of the teacher; for example a resource or task with restricted freedoms which is provided by the teacher to allow the learner to concentrate on fewer variables and thus allow them to have a deeper connection with the activity (Warwick et al, 2010). The teacher is not absent but rather mediates learning through using cultural artefacts. Again this aligns with a social constructivist view of learning as these scaffolds are cultural tools, namely artefacts

that mediate learning (Kozulin et al, 2003). Both the MKO (direct scaffolding) and cultural artefacts (indirect scaffolding) were used in this project.

In this project, the role of the MKO (direct scaffold) occurred on various levels: the mentor was the MKO to the student teacher; the student teacher was the MKO to the children; and the children were the MKOs to the student teacher as 'expert witnesses' to their own learning (McIntyre, Pedder and Ruddock, 2005). In addition an indirect scaffold, a cultural artefact that enabled dialogue and mediated learning within the ZPD was also employed.

Language is a tool that supports and transforms thinking and understanding so that ideas can be appropriated (Kozulin et al, 2003). Language is used on the interpersonal and interpersonal planes to express thinking. Therefore language is a teacher's foremost tool (Light and Littleton, 1999, Mercer and Littleton, 2003). Children require support structures to enable their thinking (McGregor, 2007). If the teacher scaffolds the children's learning with a framework of language, the children are better able to think about and describe their learning (Light and Littleton, 1999). A number of researchers have used scaffolds to support the articulation of children's thinking. An example of a tool called the 'Ishikawa' (Turner, 2002, cited in Hopkins, 2008). Its fishbone structure was adapted for use in this study and was chosen to engage the children's interest as well as annotate their responses. Each 'bone' carried a particular theme to scaffold the children's reflections about their learning. The student teacher has to be able to support children's learning in the ZPD in the role of the MKO. A pedagogy that takes children's views into account enables a very clear focus on the learning and teaching relationships. In understanding learners by listening to their views about their learning, student teachers can make children's learning, through their teaching, more focused as there is a shared understanding and language between learner and teacher (McIntyre, Pedder and Ruddock, 2005, Ruddock and Flutter, 2004, Flutter and Ruddock, 2004).

APPROACH TO THE RESEARCH

An underpinning assumption of this project was that everyone can learn, but they need and MKO to elaborate their understandings.

At the start of my Doctorate study, I had a naïve view of social constructivism. It was difficult for me to get a view of what the ZPD looks like. I settled on Tharp and Gallimore's (1998) model as one way to illustrate the process of Vygotsky's model of socially constructing learning through clearly articulating those phases in a visual format. This indicates that stage 1 of the ZPD is the space with interpersonal dialogue with an MKO. This sits well with a student teacher who wants feedback on their practice; it also gives them a clear 'role' when working with children in the classroom. Stage 2 is where the intrapersonal reflections happen leading to internalisation and appropriation. The MKO mediates (scaffolds) the ZPD by using the tool of language. From a student teachers perspective this is where they are

reflecting on how well they are teaching and how well the children are learning. This is also where the student teacher is getting the children to think about and talk about their learning.

This was a small case study, containing a spiral of research and evaluation with multiple methods chosen to elicit insights with the participants. The approach to data collection and analysis was largely constructivist, compatible with the underpinning classroom practise of the student teachers. There were 115 student teachers on the Post Graduate Certificate of Education (PGCE) training to be Primary teachers, teaching children from pre-school to 11 years old. 32 of the student teachers participated. They each worked with groups of 6 children of mixed ability, gender and so on, who they chose with their mentors. The student teacher's mentors were assigned by the schools.

During the research process there was concurrent activity (Figure 1) from each of the participants, each adopting normal classroom working practice. The student teachers planned, taught, assessed and reflected upon learning for the children. The mentors observed the student teachers and provided feedback. The children completed the work planned by the student teachers and feedback to the student teachers about their learning. Therefore there were various activities from a social constructivist perspective – the mentor was the MKO scaffolding the student teacher. The student teacher was the MKO to the children and scaffolded their learning. The children were the MKO to the student teacher, scaffolding of their understanding of their learning. Importantly from the participants' perspective this was the normal iterative cycle of practice seen in a classroom meaning that normal practices in the classroom were not disrupted so that it was as authentic as possible and not overwhelming with lots of other activity.
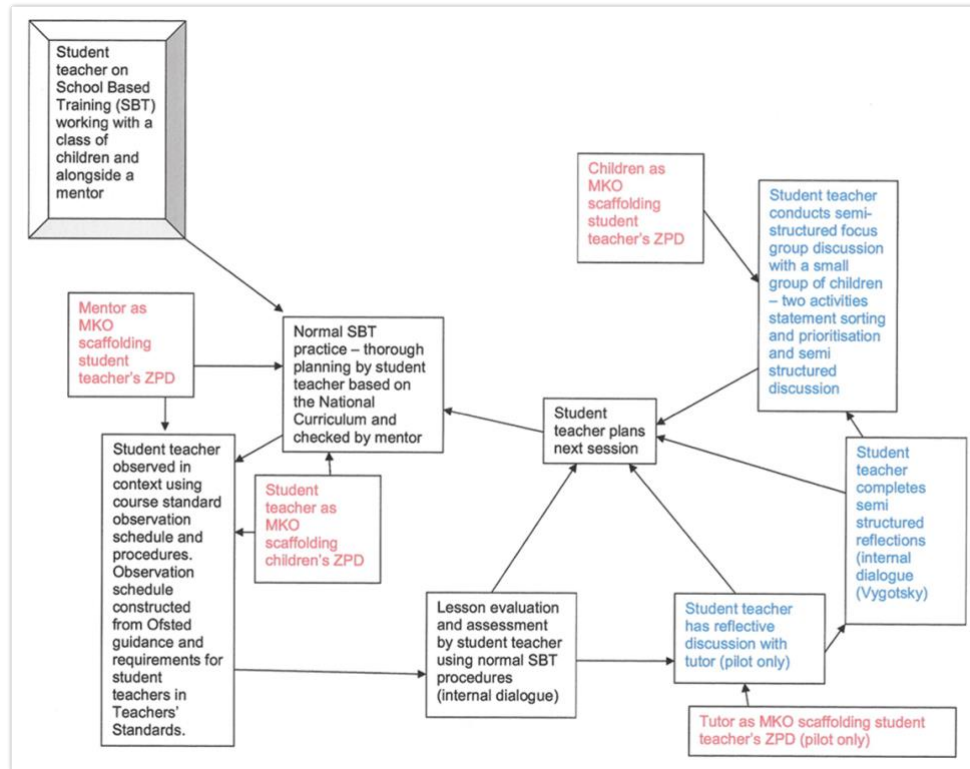
Figure 9 - Concurrent activity from each of the participants

BESPOKE PEDAGOGICAL TOOL – 'THINKING FISH'

An essential component of the research was gathering the views of the children about their learning. As thinking about learning is an abstract concept, a form of scaffolding to provide a shared language to support the children to articulate their thinking about their learning was required. As such I devised the 'Thinking Fish' (figure 2), adapted from Hopkins (2008) as a way to capture the understanding of the children about their own learning – a vicarious scaffold (Warwick et al, 2010). This was both a research tool as well as a cultural artefact (Kozulin et al, 2003) to indirectly scaffold with the children's thinking and discussion about their learning. The student teachers provided the 'Thinking Fish' to a focus group of children. It was used twice at the end of a teaching activity - the first time the children wrote on it 'what went well for their learning', annotating against the themes on the 'bones'. Then they annotated it again with 'what would need to be improved? What did they need the student teacher to do to improve their learning? What would work better for them?' As such the children became the MKOs for the student teacher in providing feedback about their learning and the student teacher's teaching.
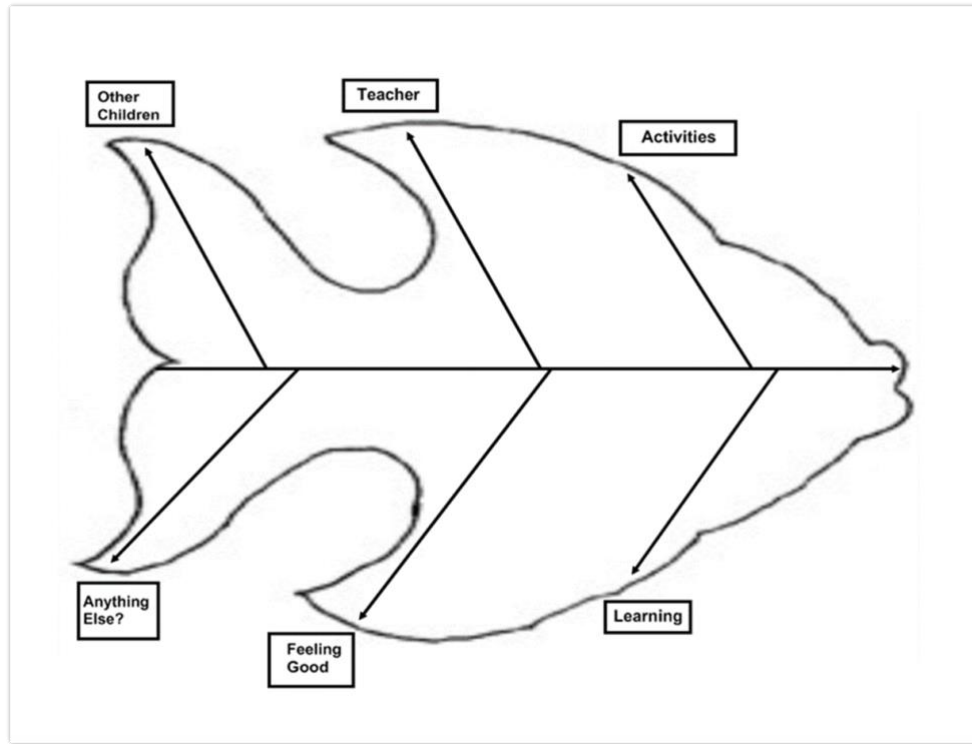
Figure 10 - Bespoke pedagogical tool: 'Thinking Fish'

The student teacher also had feedback from the mentor which was also designed around scaffolded prompts. In addition the student teachers kept reflective logs which again were designed around scaffolded prompts for intrapersonal reflection. This meant that all participants were supported as much as possible through a social constructivist perspective on the interpersonal and then intrapersonal stage.

All sources of data where reviewed and connected to enable triangulation between tools and participants.

FINDINGS

The data from the 'Thinking Fish', the mentor feedback from the observations of the student teacher's practice and the reflective logs of the student teachers' were triangulated and transparently and thematically analysed so content/thematic analysis, including frequency counts, was employed. Data were further triangulated against Tharp and Gallimore's (1998) framework in order to make sense of the data and scaffold the interpretation.

The 'Thinking Fish' scaffolded the children with the language to think about their learning and to talk about their learning. It was identified that many themes related to a social constructivist view of learning, including the role of the MKO, the discussion on the interpersonal plane and the need for scaffolding. Talk for learning

through the 'Thinking Fish' connected with the children's metacognitive processes and so they could recognise their own development in their learning. Learning progressed for the children. Notably over time the children became much more aware of their own learning through this process and much more able to talk about it with the student teacher because they had the language to do so from the scaffolds on the 'Thinking Fish'. The student teachers began to listen to the children's feedback and adapt their practice accordingly. For example the children might have suggested in an early 'Thinking Fish' session that the student teachers needed to provide them with time to talk to their peers in lessons, and this is what the student teachers began to plan for in future lessons. When the children then fed back after the next lesson they commented on the changes made as a result of their previous feedback. This was a very dialogic approach to learning. Progress was seen in the student teachers' practice in the areas around scaffolding learning with resources and a MKO, addressing individual learning needs being addressed and using talk strategies for learning in the classroom. In addition the student teachers' ability to differentiate became more finely tuned from listening to the feedback that children provided about their own learning. Through the triangulation it was clear that the mentors', children's and the student teachers' reflections often closely aligned. The process was reciprocal and collaborative. The student teacher's focus moved from their importance in the role of the teacher to a renewed understanding of their role as the MKO is enabling the learning of the children. All participants recognised the nature and importance and value of this iterative process. Children were motivated to engage in discussion about their learning (metacognition) and it reinforced the idea that student teachers needed to have a pedagogy as a means of understanding children's learning so they have something to reflect on that underpins their practice. There was no ceiling on the student teachers' and the children's learning – they kept learning together.

Findings from a small-scale research study cannot be generalised, but if replicated this project would suggest that:

- Children can express their learning needs when scaffolded with appropriate language.
- Student teachers understand how children learn when scaffolded appropriately.
- Student teachers value and respond to the feedback from the children and their pedagogy develops as a result. Initially student teachers believed that 5 years olds could not tell them anything about teaching and learning but then project enabled them to realise that the children are 'expert witnesses' to their own learning.
- Student teachers practice changed and their understanding of children's learning deepened.
- Mentors need to talk to student teachers about children's learning. For example, they would discuss the use of a Teaching Assistant to support

learning, but would not talk about the TAs role as the MKO, that is the underpinning pedagogy.
- Mentors need professional development about how to provide opportunities for student teachers to listen to children talking about their learning.
- The role of the MKO to learning is critical whoever is adopting that role – children, student teachers or mentors.
- ITE needs should include children's voice as a way of student teachers understanding children's learning.

LESSONS LEARNT

Student teachers better scaffolded learning through the children's ZPD when this social constructivist pedagogy was adopted. Myths about the ability of children lacking experience to comment on their own learning have been dispelled and an open-mindedness to a more socially constructed learning environment developed. The value of adopting social constructivist principles into the pedagogy was seen in the transformation of practice. The interpersonal exchanges enabled and scaffolded the intrapersonal reflections and as such movement through the ZPD was evident.

The learning process is complex and therefore there is a place for collaborative interthinking in the development of student teachers' understanding of children's learning. I now have a view that student teachers should not be trained to teach but rather they should be helped to understand how to enable children to learn. To do this their environment for training needs to be enabling and have strong scaffolding from MKOs. The inter- and intra-personal exchanges in this dialogic space enables transformation through collaborative reflection ('interthinking', Littleton and Mercer, 2013). Establishing a context that is appropriate for student teachers to develop an understanding of children's learning is critical. Integral to this are two components – an MKO and scaffolding. By the end of the research the Tharp and Gallimore (1998) model was too linear to truly represent the workings of the ZPD. This encouraged me to consider the idea of the helix by Littleton and Mercer's (2013) but again it implied that it is also linearity. Therefore I came to the conclusion that Tharp and Gallimore's (1998) represented a slice of the 'interthinking' helix (Littelton and Mercer, 2013) so that it is embedded in the evolving process of collaborative reflection by student teachers.

Going forward it would be interesting to see this approach more embedded in practice, so that listening to children's voice about their learning is a meaningful strategy. I think it would be reasonable to assume that the important part of the 'Thinking Fish' is the scaffolded prompts that encourage the right sort of discussion and metacognition about learning and therefore the outline could be changed from a fish to anything that best suited the children's learning context. Additionally, it

would be interesting to consider other ways that children provide feedback including monitoring their reactions and emotions as part of the learning process. A final consideration might be how to best ensure that the assigned mentor is the right role model for the student teacher and what criteria this might entail.

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LESSONS LEARNT BY STUDENT TEACHERS FROM THE USE OF CHILDREN'S VOICE IN TEACHING PRACTICE

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ABSTRACT

This practice-based project enabled Primary student teachers on a Primary PGCE course in the UK to engage with children's views to construct classroom learning. The assumption was that learning is socially constructed.
Issues addressed through the project included:
- *what pupils thought helped their learning,*
- *how children's views can support student teachers' reflective practice,*
- *how children's views can support student teachers' pedagogical practices.*

The project comprised two case studies; a pilot and a subsequent larger-scale project, incorporating action research in student teachers' classrooms. Bespoke pedagogical tools, in particular 'Thinking Fish' created dialogic spaces, and data collection methods, by scaffolding exchanges to enable student teachers to understand children's learning from a socio-cultural perspective, mediate children's reflection on their learning and feedback to the student teacher about their learning.

The results indicated:
- *enhanced student teachers' understanding of how children learn,*
- *enhanced learning by the children owing to exchanges on the interpersonal plane,*
- *mentors require development to support student teachers with children's learning.*

Outcomes cannot easily be generalised from case studies. This study found:
- *children express learning needs when appropriate scaffolds enable them to articulate thinking,*
- *student teachers adapt practice after children talk about learning,*
- *Initial Teacher Education should:*
  - *highlight the importance of children's voice,*

    o *model the creation of dialogic spaces,*
    o *develop mentors who can support student teachers' understanding of children's learning.*

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ISSUES EXPLORED

Student teachers need to understand children's learning. A principle on which this study is based is that children are the 'expert witnesses' to their learning (McIntyre, Pedder and Ruddock, 2005). Therefore student teachers need to know what children understand about their learning and to understand about children's learning itself. Consequently Initial Teacher Education (ITE) seems to be the best place for this understanding to begin to be explored.

The questions that I wanted to examine through this project were:

- what do pupils think helps/hinders their learning in classrooms?
- how can heeding children's views of barriers to/facilitators of their learning be used by student teachers for lesson evaluation, planning and reflective practice?
- to what extent can children's views support student teachers' understanding of children's learning and the development of their pedagogical practices (this includes both curriculum planning and teaching)?
- how does this impact upon the development and learning of ITE students as student teachers engaged in reflective practice?

This paper will focus on the findings from this project.

SCAFFOLDED, SOCIALLY CONSTRUCTED LEARNING

This project was rooted in social constructivism with the idea that everyone can learn. One of the key literature that was considered includes Vygotsky's *Mind in Society* (1978) where he explores the notion of social constructivist approaches to learning. Another was an exploration of the idea of scaffolding from its original definition by Wood, Bruner and Ross (1976) to the more recent idea of vicarious, or indirect, scaffolding introduced by Warwick, Mercer and Kershner (2013). Further literature included the concept of 'interthinking' (Littleton and Mercer, 2013) as an approach to collaborative and reciprocal reflection. Moreover the work of Flutter and Ruddock and the Teaching and Learning Research Project (2004) was about considered to be important in establishing children's voice as part of the process of understanding children's learning. Flutter (2007) went further and suggested that embedding children's voice should occur in ITE in the first instance.

RESEARCH APPROACH

The project consisted of two case studies, each containing a spiral of research and evaluation – a pilot and a main study (figure 1). The employment of a case study encouraged data what was rich and could be examined in depth, using insider perspectives to make sense of, and explore, the phenomena. Through the use of multiple methods, insight could be obtained.
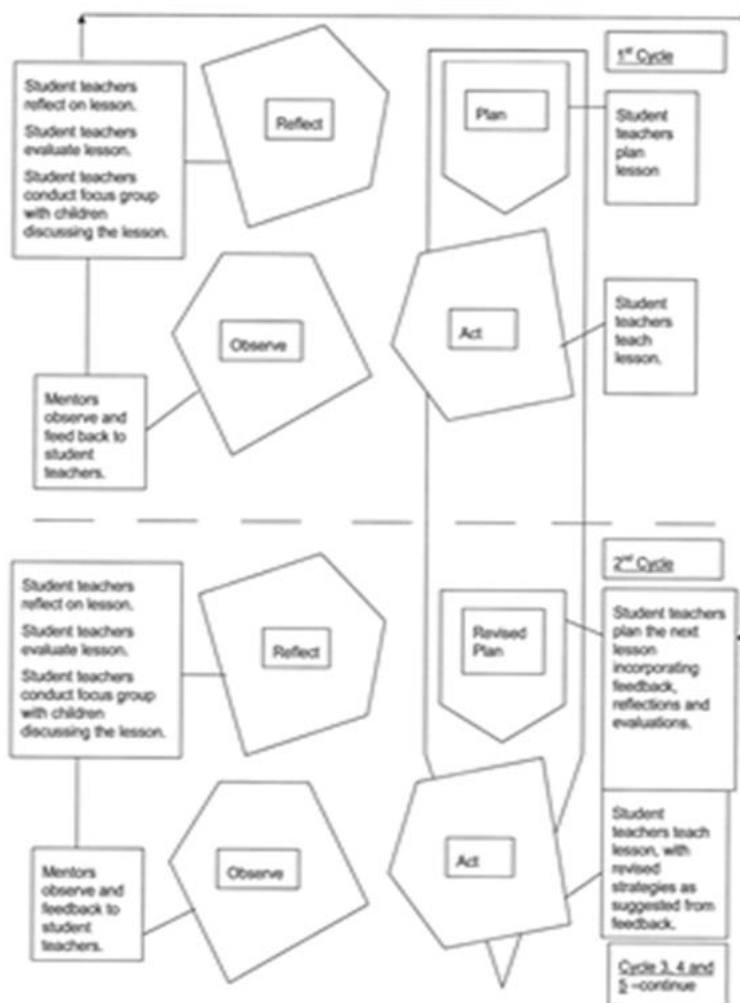

Figure 11 Cycles of research

I adopted a largely constructivist ontology and epistemology generated from pedagogical understanding. Knowledge was therefore explored through a social

constructivist lens and knowledge was understood through the elicitation of data using social constructivist methods. This meant that a realist view was taken. Data was analysed through an interpretivist lens with an element of reflexivity which enabled me to make sense of what was happening through both my lens and that of the participants.

Knowledge was constructed through the use of language as a key tool. A shared language enabled this. Talk negotiates power and as such the role of the More Knowledgeable Other (MKO) (Vygotsky, 1978) changed between participants as knowledge was exchanges. However, this was enabled through the common ground of classroom practice which already existed between participants and meant that everyone was able to contribute.

Reflection was an integral component through both the interpersonal exchanges with others and intrapersonal thinking/reflection. Reflection pervaded this research and so semi-structured methods of recording this were developed. The interpretations were rigorous, transparent and triangulated. It was accepted that no generalisations could be drawn from the findings but rather that the findings would provide a mirror for a wider context.

The sample consisted of thirty two student teachers, in the early stages of a one year, post-graduate, primary (5-11 years) teacher training programme in England. Each student teacher selected a focus group of six children, based on their key attributes. A mentor was assigned to the student teacher by the school. It was therefore important that ethical professional practice as maintained throughout (BERA, 2018). Thirty two student teachers and mentors out of a total postgraduate cohort of one hundred and fifteen volunteered to be included in this project. The children were selected using purposive, stratified, criteria-based methods by the student teachers with their mentors. The mentors were sampled by convenience.

The project took place over one week of teaching where each student taught 5 lessons in one subject consecutively. The project consisted of a lot of simultaneous activity (figure 2).
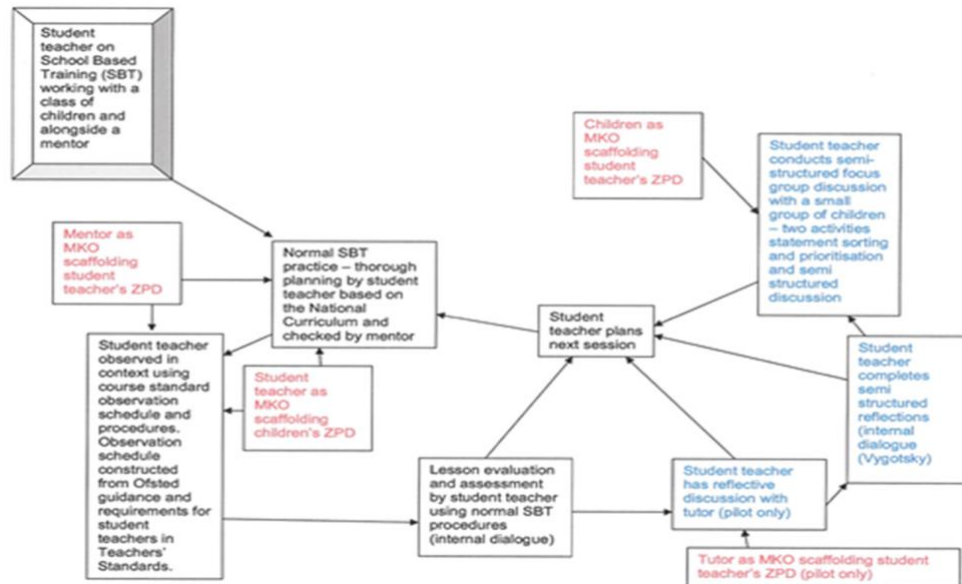
Figure 12 Conccurent activity by participants

The student teachers planned, taught and evaluated lessons. The mentors observed the student teachers and provided feedback on their practice.   The children completed the work set and fed back to the student teachers about their learning. This was a normal cycle of teaching and learning practice for a student teacher learning and teaching in a school-based setting. It is useful to highlight here what was happening from a social constructivist perspective. The mentor was the MKO to the student teacher, scaffolding their understanding of children's learning. The student teacher was the MKO to the children, scaffolding their understanding of their learning.   However, the children were also the MKOs to the student teacher, scaffolding the student teachers' understanding of their own learning. The language, or talk, in these exchanges negotiated the power as the role of the MKO changed by establishing a common understanding where everyone was able to contribute. Alongside all of this the student teacher was reflecting on the intrapersonal plane about their developing understanding of children's learning.

EMPLOYING PEDAGOGICAL SCAFFOLDS

It was very important to have a shared language to enable the interpersonal exchanges between the student teachers and the children in the focus group activity. This was achieved in the design of the 'Thinking Fish' as both a bespoke pedagogical tool and a research tool. The 'Thinking Fish' was adapted from Turner (2002, cited in Hopkins, 2008) and is based on a Japanese business management tool – the Ishikawa fish bone. It contained scaffolded prompts on themes related to learning

that enabled the children to think and talk about their learning with the student teachers and provided a way to capture the children's understanding about their learning – a scaffold for shared reflection (interthinking) as well as a bespoke pedagogical and research tool. The themes and approach were derived from the work of Macbeath, et al (2009) and McCallum et al (2000) (figure 3).
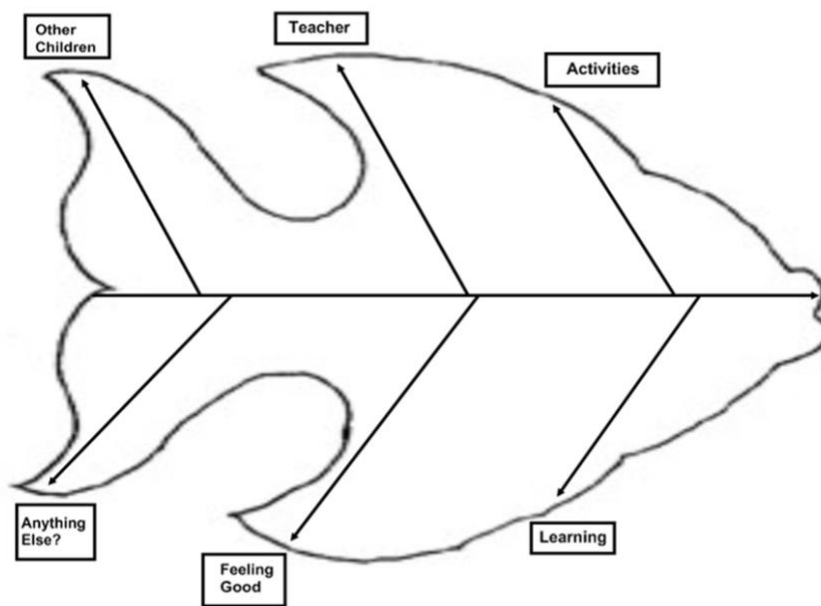

Figure 13 The 'Thinking Fish'

This means of enabling the student teachers to have this dialogue with the children, was used at the end of each teaching session in the sequence when the student teacher would meet with the focus group of six children to discuss their learning in that session. The 'Thinking Fish' was used to scaffold answers to two questions; first, 'what went well in that session to enable your learning?' and then again, 'what could be improved in the next session to enable your learning further?'

The implementation of the 'Thinking Fish' helped to create and enabling environment where discussion happened about children's learning between children, between adults and between adults and children. This led to the mediation of thinking about learning subsequently its transformation. The language used for making meaning in this instance, bridges the interpersonal and intrapersonal reflections and metacognition by the student teachers and the children about children's learning. Simply, children talking about their learning on the interpersonal plane scaffolded each other and the student teacher. As such learning

was reciprocal and through the dialogue there was a co-construction of understanding and so learning was socially constructed.

This evidenced children's voice in a form which enabled student teachers to understand children's learning in addition to the traditional feedback provided my mentors to support this.

FINDINGS

Data were analysed and triangulated transparently and thematically and then compared to Tharp and Gallimore's (1998) pedagogical framework for understanding Vygotsky's social constructivist view of learning in the interpersonal and intrapersonal spaces of the Zone of Proximal Development (ZPD). This was a way of making sense of the findings and scaffolding the interpretation using and accepted idea. It focused the interpretation towards the student teachers' developing understanding of children's learning.

The 'Thinking Fish' scaffolded the language for the children to articulate their learning. Themes were identified across the social constructivist perspective of learning. Most notably the children highlighted how being active and constructing meaning in their learning was important, as well as the role of an MKO and resources in helping them to achieve this. They particularly discussed how the student teacher provided 'clues' to their learning and modelled expectations (scaffolding). In addition, through the talk about their learning, the children's metacognition about their own learning developed as their discourse about their own learning developed over time. They commented that they could see improvements in the learning through the way that the student teacher facilitated learning opportunities; that collaboration with their peers helped to generate ideas together; that the resources they had access to meant they could 'get on' independently (vicarious scaffolds) with what they were doing and that the activities made them think and want to learn more (moving through the ZPD). This indicated that they understood the processes involved in social constructivist learning approaches. One child commented that *'at school council we buy resources but in this focus group it's more about how we learn'* demonstrating the connection that the children understood the purpose of the focus group discussion, and that the child's voice was being heard, as a valuable part of their learning process.

From the student teachers' perspective it was clear that the scaffolds provided by the children and for their intrapersonal reflections were important. This promoted a development in the student teachers' understanding of learners and therefore the importance of differentiation, adaptation to the learner's needs and feedback to the children. The student teachers made progress in their understanding of how children learn, especially their role as the MKO in the children's ZPD. They valued the scaffolding of their reflections by the children and could see that learning was

reciprocal. They developed their understanding of differentiation, particularly how to adapt their teaching to suit the needs of the children. They shifted their view from a focus on their role as a teacher to that which enables the learning of the children. They saw that the learning was collaborative. They recognised that the interpersonal exchanges were enabling themselves to reflect intrapersonally about their understanding of children's learning. All student teachers understood children's learning better, to a greater or lesser extent, as would be expected normally. The average proportional gain made by the student teachers was 15%. The greatest proportional gain by student teachers was seen in the aspects of utilising resources, including the use of adults (scaffolding/MKO), addressing individual needs (learning) and talk for learning (socially constructing learning) (figure 4).
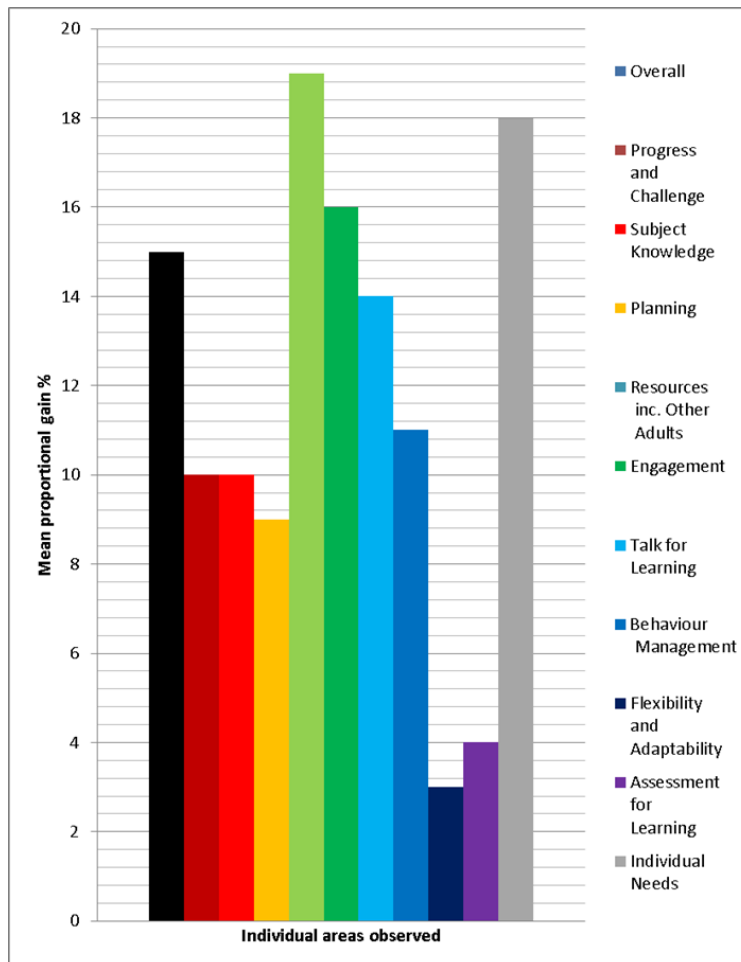

Figure 14 The proportional gain made by the student teachers in their understanding about children's learning

Comments that the student teachers made indicated that they understood the strengths and needs of the children more clearly and that they felt this approach was more effective than marking books. They remarked that it enabled them to restructure teaching and learning activities to support, question and challenge the children's learning. They identified that the approach enabled them to address misconceptions through close monitoring. Student teachers were surprised that the children's advice was helpful, honest and worthwhile in terms of helping them to understand the children's learning better. In addition, because the student teachers were responding to the needs of the learning of the children, the children were better behaved and more engaged in the learning environment. They acknowledged that the discussion supported the metacognition of both the children and themselves as learning teachers. They could see that children understood how they liked to learn. In addition, they placed increasing value on the importance of talking about learning and using these interpersonal exchanges to enable their understanding about children's learning to 'sink in'. In other words, what the children said cause the student teachers to reflect more. Going forward the student teachers considered that this was a useful approach to adopt in their practice. On reflection, one alteration that they might make would be to differentiate the number of themes on the bones of the 'Thinking Fish' depending on the stage of development of the student teacher to prevent some student teachers from becoming overwhelmed with information.

The mentors' feedback was found to be helpful but also contradictory. For example they might highlight that the student teacher was now using talk for learning strategies in their teaching, however, they would also comment that the classroom was now too noisy. Another example was that the mentor fed back that the student teacher was making use of the Teaching Assistant (TA) to work with the children but did not discuss how this fits with the social constructivist, pedagogical approach of utilising an MKO to scaffold children's learning. That said the mentors feedback aligned very closely with the children's and they did acknowledge that the student teachers' practice was improving through listening to the feedback by the children about their learning.

Overall, the results indicated:

- enhanced student teachers' understanding of how children learn as they adapted their practice in response to children's views,
- enhanced learning by the children owing to their exchanges on the interpersonal plane, with peers in the dialogic space created by the bespoke pedagogical tools,
- mentors require development to support student teachers to engage meaningfully with children's learning.

LEARNING OUTCOMES

This study found that:

- children can express learning needs when appropriate scaffolds enable them to articulate abstract concepts,
- when student teachers respond to children talking about learning they can develop their practice.
- Implications for Initial Teacher Education are that it should:
  - highlight the importance of children's voice to support student teachers in developing their pedagogy,
  - model ways in which teachers can create dialogic spaces for children's interthinking,
  - consider what development mentors require to support student teachers' understanding of children's learning in classroom

Student teacher and children, when provided with the right language and scaffolds can articulate their thinking about learning. The role of the MKO is critical in this scaffolding process. The learning process is complex and utilising the children as MKOs for the student teachers value the opportunity that collaborative interthinking provides. It is here that student teacher can be seen as qualifying to help children learn rather than simply qualifying to teach. Providing opportunities to scaffold student teachers' pedagogy and critical reflection is essential during the ITE process. All learners whether they are student teachers or children need an enabling environment where there are MKOs to scaffold learning, talk about learning and reflections. In order to make this successful they need representations that help to manage the dialogue and reflections in the way that the 'Thinking Fish' did.

Furthermore it was found that the Tharp and Gallimore (1998) representation of Vygotsky's ZPD was too linear as it did not capture the complexities of the scaffolded interpersonal and intrapersonal reflections enacted by the student teachers in this project. However, Littleton and Mercer (2013) provide for more fluid movement between the stages of the ZPD, which perhaps represents the way that learning happens more fully, through their notion of the ZPD being a helix rather than a staged model. From the perspective of this project it was perhaps the a combination of the two representations that best describe how learning happens from a social constructivist perspective.

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