Virtuality and Education – Future Prospects

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Contents

Introduction

The issues contained in the book "Virtuality and Education – Future Prospects" are focused on several areas, one of them being knowledge building. Education systems cannot keep up with the changes that are caused not only by the requirements of the information society, but also by changes in the students, living environment, of which the media are an important element. Today's education is focused on cognitive aspects and in overloaded contents of teaching programs there is not enough time for reflective teaching. This problem is raised by the text opening the book, written by Grzegorz Karwasz and entitled "Cognitive Didactics: Hyperconstructivistic Knowledge Building". The author emphasizes in it the necessity to combine elements of constructivist and cognitive science didactics with pedagogical knowledge. He draws attention to the role of hyperconstructivistic didactics, which requires the cooperation of the teacher and the student on the way to knowledge building. This requires participation in real experience, through direct cognition, experiments and deductive thinking. The text underlines the importance of the scientific knowledge and pedagogical competence of teachers. Hyperconstructivism in didactic practice is based, among others, on an active search for interdisciplinary organized knowledge and the use of its diverse sources.

Erik Bratland also deals with the building of knowledge, in the text titled "Code Clash and Code Match in Education: Why Does the Government's Digitalization Strategy Clash with Teachers' Knowledge Practices in School Subjects?". The content of the publication refers to the critical analysis of the information technology implementation system to the educational process, which, in the author's opinion, only takes into account the digital competence of teachers and other elements of school culture, and ignores the perspective of subject differences. This issue is

considered from the perspective of the Norwegian system. The author points out that the forms of knowledge presented on various school subjects are important for the integration of technologies in the classroom.

The next text entitled "Revitalizing Teachers' Didactic Thinking" written by Duarte N. F. Pinto and Inger L. Valstad, presents a description of the research results regarding changes that have occurred in the ways of planning a lesson, its structure after the introduction of the iPad in the didactic process. The research findings indicate the needs related to teachers' education and the development of a new digital didactics that would meet the needs of modern education.

Agnieszka B. Jarvoll's text, entitled "Teaching at Stake! In Search of the Teacher's Experiences from an Intervention with Minecraft" shows how the thinking of teachers changes after experiencing Minecraft based teaching. This experience allows the teacher to better understand the student and use the game as a way of transmitting scientific knowledge and concepts.

One of the major challenges facing modern didactics supported by information and communication technology is the creation of its theoretical foundations and subsequent empirical verification. This area is indicated in the text by Wioletta Kwiatkowska entitled: "A Review of Selected E-learning Models: Theoretical Foundations". In her paper, she draws attention to the factors of improving the teaching and learning process in the online environment. She emphasizes the importance of the structure of content, the quality of didactic materials and programs used in teaching, the value of which should activate the student's independent thinking

New technologies can support the teacher's administrative activities in the areas of: documenting of the teaching process, creating student lists, collation and certificates. Kamila Majewska in the text "The Electronic Register in Polish Schools. Studies from the Level of Early School Education", based on proprietary research results, proposes the possibility of using e-registers in early childhood education. Among the important competencies that are essential for every human being are those related to communication. Good education requires the correct use of language. Constructivists pointed out its role in shaping the concepts,

they emphasized its importance in building knowledge and concepts. The text crowning the book by Roald Larsen is entitled: "Creative Teaching – How Can One Make Student Performances Based on Myths? Current Problems and Challenges". The author shows the possibilities of developing imagination and language skills through an oral narrative, the content of which are myths. The author himself is a well-known Norwegian writer and researcher of the myths of northern peoples. The text draws attention to education, which allows you to combine a language with theatrical performance. In this context, the media can popularize creative activity and allow the interpretation and change of codes from verbal to visual. The creative activity of students based on their culture and universal values contained in myths and stories are an important element of building the identity and value system of the 21st century man.

Giving the reader a book written by Polish and Norwegian authors, I am convinced that it will help to find the answer to the question about the present and future of education with new technologies. The content of the book also outlines the areas of future research and their directions. Virtuality requires immersion into an environment that is familiar to students and is part of their experience, this space raises new challenges for school and teachers. There is no single theory or teaching concept that could serve as the basis for today's didactics with new technologies. Cognitivism, constructivism, hyperconstructivism, models of knowledge building or e-learning based teaching models still do not create the consistent foundations of new technology-based teaching. However, these views bring us closer to a better understanding of the challenges facing education, the aim of which should always be to educate and to bring up a creative and sensitive person who can enjoy the benefits of new technologies.

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Cognitive Didactics: Hyper-Constructivistic Knowledge Building

Abstract: *The crisis in teaching Science (and not only) triggered the implementation of previously developed concepts, like constructivism, cognitivism, pedagogical contents knowledge, inquiry-based teaching. We combine these ideas into hyper-constructivistic didactics, in which knowledge (and competence) are constructed with pupils, but under teacher's wise guidance. Neo-realism, i.e. the extensive illustration of phenomena by experiments, complements this approach.*

Keywords:

Motivation: need for renewed Pedagogy

The European Union already identified serious problems in Science education about ten years ago. So-called Rocard's Report (2007) showed that the number of graduates in physical sciences in the Netherlands, France and Germany fell by 40–50 % between 1994 and 2003. The subtitle of that report sounds significant: "A Renewed Pedagogy for the Future of Europe".

Stimulated by this report, some countries (and the EU in its whole) undertook efforts aimed at increaing the number of students in Science. Examples, say of Poland, showed that the effectiveness of these actions was limited to their exact (financial) duration and did not bring a "renewed pedagogy". This is to be attributed to essentially "palliative" activities (extra scholarships to students, extra money for tutoring etc.) that did not change the contents and ways of teaching science. Students are expected to reproduce the knowledge transferred to them and any independent thinking

is not well-seen. Even if Polish teachers would prefer the constructivistic approach, see fig. 1, their potential attitudes do not translate into education practices: Polish schools (and teachers) are ranked almost exclusively according to formal requirements (percentage of passed exams, see fig. 2.) rather than on the basis of innovative ways of teaching.

Italian teachers, in turn, do not declare clear preferences regarding the two styles of teaching (or alternatively, they present a broader variety of styles, as the comparison is *ipsative*). Strong criticism on traditional teaching was also expressed in the UK (Brand, 2011): "For many elementary teachers, teaching science primarily involves worksheets and definition". Even stronger words on the school system as a whole came from Harrison (2004):

> *The present system does not meet the needs of any but a small minority of the students I teach. It is based on a specification of content in the National Curriculum that requires students to memorize and repeat facts about scientific knowledge that are of little interest or relevance to them. It does not prepare them to understand the scientific issues that will meet in everyday life.*

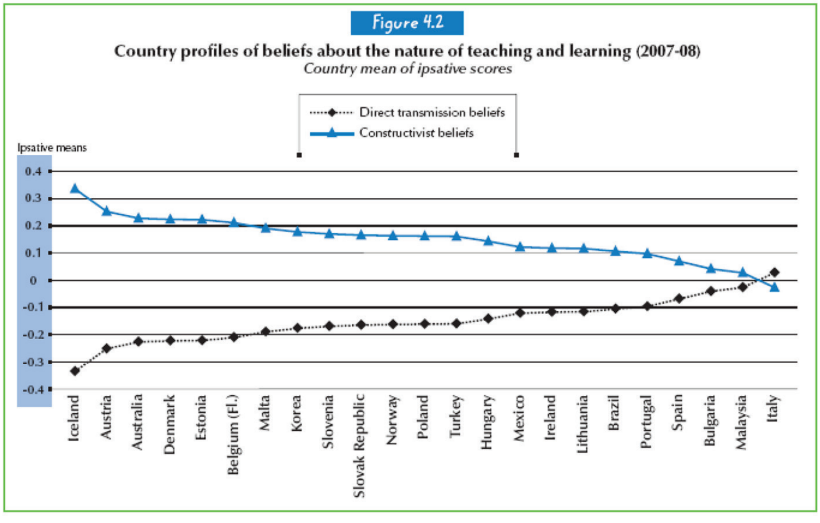

Figure 1. Beliefs as declared by teachers: direct transmission vs constructivism (OECD, TALIS, 2009).

It is also quite commonly believed that present school systems are such as all pupils, starting from primary school, would become scientists as adults. Do we really need all these scientists?

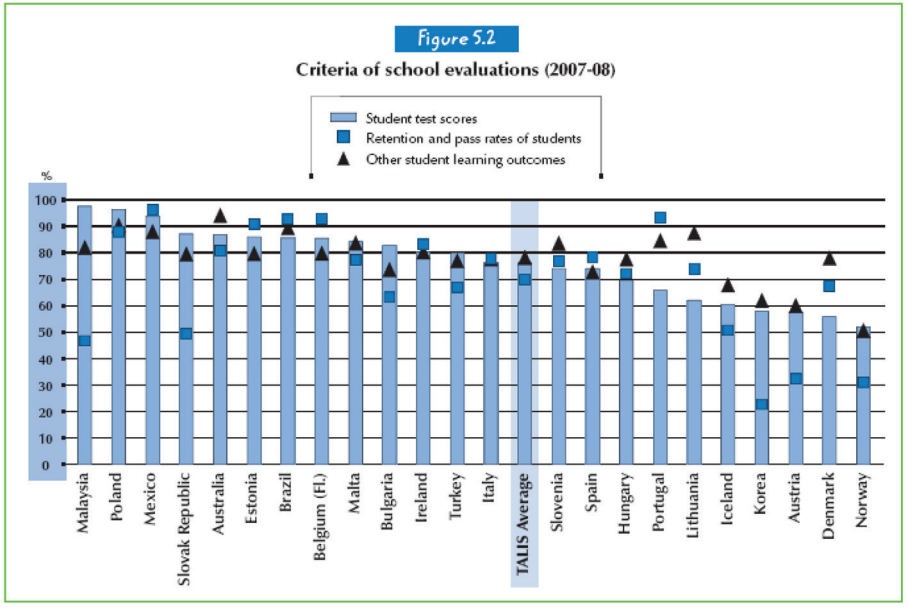

Figure 2. Criteria of school evaluations. Polish (and also Portugal) schools belong to the most formally evaluated among all compared countries. From: OECD (TALIS, 2009).

Constructivism: social roots

Numerous approaches to teaching and learning meet with a public response and, in consequence, become indicators for official educational policies. Constructivism is one of such approaches; it is usually referred to its social meaning: knowledge is a social construct. The basis for the construction process is "common thinking", and knowledge comes as the result of a social agreement, so it requires social acceptance (and an institution that codifies and defends it).

We note that strict referring to the social constructivism would lead to *epistemological relativism*, and cannot be accepted in view of scien-

tific realism: we assume that objective, or at least desirably objective truth does exist and the teacher should tend to show it to students. Possible "partial" truths are only steps to the final statement that the teacher planned before the lesson. Scientific "truth" that would correspond solely to the outcome of common thinking cannot be accepted. Therefore, we propose to go beyond such a "free-run" constructivism, towards using common knowledge only as a starting point, and to construct knowledge under the strict guidance of the teacher/ trainer/ educator. We call this approach "hyper-constructivism" (Karwasz 2011).

Anyhow, the works of Berger and Luckmann (1966) brought an important insight into the *social perception* of knowledge. It is not *objective* truth that influences human actions but the *social perception* of this knowledge. They wrote (p. 19):

> *Everyday life presents itself as a reality interpreted by men and subjectively meaningful to them as a coherent world. As sociologists we take this reality as the object of our analysis. Within the frame of reference of sociology as an empirical science it is possible to take this reality as givem to take as data particularly phenomena arising within it, without further inquiring about the foundations of this reality, which is a philosophical task.*

Thus, we draw practical conclusion for the hyper-constructivistic teaching: truth, or partial truths, in order to be fixed in minds, first need psychological acceptance by all individuals in the group. Knowledge, in order to be assimilated, needs emotional support.

Cognitivism – science on human understanding

By the term "cognitivism" a common domain of different disciplines – both human (philosophy) and experimental (psychology, neurosciences) is intended. For didactics, cognitivism means an essential change of paradigm: the subject of teaching is not specific knowledge, but its state of *understanding in the mind* of a young person. In other words, during the lesson it is not the sequence of equations to be written that scans time, but the *reflected* knowledge, as seen in the eyes of students: any brake in understanding terminates the lesson. The point of interest of cognitive

teaching and learning is not a scientific subject itself but its *representation* in students' mind.

Different authors stress various aspects of cognitivism. Jerome Bruner in his late "Acts of meaning" (1990, p. 8) wrote:

> *The cognitive revolution as originally conceived virtually requires that psychology join force with anthropology and linguistics, philosophy and history, even with the discipline of law. [...]. Very early on, for example, emphasis began shifting from „meaning" to „information", from the construction of meaning to the processing of information.*

Piero Crispiani (2006, p. 8) gives a following definition of cognitive didactics:

> *Cognitive didactics in not a single method, is not based on one procedure or protocol, but accumulates a series of statements and doubts on the [didactical] observations themselves, and appeals to the previous knowledge – from neuro-psychology to pedagogy, ethology, sociology etc. – to the most reliable aspects of the reasoning, i.e. the human mind."*

In practical didactical applications, a cognitivist method means to consider not only the final goal of a lesson but a *path* of arrival to this goal, or even more: many *possible* paths of arrival.

Cognitivist didactics is to be completed with cognitivist *pedagogy* (Siemieniecki, 2013), which streses the general importance of communication: ways of "packing" information, ways of transmission, modes of receiving.

> *In this way, communication creates the reality. The situation indicates communication and communicating as fundamental notions, that must find within subjects of cognitive pedagogy. There is not didactical nor educations activity without communicating. That is communication which defined the structure, re-organization and processing of social fact.* (p. 76)

Pedagogical Knowledge Contents

What is another factor necessary for obtaining high didactical efficiency, is the equilibrium between scientific knowledge and pedagogical com-

petences of the teacher. Lee Shulman (1987), evoking an educational reform, indicated that, apart from the knowledge of subject contents, general pedagogical and curriculum content knowledge, teachers must show a special ability: pedagogical content knowledge

> *Among these categories, pedagogical knowledge is of special interest because it identifies the distinctive bodies of knowledge for teaching. It represents the blending content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction.* (p. 8)

Teachers must understand pupils and their needs, but also "educational ends, purposes, and values, and their philosophical and historical grounds". We call this requirement a "9:1 rule": the teacher must know not only specific information to be transferred to the student, but also its whole *entourage* – the history of the discovery, alternative laws, limits of applicability, practical impacts, possible wrong explanations etc. What we also adapt from PCK is the convction, that pedagogical constraints (and pedagogical goals) are not less important in teaching than scientific contents themselves, see Abell (2008).

Inquiry-based teaching

Inquiry-based teaching (IBT), as stated by Shelley Goldman (1998, p. 258), has always been present in educational systems, also in USA, but usually reserved for higher-level social groups: "For most of this century, our educational system served only the elite in thinking-centered classrooms. The majority of students received an education aimed at the acquisition of basic skills and routine knowledge." A few years ago, IBT also became an indication for EU.

A variation of IBT, particularly applicable on physics, see for ex. Fazio, 2003), is so-called PEC (Prediction → Experiment → Comparison) methodology. Students are asked to predict the outcome of an experiment; this resembles a constructive, inquiry-based methodology. "A conducting wire is placed near a magnet. What will happen if an electric current is supplied to the wire?" For sure something will happen – probably the wire

will move. A series of "left" or "right hand" rules governs the direction of this movement, and say, again in Polish school, these rules become a part of competence tests. So, even PEC itself does not sufficiently stimulate students' ability to create and resolve new situations.

All these approaches have been recently criticized for being not much efficient in long-term educational goals: learning by discovering, with weak instructions lead to poorer results than traditional teaching (Kirchner, 2006). Moreover, some tests showed that unguided students can perform worse after learning than before: mental processes during acquiring knowledge are different from doing research. Therefore, not denying the achievements of constructivism and IBT, the leading role of an adequately prepared teacher comes inevitably back. Students still can construct their knowledge in an (apparently) independent way, but the teacher/ trainer/ needs to supervise that their cognitive processes go towards the pre-defined didactical goal.

Hyper-constructivism: principles

All this discussion, and first of all the requirement to form adults capable to adapt to changing cultural conditions, lead to a new strategy: learning by self discovering, but under the guidance of a teacher/ trainer, well-prepared both scientifically and pedagogically. There is also a second requirement: in present, virtual worlds, it is necessary to come back to really existing, tangible objects. Real objects – a page in a book, a physical object – fix the cognitive attention for a longer time than internet pages that swap within half a second.

Two strategies

These two main strategies:

1) constructing knowledge by pupils, but under the strict and wise control of the teacher
2) using all available (i.e. really existing) resources – objects, experiments, books, internet we define as:
   - **hyper-constructivism** (i.e. going beyond the social constructivism, in which knowledge is merely discussed and socially accepted)

– **neo-realism** – all what can be shown (seen, touched), must be shown, and even more.

The latter of these indications goes beyond what Albert Einstein used to say: "Everything should be explained as simple as possible but not simpler". We say: "Everything should be explained as simple as ever *impossible*, in a way, that everyone can understand it". We show not only falling balls, but also an electron (lepton) as a Greek euro-cent (ΛΕΠΤΟ) and proton (an iron cube, with three animal-like quarks on three corresponding walls and of a mass in proportion to the lepton). Giving a visualization stimulates pupils imagination: quarks posses their features, and we need to report them; also the Earth, seen by Voyager far away seems a faint, blue point.

Hyper-constructivism: principles

– Information is pan-available
– Teaching is *interactive*
– Elements of individual knowledges of students are the starting *resource*
– First, it is the teacher who defines *implicitly* the arrival goal (i.e. a law, a principle, a phenomenon)
– Such a heuristic goal corresponds to an *ontological category* (Kant)
– Teacher has to *induce* this category in minds of student
– The arrival *path* is defined (case-by-case*) according* to the knowledge of the audience
– In constructing the arrival path, the teacher uses knowledge available in the target group and *ad-hoc* experiments (or texts in teaching languages, history, philosophy)
– Learning becomes an active (and involving) discovery

HC didactic rules are similar to the traditional didactics, but completely different:

– Frequently proposed activity of students is substituted by *autonomous* constructing in school/ extra-school group, of a fragment of knowledge that was planned by the teacher.
– Students/ pupils construct this knowledge themselves, based on possessed resources (own information, experiments, internet, books at hand).

– The teacher solely streams their group thinking in the planned direction.
– In case of difficulties, the teacher does not say: „Wrong! Sit down!" but asks questions in such a way that the student and/or his/her colleagues find the error themselves.
– Obviously, it requires the huge resources of knowledge and experience of the teacher. In physics, additionally – many different experiments at hand.

The difference between HC and IBT is that, giving an experiment to students, first we say "please do something!". –"What shall I do?" they ask. "Anything you want!". Showing what to do would spoil independent thinking. As stated by Polish pedagogist, Kazimierz Sośnicki, "Too much visualizations (exemplifications) lead to infantilism."

We take the *common thinking* from constructivism as a starting point for the construction of desirable knowledge. We do not disregard this thinking as wrong pre-concepts (Duit, 2006): these are objectively existing social facts, which must be accounted for in constructing "correct" knowledge. Say, pupils' convinction that heavier objects fall quicker than light ones is a useful base for the construction of a didactic path. Using the "filled-up" (Popper's expression) notion that "objects fall because of gravity" not only does not explain anything (as "gravity" it means being heavy), but it also spoils, already at the beginning a possible *cognitive* path.

A hyper-constructivist path starts from common thinking (heavier objects fall quicker), but proceed via a series of experiments on light and heavier balls falling. First, a ping-pong ball falls from about half a meter. However, the abstraction of non essential observables is the essence of scientific experiments. Therefore, we perform this experiment asking students to close their eyes and listen which sound is first: ping-pong or caoutchouc. Like in a real experiment, we repeat this trial twice (and not more) – the third, cross-checking trial is with their eyes open.

HC – resume':

1) Teaching objectives (knowledge and cognitive skills) are thoroughly defined, with long preparation (for. ex. the concept of *energy*)
2) Common thinking, i.e. pre-existing knowledge is the starting point ("objects fall because they are heavy")

3) A set of steps (and alternative paths) is also well defined: discussion with students is the way to get the final construct
4) at-spot available knowledge (via internet, books, experiments) is used to achieve the fixed points of knowledge ("kinetic energy can be transformed into potential and vice versa").

We stress another aspect of hyper-constructivistic path: student start from a variety of (common) thoughts, and the teacher links them into a coherent reasoning. Differently from social constructivism, from IBT and PEC approaches, students are the active particpant of all actions: defining problem, projecting experiment, performing it, explaining, evaluation of wrong answers, drawing conclusions, asking further open questions.

At all steps, students are not left for a free-lance discussion ("who will say more?"), but are *strictly guided* by the teacher ("do you agree with this answer? Can we find-out why?"). This, in turn, reflects Kant's epistemology: the scientists do not ask the nature like a child "what is this", but like a magistrate – "is that truth, than on May 1st, in Sopot, on Kujawska street, you stabbed Jan Kowalski Yes? or No?". The nature usually answers "Ni" – neither Si nor No, and HC teaching should also warn students about it.

Teaching in school and outside school

Hyper-constructivist narration on science has been developed in a series of our actions outside school: i) introductive lectures and training for teachers and guides at interactive exhibitions, ii) at workshops and plenary lectures for kids at universities, iii) at interactive lectures in science museums. Such activities, for groups that each time present different preparation, without fixed curricula obligations and with no strict limits of time, constitute natural playgrounds for plastic and interesting narration.

On the other hand, the practical applications of IBT in schools clash not only with the administrative requirements of authorities (see again fig. 2) and with the lack of time, but also with the lack of skills, which can be accumulated only with long pedagogical experience. As stated by van Uum et al. (2016): "For primary school teachers, the open nature of IBSE

poses challenges as they often lack experience in supporting their pupils during the different phases of an open IBSE project, such as formulating a research question and designing and conducting an investigation."

Further more, it is not enough to propose IBT without inducing socio-cultural changes in teachers, actions (Brand 2011). This is the crucial point linking to an apparently contradictory analysis in fig. 1 and 2: Polish teachers declare the will to introduce constructivist approaches and the practice is just opposite. Deeper cultural changes are needed in teachers' thinking – a variety of long-term actions are necessary to achieve such changes.

Teaching outside school allows extending the educational aims outside fixed national curricula, towards diversified practical and social abilities. As stated by Hudson (2003):

> *Informal learning experiences are particularly well positioned to facilitate the affective and social components of learning. They can provide the fusion of the cognitive, affective and social that is too often absent in the classroom but is essential to the kind of radical shift in attitudes and values on which sociopolitical action depends. It is also well established that education in and through the environment can play a substantial role in assisting the re-ordering of values and the development of new ones.*

Learning is Fun

The overflow of information (and the rigidity of the school, we recall fig. 2) makes learning not much loved by pupils. To greater extent, therefore, an effort has to be made to make learning exciting. As the founder of didactics as a science, Jan Komensky, wrote in his "Great Didactics" in 1657 (&18): "and the subjects will attract students if they correspond to pupils, capacities and are presented clearly, and particularly if we interweave with matters joyful or less important". Adding fun, makes possible teaching complex notions, even in physics, and even for children (Karwasz 2011, 2015).

The success of these initiatives is, however, not due to their "joyful" elements, but thanks the didactic and scientific contents. As resumed in (Karwasz, 2012), the three cognitive aspects of the object/ lesson/ lec-

ture/ rehearsal: lucid + didactic + scientific must be in mutual equilibrium, like white light is composed of three fundamental colours. Reducing teaching to be "pleasant" makes it, in longer term, ridiculous and useless.

Among the competences that should be developed in this mutually complementary approach, we recall those from OECD (AHELO, 2014): – critical thinking, – analytical reasoning, – problem solving, – written (and oral) communication.

Conclusions

The need for new pedagogy, well identified both in Europe and in America, comes from new technological and cultural circumstances. The background for the reform started growing as early as in the second half of 19th century, as concepts of constructivism, cognitivism, pedagogical contents, inquiry-based teaching and so on. However, different implementations did not bring a significant breakthrough in efficiency of educational systems. This, as shown by numerous studies, including those by OECD, stem from the gap between potential attitudes and practical implementations. Therefore, science teachers at all levels of educations, both formal and informal, should be the primary target group of new methodologies.

The detailed goals of the proposed methodology coincide with the current indications from EU (and OECD) institutions: "communication in mother language, communication in foreign languages, competences in STEM (science, technology, mathematics) and informatics (digital reality), lean to learn, social and civic competences, spirit of initiative and enterprise, cultural consciousness and expression" (Da Re, 2015). In other words: not only the contents, but a wide range of attitudes and abilities needed in adult life.

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Code Clash and Code Match in Education: Why Does the Government's Digitalization Strategy Clash with Teachers' Knowledge Practices in School Subjects?

Abstract: *The authorities' plans for digitalizing school are marked by high ambitions and expectations. These ambitions have only been fulfilled to a limited extent. To explain the gap between the government's plans and reality in school, educational research has focused on factors such as teachers' digital competence or other factors of school culture. This paper takes a different perspective, claiming that the integration of technology in schools will in part depend on the subjects' forms of knowledge. With a starting point in the Legitimation Code Theory (Maton 2014), the article argues that the Norwegian government's digitalization strategy partly conflicts with teachers' knowledge practices in the classroom, which results in degrees of code matches and code clashes between the school and the authorities' plans for digitalizing education.*

Keywords: *ICT, digitalization of the school, technology integration, Legitimation Code Theory, specialization, knowledge practices, subject areas*

Introduction

After the year 2000, Norwegian authorities have been engaged in the large-scale digitalization of primary and secondary schools, and there have been high expectations regarding the results (FFD 2017). According to the plans, students shall develop skills and digital competence by using technology in all school subjects (LK06). However, ICT also forms part of a more comprehensive project, where technology spearheads fundamental changes in school. Technology is supposed to facilitate the

change of schools in several areas. Technology shall enable students to participate in an increasingly digitalized society, so that they can deal with a world marked by fast changes. The teaching of digital competence is supposed to create digital skills, digital judgement, critical thinking, cooperative skills, and in-depth learning (FFD 2017). Above all, technology should stimulate better learning, and there is hope that it can increase the learning outcome.

However, the high hopes regarding ICT of educational authorities in Norway and in many other countries have only been realized to a limited degree. While Norway is on top of international lists regarding the presence of technology in schools, this has not led to an increase of subject-related and pedagogical use of technology in the classroom (Hatlevik et al. 2013). Furthermore, studies show that the use of technology varies, sometimes considerably, among school subjects (Krumsvik et al. 2013, Hatlevik et al 2009). This situation is not unique for Norway, but is part of an international trend, a growing gap between official plans and the realities of digitalization in school (Selwyn 2011). This problem has received considerable attention in the research on the use of ICT in education; a number of studies investigate the factors that can support digitalization of school. Commonly, these studies focus on the digital competence of teachers, factors of school culture, available technological resources, and ICT administration (Law et al 2008, Erstad 2010). It is often argued that there is a need to change all these factors, which assumedly will lead to a better integration of technologies in. While this research certainly has provided new insights into the use of ICT in schools, it tends to overlook knowledge as a fundamental factor, which is crucial for the implementation of technology in school.

Like the official strategies for ICT in education, much of that research overlooks that the integration of technology in the classroom depends on teachers' knowledge practices and the forms of knowledge in each subject. Educational knowledge is not neutral knowledge, and the use of technology in school is formed by knowledge practices of teachers as well as by their ideas of how students can learn best in their subject. This article investigates the relation between the official strategies for digitalization on the one hand and the teacher's knowledge practices in school

on the other. The article argues for the official strategy, emphasizing the societal need for digital competence, which partially clashes with knowledge practices in the classroom practice in each subject. With a starting point in Maton's (2014) concept of specialized codes, I argue that the digitalization of school has so far resulted in degrees of code matches and code clashes inside school subjects but also between schools and official strategic plans.

Theoretical frame work: LCT and specialization codes

This article is based on social and realistic framework formed by Karl Maton's Legitimation Code Theory (LCT; Maton 2014, 2016). LCT focuses on performances in an educational context. In order to show progress, the practice and conceptualizations of an individual have to agree with the legitimizing code, which provides the base for what can be conceptualized as being legitimate in a subject or in education. This project will use LCT, specifically its dimension of specialization. Specialization starts with the assumption that practices, viewpoints, or knowledge requirements are about or are oriented towards something or someone. Analytically, there is a distinction between epistemic relations (ER) between practices and their object or focus and social relations (SR) between practices and their subject, author, or actor (carrying out practices). In the same way, knowledge requirements are realized between epistemic relations (ER) and their object of study and social relations (SR) between knowledge and its subjects or authors. These relations illuminate the question of what is legitimate and can thus be described as knowledge and who can be a legitimate knower. Each of these relations can be strong (+) or weak (-), thus creating four specialized and legitimizing codes (Maton 2016 et al. p. 12): *Knowledge* (ER+, SR-), *Knower* (ER-, SR+), *Elite* (ER+, SR+) and *Relativist* (ER-, SR-). These codes can be represented and analyzed with the following model:

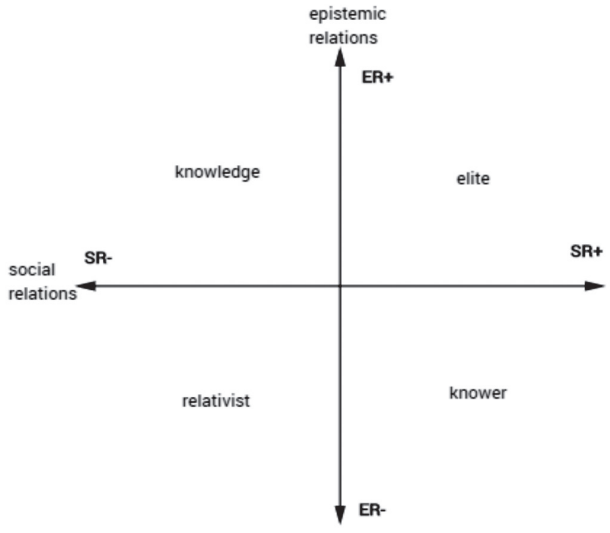

Figure 1. adopted from Maton 2016 et al., p. 12.

Translation device and analysis of the political strategy for digitalization in schools

Computers and the Internet have long been a part of the educational system, but only after 2000, Norwegian authorities have developed systematic plans and strategies for the comprehensive digitalization of schools and education. These plans are not unique for Norway, but form part of a broad international movement, with government-initiated plans for digitizing school. The most important plans are the *Program for Digital Competence 2004–2008* (PFD 2004), the school reform *Knowledge Promotion* (LK06), and the recently presented *Future, Innovation, and Digitalization – Digitalization Strategy for Primary and Secondary Education from 2017 to 2021* (FFD 2017). A common characteristic of these documents is that they treat knowledge as a neutral category, and assume that technology can be integrated into the classroom without friction. The analysis of these documents was inspired by an external language, developed by Chen et al. (2011, p. 73), a translation device suitable for analyzing data with the concepts from LCT theory.

Table 1. A translation device for specialization codes and political documents

EPISTEMIC RELATIONS (ER)			
Concept		Indicators	Example quotes from empirical data
content knowledge	ER+	Content knowledge is emphasized as determining form of legitimate educational knowledge	Scientific subjects and other areas of knowledge are in continuous transition, and school subjects must be based on updated knowledge (FFD, p. 16)
	ER-	Content knowledge is downplayed as less important in defining legitimate educational knowledge	The digital competence of students is not developed by itself but by daily exposure to different digital media, which creates interest, a low threshold for use, and a good basis for learning (PDK, p. 20)

SOCIAL RELATIONS (ER)			
Concept		Indicators	Example quotes from empirical data
Personal knowledge and experience	SR+	Personal experience and opinions are viewed as legitimate educational knowledge	The learner is seen as an active and creative producer of knowledge and is not just a recipient of information and knowledge from external sources (PDK, p. 25)
	SR-	Personal experience and opinions are downplayed and distinguished from legitimate educational knowledge	To achieve competence in a subject means to be able to acquire and to apply knowledge and skills for being able to master challenges and to solve problems in known and unknown contexts and situations (FFD, p. 17).
Concept		Indicators	Example quotes from empirical data
Societal need for competence	SR+	The competence that is needed for the labor market is seen as legitimate educational knowledge	A changing labor market requires that students are prepared for lifelong learning, to think in new ways and apply what they have learned in new contexts (FFD, p. 16)
	SR-	Competence in the workplace is downplayed and distinguished from legitimate educational knowledge	The use of ICT in some subjects forms part of those subjects both through the competence aims and the methods teachers choose to use (Preface, FFD)

An analysis of selected documents, FFD (2017) and PDK (2004), shows that technology is seen as a means to change education on different levels, among others better, learning, better learning results, and transformation of work methods in education. To legitimize the plans for the digitalization of schools, both plans (FFD, PDK) stress, with different orientation, social conditions. These social conditions refer to the new ways in which students can be active participants, but also to a new knowledge society where society and the labor market require new forms of competence. While the PDK-plan stresses the importance on pedagogy based on the interests of children and young adults and their autonomy and self-realization (Skagen 2014), the FFD-plan focused

more on the importance of the teacher for the learning process. However, a number of studies have shown the digitalization has not strengthened the role of the teacher, but that the use of technology has several unfortunate consequences such as restlessness, perseverance of students' everyday-culture, and non-subject related use of ICT (Blikstad-Balas 2016, Krumsvik 2013). Despite the increased accessibility of technology at school, there is still a considerable gap between expectations and the teachers' use of the technology for pedagogical aims (Blikstad-Balas 2015, Kopcha 2012, Ludviksen & Rasmussen 2006).

The far-reaching official plans for digitalization are based on the expectation that technology will lead changes in school, merging different forms of knowledge and experience, where the integration of technology into the classroom is driven by a societal need for digital competence. The last point is stressed by the plan of the Ministry of Education and Research, stressing the development of students' competence to "deal with a world in rapid change (FFD 2017, p. 7). Seen from this perspective, the document represents the weakening of the 2004 plan with its focus on the pedagogy of children and young adults. On the other hand, the ministry retains the idea that technology in itself will change education (FFD 2017, p. 22): "New technology leads to a change of pedagogical and didactic framework. It changes learning processes and teaching. Students become active and can cooperate on common products and utilize accessible sources and learning resources." These statements are formed by the constructivist understanding of learning at school and explain the demands on teachers in the ICT-driven school (FFD 2017, p. 22): "Teaching in a digitalized school requires a new and different competence from both teachers and other professions that work with teaching." This competence, which is aimed at improving the quality of teaching, is described as professional digital competence. It is assumed that teachers with such competence will be able to provide a qualitatively good learning process for their students.

Even though the term knowledge is used several times, in particular in the FFD-plan, it remains a descriptive term, without a clear content or independent status. The subjects' knowledge structures (Bernstein 2000), their concepts and theories, do not have the status of a legitimate

form of educational knowledge, which can define prerequisites for the use of technology in school. Based on the idea that technology is an all-pervasive force that can change education, knowledge is now reduced to something that should be adapted to the work of students using the new technology: "To be able to evaluate a problem in such a way that the computer can help to solve it, requires the ability to break down the problem into logical steps–into an algorithm" (FFD 2017, p. 18). Instead of the knowledge structure of the subjects defining the prerequisites and forms of the pedagogical use of technology, technology itself creates the framework of how students shall acquire and apply knowledge. This transition to an adapted concept of knowledge is a development foreshadowed by the 2006 Norwegian school reform Knowledge Promotion (Bratland 2016 et al.). In this reform, knowledge was replaced with a broad concept of competence. In the ministry of education's strategy for a digital school, this broad concept of knowledge is continued; there is an emphasis on basic skills, experiences, ethics, and application of knowledge. From the perspective of this adapted concept of knowledge, forms of knowledge in the subjects are no longer seen as a crucial factor providing form and content for the knowledge practices in the classroom. The authorities thus ignore new international research on the integration of technology in school. This research shows that knowledge and the form of knowledge practices are decisive for student learning, knowledge building, and success in education (Maton et al. 2016). This knowledge shows that the structuration of knowledge in school subjects is not neutral but has effects on educational practices. In other words, these studies suggest that different forms of knowledge will interact differently with different forms of educational technology in the classroom.

Instead of letting subject knowledge decide how ICT is used in schools, the authorities base their digitalization strategy for schools on the vision of a future society, a society marked by considerable changes and supposedly requiring new forms of competence, skills, and knowledge. Teaching with digital technology shall enable students to participate in a "knowledge intensive and specialized labor market", adapting to a workplace that demands "lifelong learning" and adjustment (FFD 2017, p. 16). In other words, what legitimates the increased use of technology

in education is the extensive proliferation of that technology as well as a changing society. This means that in the strategy to digitalize school, *social relations* (SR+), as they are realized in work life, are more important than *epistemic relations* (ER-). The official strategy of digitalization stresses social conditions and prioritizes the generic qualities regarding the use of technology, irrespective of the context. These generic qualities, with their focus on learning to use digital tools and on acquiring digital competence may be relevant in the context of work life. However, these measures do not in themselves contribute to the increased integration of technology in the classroom, which depends on the forms of knowledge in the subjects, codified in the subject section of the curriculum. The fact that the digitalization of schools has been a limited success can be explained by the fact that social relations (SR+) have a stronger position in the mentioned documents, compared to epistemic relations ER-). This means that specialized knowledge is toned down in the process of the digitalization of schools, and that digital skills and generic forms of competence, which strengthen participation in social and work life, are seen as measures for the use of technology in school. This form of legitimation of the use of digital technology implies creating a privileged position of practices characterized by a *knower code*. This situation leads to *code clashes* and to some degree to *code matches* between the official strategy for digitalization and the knowledge practices established in the classroom.

Specialized subject codes and the integration of technology

As mentioned above, recent studies have shown that the forms of knowledge in the subjects have considerable influence on how technology is integrated in schools and other educational institutions (Howard & Maton 2011, Maton et al. 2016.). These studies, which use LCT-specialization as a starting point, argue that knowledge and knowledge practices are crucial for students' learning, knowledge building, and educational progress (Maton et al. 2016). The research is based on a social and realistic concept of knowledge (Maton & Moore 2010) and shows that the structuration of knowledge in the subjects is not neutral but has differ-

ent effects on educational practices. These studies provide a new insight in to how the integration of technology is connected to the knowledge structure of the subjects and knowledge practices in the classroom. The studies suggest that different forms of knowledge will interact differently with digital technology as well as determine to what degree technology is integrated in the classroom.

This research provides an insight into an essential factor that can explain why the official strategy for digitalization falls short and why there is a gap between the ambitions of the authorities regarding integration and use of ICT on the one hand and the reality in schools on the other. In school, the use of technology is formed by the knowledge of the subjects and knowledge practices in the classroom. This means that the use of digital technology in education will be markedly different from the use of technology in everyday life or at the workplace. The digital competence of the net generation or the digital practices of the workplace cannot easily be transferred to a school context. Only generic forms of technological use, technical mastery, will easily be applied in the workplace. When the authorities focus on these generic forms of technology use in school, the result can be described by the concepts of "code clash" and "code match" between the official strategy on the one hand and the knowledge practices in school on the other.

The connection between technology and the teaching of subjects as defined by the national curriculum has been investigated in several studies, showing that some form of using ICT-tools "match" some subject areas better than others. In mathematics, for example, ICT is used to create graphic presentations and illustrations (Hennessy et al. 2005), in natural science ICT is used to visualize the empirical conditions of nature (Webb & Cox, 2004), and in English technology is used for language development and writing (Silvernail & Glitter, 2007). These studies show that teaching with the use of ICT is formed by knowledge practices in different subjects and suggest that there is no homogenous use of technology across subjects. These results direct attention towards teachers' knowledge practices and the underlying pricples of the subjects.

The differences between the subject areas and their forms of knowledge is a central topic in the contemporary sociology of education. It becomes clear that much of research on the use of technology in education overlooks knowledge, which is a decisive factor influencing practices in different subjects (Howard & Maton 2011). In the article "Theorising knowledge practices: a missing piece of the educational technology puzzle", Howard & Maton (2011) start their argument on the basis of a large study from Australia. This study, known as "Digital Educational Revolution in New South Wales" (DER-NSW, 2010–2012), has been initiated by the Australian authorities and is part of a larger evaluation of teachers' and students' use of computers and other technology in secondary school classrooms. These evaluations provide an insight into the relation between different forms of subject knowledge and the integration of technology into the classroom. As mentioned above, the LCT-specialization allows investigating the principles behind knowledge practices in education. Howard and Maton's (2011) analysis of teachers' integration of technology is based on differentiating between two principally different relations to knowledge. A distinction is made between the epistemic relations (ER) to an object or focus (content, skills) and social relations (SR) to an agent or author (experience, attitudes). These two relations can vary in intensity and unveil what is necessary to know and what kind of *knower* one needs to be in order to be successful in the respective subject. The above-mentioned evaluation (DER-NSW) includes both teachers and students and treats all subjects as being homogenous. Howard and Maton's (2011) analysis, however, shows that subject areas show considerable variations in terms of knowledge and that different subjects are regulated by specialized codes. The subjects of English and mathematics can serve as an illustration of that variation. In English the social relations are strong (SR+), compared with epistemic relations (ER-), and both students and teachers characterize English as a subject with a knower code (SR+, ER-). In mathematics, however, epistemic relations are strong (ER+) in comparison with social relations (SR-), and both teachers and students characterize mathematics as a subject with a knowledge code (SR-, ER+). The following figures illustrates those findings:

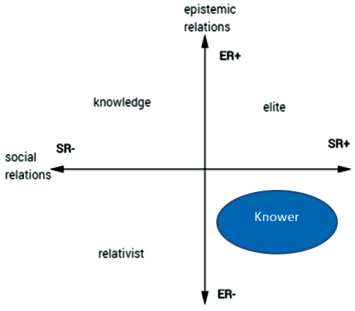

Figure 2. Teachers' perceptions of bases of achievement of English

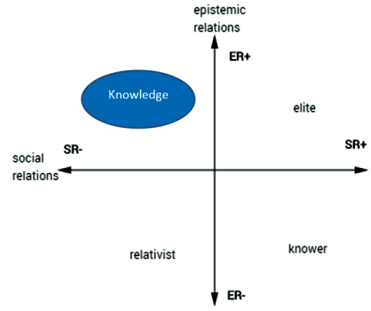

Figure 3. Teachers' perceptions of bases of achievement of mathematics

The underlying codes of subjects play a decisive role for the integration of technology into subject areas. Based on the evaluation data (DER-NSW), Howard and Maton (2011) show that the teachers' understanding of how ICT can be used to achieve knowledge and to support student learning is related to their views of what qualities lead to success in the subject area. Based on an analysis of the underlying relations (SR, ER), Howard and Maton show that math teachers' use of technology encompasses the evaluation of skills and procedures, while ICT is not seen as being important for achieving success in the subject. In English, it is the opposite; here the main focus are practices that provide experience using the language and developing a sense of language, and ICT is regarded to be important for supporting learning in the subject. In conclusion, it can be seen that the relations underlying the teachers' use of technology in various school subjects are considerably different. This leads to degrees of code matches and code clashes between the official strategy for digitalization in Norway on the one hand and the teachers' knowledge practices in the different subjects on the other.

Code clashes and matches in the integration of technology in school

The official plans to digitalize the school sector are driven by the idea that society is marked by considerable changes, leading to a knowledge

society. Here, teaching should provide students with competence in line with future challenges: "The digital agenda stresses the role of digital competence and participation, and this means that we must increase the effort and digital competence among students, teachers, and other staff in the sector of education and in teacher education" (FFD 2017, p. 6). As has been shown in the analysis of the official strategy for the digitalization of schools, this strategy prioritizes social relations, where learning about digital technology is seen as the decisive factor for participation in society and labor market. What is seen as important in the official plans are the generic aspects of the use of technology, not the specialized knowledge of the subjects. While social relations have a strong position, the epistemic relations to knowledge are weaker. The practices stressed in the official ICT-plans are geared towards students as knowers, and the plans are generally characterized by a knower code, even though some passages in the documents point in a different direction.

In school and teacher education, however, the integration of technology, as it is expressed through knowledge practices in the classroom, is shaped by the forms of knowledge of the subjects and the teachers' perceptions of how students can best learn the subject (Bratland 2016). In the section above, it was argued that different subjects interact differently with digital technology, and that this interaction determines the scope and form of integration in the classroom. While the authorities assume that technology can be integrated into subject areas in schools without any friction, research shows that technology in the classroom follows the established pedagogical practices in the subjects (Krumsvik et al. 2013, Hatlevik et al. 2009), and that these practices are regulated by the form of knowledge in the subjects. This is further clarified in Howard and Maton's (2011, pp. 201–203) analysis of the use of technology in the school subjects of English and mathematics. In the study, math teachers emphasized that knowledge is necessary for students to understand mathematics. The limited use of ICT in the classroom is not the result of resistance to technology or the lack of equipment in the classroom, but is driven by the conception of what is useful and necessary in order to learn mathematics as a subject. ICT and digital tools are used when they serve a need in the subject area, for example to demonstrate mathemati-

cal principles by using spreadsheets. These practices are decisive for the integration of technology in the subject. While the plan of the authorities to digitalize schools stresses social relations, ICT-use in mathematics is formed by knowledge code practices stressing epistemic relations. Mathematics is characterized by a knowledge code, and for that reason there is a code clash between the official technological strategy and the practices applied in the subject.

The situation is different in the subject of English. Here, ICT is seen as a tool that provides students with a chance to express themselves. Students of English are seen as legitimate knowers from the start, and specialized knowledge is toned down. In the interviews, teachers stress the disposition of the students, the chance to express themselves personally, and how technology stimulates reading and writing and opens up for new creative methods in the subjects. These creative methods encompass digital forms of content production, across the genres, using multi-modal texts. These knower code practices are typically supported by student-centered activities in the classroom. In general, the practices in English are marked by a knower code, stressing social relations, which means that the subject is more in line with the official strategy for digitalization. Regarding this strategy, the practices in the subject can be described as a code match. However, also in English there are topics that require epistemic relations to a larger degree. Teachers do not interpret technological practices for acquiring specific skills and knowledge such as mastering the language and literature as being useful, which indicates a code conflict with the official strategy for digitalization.

Howard and Maton (2011) show how the integration of technology varies between the subjects English and mathematics and that integration depends on the codes that underlie the specific practices of the subject. Seen in relation to the official strategy for digitalization, English is marked by a higher degree of technological integration in comparison with mathematics. This difference can be explained by the fact that the subjects are dominated by different specialized codes. Much of the technological practices in English is driven by a knower code, and here there is congruence between technological and knowledge practices, in line with the digitalization initiative of the authorities. In mathematics, there

is a lower degree of congruence between technological and knowledge practices. ICT is used for technological practices when these support learning of mathematics. The subject of mathematics stresses epistemic relations, and its practices are driven by a knowledge code, leading to a code clash with the official strategy for digitalization in schools.

Conclusion

So far, the ambitious official plans for the digitalization of schools have been a limited success in Norway and in other countries. There is a considerable gap between the official ambitions and reality in school. This problem has been studied extensively, and common explanations mention factors such as the lack of digital competence, school culture, available technological resources, and ICT-leadership (Law et al. 2008, Erstad 2010). This article, however, focuses on knowledge and argues that the forms of knowledge in different subjects play a decisive role for the integration of technology in the classroom. The article takes up one of the dimensions of LCT-specialization and applies this theory to illuminate the Norwegian strategy for the digitalization of schools. The analysis focuses on the principles underlying the official plans and shows that social relations (SR+) play a stronger role than epistemic relations (SR-), which results in those plans in general being characterized by a knower code. This is expressed in the authorities' strong focus on generic digital skills and competence, which is assumed to be crucial for a future society and labor market. The article shows that the use of technology in society is formed by particular social codes, which differ fundamentally from the aims and purpose that a school has. When social considerations and goals are stressed in the official strategy for digitalizing education, the result is that the underlying values of the use of technology partially collide with the nature of the school and with the knowledge practices of the subjects.

In the article, this argument is supported by the studies of the use of technology in school subjects (Krumsvik et al. 2013, Hatlevik et al. 2009). In particular, the article draws on Howard and Maton's (2011) contribution, based on the LCT-theory, analyzing the school subjects of

English and mathematics in lower secondary schools in Australia. This analysis investigates knowledge practices and their role in the integration of technology into the classroom. The analysis of knowledge practices in the mentioned subjects shows that they are characterized by significantly different knowledge requirements, based on different underlying principles of organization. While the practices in English are mainly driven by a knower code, implying a constructivist pedagogical view, the condition is different in mathematics. Here, the learning of skills and concepts is central, and the subject is marked by a knowledge code. The use of technology in the classroom is formed by knowledge code practices, and technology is used when it is assumed to be useful for learning the subject. Seen in the context of the official ICT-plans for schools, the analysis of Howard and Maton (2011) demonstrates that these plans lead to a code clash with the subjects like mathematics and to a partial code match with English. In general, the LCT-inspired analysis of the patterns for the integration of technology into the classroom is far more complex than the ideas that form the official plans for a digitalized school.

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Revitalizing Teachers' Didactic Thinking

Abstract: *The subject of this article is to explore how lesson planning, structuring and assessment have changed after the implementation of the iPad in the school as the main teaching artefact. Technological solutions provide teachers with new opportunities in the execution of their everyday teaching work, but in addition to the teachers needing to revitalise their didactic approach, they also need to master the new technology. We therefore wish to examine how technology, pedagogy and academic content knowledge function in symbiosis, where the teachers' focus is on pupil learning with the aid of a new technology.*

Keyword:

Introduction

During the past decade, digital technology has proliferated within Norwegian schools. Through its emphasis on digital skills, the Department of Education has highlighted that all Norwegian pupils are to have skills in using digital tools, as a result of which several schools have elected to buy in iPads for all pupils and teachers. Introducing the iPad into the school has led to great changes in how the planning, structuring, and post-lesson work of teaching is conducted. Earlier research on the use of digital technology has largely related to ICT in terms of PCs, smart-

phones and similar (Krumsvik & Jones, 2015). The findings have indicated that teachers need to handle several new challenges within classroom management, including everything from didactic challenges to a need for increased digital skills. Studies such as the SMIL Study (Krumsvik, Egelandsdal, Sarastuen, Jones & Eikeland, 2013) and the Rogaland Study (Krumsvik, Ludvigsen & Urke, 2011) have shown that digital skills were of great importance if teachers were to succeed in their classroom management in the digitalised educational reality (Krumsvik, 2014). Another important finding was the significance of having digital teaching and learning in which the teacher is perceived as a clear classroom leader who is able to help the pupils in their search for knowledge. This altered didactic approach is the focus of this article: What happens when technology begins to occupy such a predominant role in the everyday work of the school and becomes the main teaching artefact?

Both schools featured in our research have taken the iPad into use for all pupils and teachers. Teaching is planned according to the same template in the iThoughts app and the technology accommodates all elements in the teaching session, corresponding to the elements mentioned in the didactic relational model of Bjørndal and Lieberg (1978), to which Norwegian teachers are introduced during teacher training. The main difference after the introduction of the iPad into the classroom is that teachers at the schools in which we conducted the research have used the iThoughts template when planning their teaching, while in the period before the introduction of the iPad, the use of the didactic relational model in planning was optional.

We formulated the following research query to cover the areas we wished to investigate:

> *How does technology, pedagogy and content knowledge function symbiotically when the didactic focus of teachers is on pupil learning with the help of an iPad?*

In order to find the answer, we chose to base our enquiry on Mishra & Koehler's (2006) TPACK (Technological Pedagogical And Content Knowledge) model. The model focuses on various aspects of teaching planning that use technology as a natural part of school life. With the

help of this model, we can examine more closely the revitalisation of didactic practice after the introduction of the iPad.

Theoretical approach

Technology in the school is nothing new for teachers, but when the technology is implemented as the main teaching artefact, it is no longer voluntary whether or not to make use of it. This demands a compound set of skills on the part of teachers, which we will describe with the aid of Mishra and Koehler's (2006) TPACK (Technological Pedagogical And Content Knowledge) model.

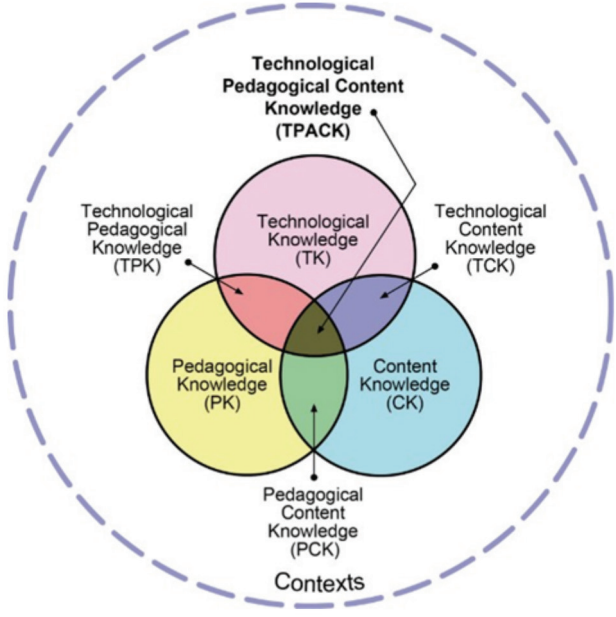

Figure 1. Mishra and Koehler's TPACK model. Downloaded fra http://www.tpack.org/.

The TPACK model can be regarded as a basis for effective teaching using technology. It is built up of three types of knowledge: Technological Knowledge (TK), Content Knowledge (CK) and Pedagogical Knowledge (PK). These three areas interact and in the intersections there arise

the compound knowledge areas that Mishra & Koehler (2006) have termed Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK) and Pedagogical Content Knowledge (PCK). In the innermost part, we find the intersection between all these skills areas: Technological Pedagogical and Content Knowledge, hereafter referred to as TPACK.

Technological Knowledge (TK) focuses on what knowledge is necessary for teachers in terms of technology. In practice, this means that teachers need knowledge and skills in respect of various digital tools. They also need to know what resources they can use and have access to. If the technology is used correctly, this can contribute to stimulating learning. If it is not, it can be a hindrance to learning. Teachers' understanding of how technology can be used in teaching will thus have a great significance for pupil learning outcomes (Koehler & Mishra, 2009).

Content Knowledge (CK) is concerned with the knowledge possessed by the teacher in the academic subject in question. It is concerned with facts, methods, procedures, terms, theories and practice. What form significant framework within Content Knowledge are academic curricula and the five basic skills that are to be implemented by teachers in Norway in all subjects: reading, writing, arithmetic, verbal and digital skills.

Pedagogical Knowledge (PK) is the knowledge area that focuses on didactics. This looks at how the teacher structures the teaching and which methods the teacher uses to achieve good pupil learning in relation to the pupils' learning abilities (Koehler & Mishra, 2009). Important elements within Pedagogical Knowledge include good classroom management abilities, teaching planning and assessment.

These three areas provide an image of the need on the part of the teacher for integrated skills in planning teaching when technology is used as a natural part of school life. The challenge is to perceive these components in relation to each other rather than in isolation. Shulman (1986) highlighted the significance of seeing the connection between didactic skills and academic skills. He believed that teachers could not work purely on the basis of academic skills but needed to couple their academic skills with didactic competence in order to provide pupils with the best possible opportunity to learn. After technology was introduced

into the school, Mishra & Koehler added the need for technological skills and developed the TPACK model. The model forms the basis for seeing and discussing how effective teaching can be with the help of technology, pedagogy and content knowledge. Teachers should be flexible users of all skill areas and should be able to use these areas in an appropriate manner (Koehler and Mishra, 2009).

Nordenbo, Søgaard Larsen, Tiftikci and Wendt & Østergaard (2008) pointed out that digital didactics provides new opportunities to emphasise the teacher's teaching actions, while research on classroom management emphasises that the teacher's teaching actions are one of the most important factors in demonstrating what it is that affects pupils' progress in learning. It will thus be essential that the use of digital tools should have a clear didactic goal and that the school should be conscious of this, if it is to be beneficial to pupil learning.

The technology provides teachers with a didactic opportunity to differentiate teaching for individual pupils and enables pupils to develop new knowledge, while the inbuilt tools in the iPad mean that the teacher can easily check whether the pupils are able to read and understand their tasks. Pupils can show their products and share their learning, and new forms of assessment are made possible. Even though technology leads to a number of new opportunities, a lot of teachers find it difficult to find their way through the technological jungle and do not transfer theories about digital learning into good pedagogical and didactic teaching practices (Johanson & Karlsen, 2018).

Digital learning is one of the five core skills emphasised in the Norwegian school system. A key goal in the curriculum is to ensure the development of pupils' skills in our digital age. On this basis, one could wish that teaching practices in Norwegian classrooms have changed in pace with the introduction of technology, but surveys show that many classrooms still feature traditional teaching practices (Hillmann & Säljö, 2016; Bøe & Knutsen, 2012). However, new technology has led to a paradigm shift in the classroom, with marked changes in the teacher's role as class leaders (Pinto & Valstad, 2017). The teaching is no longer carried out purely from the teacher's desk: the pupils can equally well find tasks in virtual rooms created by the class leader or by others. A relatively new

concept, "classroom orchestration" (Roschelle, Dimitriadis & Hoppe, 2013), has become relevant when speaking of classroom management in the technology-rich classroom. Classroom orchestration illustrates how the teacher needs to orchestrate classroom management in a new and different way than earlier, in that learning in the technology-rich classroom takes place in both virtual and physical classrooms. While providing many opportunities, this also challenges the classroom leader to prepare, conduct and evaluate teaching in different ways than earlier. On this basis, we can see the need for the extended understanding of what constitutes classroom management in the digital school and for the revitalisation of teachers' didactics (Krumsvik, 2014).

Method

Data was collected from two schools teaching first to tenth grade which have taken into use the iPad in their teaching. Both schools have purchased iPads for all pupils and teachers that plan their teaching using the same template in the iThoughts app. At the time the data was collected, one of the schools had worked with the iPad for one year, while the other school had started on its second year.

We have used semi-structured interviews as a method. Semi-structured interviews provide interviewees with the opportunity to freely describe their own perspectives on reality without being trapped by preformulated questions, whether in the context of an open conversation or of a form where alternative answers are provided (Kvale and Brinkmann, 2009:47). The method was intended to identify what experiences teachers had drawn through their work using the iPad as a teaching artefact. We designed an interview guide as an aid to ensure that all aspects that we wanted to examine more closely would be covered, while we remained open to drawing in new and unexpected phenomena if they arose. The interviews were carried out with both researchers present, fully transcribed and subsequently analysed.

After analysing the interviews, we developed a quantitative questionnaire, using SurveyXact, which was sent out and received a response rate of 76 percent (31 out of 41 teachers fully answering the questionnaire).

The questionnaire contained both multiple-choice questions with between two and four given alternatives and extended responses in which the respondents could provide written comments.

Discussion

How does technology, pedagogy and content knowledge function symbiotically when teachers are enabling pupil learning? The Tpack model indicates that knowledge within the three skills areas is essential for teachers who are using technology in their teaching. Based on our findings, we will describe how teachers alternate between using the different skills areas when their didactic focus is on pupil learning with the help of the iPad. We will also identify which didactic changes this has led to, especially in the areas of planning, structuring, classroom management and assessment.

With the introduction of the iPad as a primary teaching artefact, the teachers on whom we conducted the research had to plan their teaching via the iThoughts app according to fixed criteria (see Fig. 2). The didactic planning that was carried out in iThoughts bore great similarity to the didactic relational model, but technology supplies new opportunities for didactical choices before, during and after teaching sessions.

Displaying the mindmap in iThoughts gives teachers an opportunity to expand and combine cells in order to manage the information flow to pupils. This can be a useful didactic aid that awakens interest and understanding for pupils. The clear visualisation of what is taking place and which criteria are being emphasised can contribute to a better learning situation for pupils. As we see it, the template is an extended version of the didactic relational model, covering the entire teaching session. The template secures the whole process in the teaching session and teachers emphasise particularly the importance of this for the close of the lesson. Before the teachers started to use the mindmap, the teaching session might be concluded without summing up the pupils' learning, but after the introduction of the iPad, more systematic work was carried out on the content of the lesson and the concluding summary of what had been learned.

Figure 2. (Pinto & Valstad, 2018). Planning teaching in iThoughts according to fixed criteria: example from Vik school, social sciences.

With the introduction of the iPad as the main teaching artefact, teachers perceived the changes in classroom management as improvements (Pinto & Valstad, 2017). When teachers plan their teaching based on fixed criteria via the iThoughts app, it is done with a focus on classroom management and learning assessment. Pupil learning is incorporated into an integrated system structure of which ensures attention to all elements in the teaching. This systematic planning provides a better structure and overview over the learning material. Teachers speak of achieving a more comprehensive product that helps them in their classroom management role (Pinto & Valstad, 2017). The teaching template

in iThoughts also leads to pupils gaining better understanding of what is to be learned, which learning strategies they can use and how they can be regarded.

In line with Mishra & Koehler's (2006) TPACK model, we see the significance of viewing the connection between pedagogy, content knowledge and technology when planning teaching with the help of technology. Teachers need skills in how digital didactics can help pupils attain deeper learning so that the teachers can enable the best possible learning outcomes for the pupils. Although it is a matter of learning with technology rather than learning from technology, it does demand that teachers are competent users within several skills areas and are able to perceive the connections between these.

The report "What the research says, iPads in the Classroom" (Clark & Luckin, 2013) mentions the "iPads in Scotland" survey by Burden et al. (2012). This survey agrees with our findings that the use of iPad improves the learning experience and transforms the teachers' practice. The iPad's ease of use and rapid one-click access to different tools activates a broader spectrum of possible learning activities in the classroom, while the iPads' accessibility and programmes provide teachers with an opportunity to communicate more easily with pupils. This enables teachers and pupils to explore alternative activities and new forms of assessment. One teacher describes this as follows:

> *It is a tool for which a broad spectrum of apps have begun to be available, providing for different approaches to academic material and different methods for dealing with this material. It is easy for everyone to get going with their work and it provides simple access to apps, the internet and online tasks. It is good for using speech notes to record reading homework at home in Showbie, and the iPad is very good at text creation, with the good editing facilities that are available.*

The teachers found that the iPads activated them as teachers to promote independent learning among pupils and to adapt learning based on the needs of individual pupils, as well as providing easier resource sharing both with pupils and between teachers (Clark & Luckin, 2013).

The iPad helped pupils to create and maintain structure in the work and it was found that they produced much more after they began to use the iPad. The differences between pupil work were less pronounced than previously; the vast majority of them created good products that they could display. The opportunity to produce multi-modal products is beneficial to all the pupils in that they are able to work using the method that is appropriate for their level of mastery. One teacher describes:

> *I think it is a good tool in that the pupils are able to show so many good aspects of themselves. The work is good and the pupils enjoy using it.*

Blikstad-Balas (2015) claims that teachers' digital skills are vital if pupils are to gain increased benefits from the digital technology. According to Blikstad-Balas, the greatest success factor is good classroom management, followed by other important factors such as uninterrupted work, a positive learning environment and the teacher's ability to motivate pupils. The significance of classroom management can be essential when digital aids are being used as challenges can easily arise as a result of technology. The teacher does not only need digital skills; it is equally important that the teacher structures pupils' work routines and functions as a supporter in developing pupils' academic understanding (Blikstad-Balas, 2015, s. 112). The structure was highlighted as an important methodological issue that worked better after schools took the iPad into use. One of the teachers recounted that:

> *The way we have implemented the mindmap with goals, criteria and so on has made the goal of teaching clear for the pupils at all times. The iPad makes it easy to have a joint focus and structure in the teaching, which means that cooperation, acquisition of information, sharing of information, as well as communication with pupils has improved markedly.*

Here we see how the skills areas in the TPACK model – technology, pedagogy and content knowledge – function in an interaction in which all components are significant for pupil learning. Mishra and Koehler emphasise the significance of teachers having the ability to be flexible users of the three knowledge areas: academic content knowledge, peda-

gogy and technology (in Engelien, Johannessen & Nore, 2011:217). This is not always easy to achieve and it requires that teachers perceive the opportunities and limitations that they have within the various knowledge areas.

Black & Wiliam (2011) believe that didactics should be interactive. They mean by this that teaching needs to be in collaboration with pupils so that they can develop the power to incorporate new facts and ideas into their understanding. According to Wiliam, the interactive didactics is particularly well suited to pupils who are struggling academically and to pupils with different ethnic backgrounds. Pupils gain joint responsibility for their own learning, but to achieve this they should also share responsibility for the lessons and not be constrained by having to guess what the teacher is thinking (Wiliam, 2011). One teacher reported that one of the changes after introducing the iPad was that:

> *It became simpler to conduct varied teaching and at the same time meet the pupils at different levels within the same classroom. The pupils can select for themselves an app that is appropriate for the work, which leads to better individual adaptation of teaching.*

The teacher also needs to become open to multiple ways with which to communicate with pupils "When teachers open up channels of communication for pupils, the pupils will use them." (Wiliam, 2011). This means that the teacher's instruction is no longer the critical point, but that the teacher needs to enable affective learning environments in which learning goals and criteria are apparent. This is in line with what is happening when teachers plan their teaching with the help of the iThoughts mindmap. Pupils get a clear impression of what is expected of them, so that they can take responsibility for their own learning and choose their own way to attain the goal.

The iPad is multi-medial and can be used to read, listen, view and visualise. The pupil and the teacher can thus record comments or choose to write, use images or film and share products via Showbie, so that pupils can immediately receive and give responses to each other. As a teacher told us:

> *It takes the pupil two minutes to deliver an unfinished task. They can work further on it at the same time as you can provide feedback based on what they have submitted. For the youngest pupils, the feedback can be recorded verbally so that they can listen instead of reading, if the latter is difficult.*

In line with Wiliam's (2011) thoughts, pupils and teachers who have taken the iPad into use in teaching are enabled to use several communication channels. This presupposes that the teacher can master and juggle with the skills areas of technology, pedagogy and content knowledge in his or her planning work. If the teacher is unaware of the possibilities that exist in the use of the iPad, he or she will be unable to enable the pupil to find their own way of acquiring knowledge. The more skills the teacher possesses regarding the possibilities offered by the tool, the more working methods his or her pupils will be able to work with in parallel in the classroom. Our interviewees spoke of how their pupils were often able to choose for themselves which programmes or apps they wished to use, while on other occasions the teacher determined this based on what was the purpose of the task. This presupposes a high level of technological and didactic skills on the part of the teacher. One teacher tells us:

> *Support apps such as scanPen provide pupils with the opportunity to take a picture of the textbook, upon which the iPad will read out the text for the pupils. This is very useful for those who have difficulties with reading long texts and helps to level out the differences between good and poor readers. The iPad also has a dictation function through which pupils can read in a text and the iPad will write the text out for the pupil.*

When teachers are familiar with the existing knowledge and inherent abilities of a pupil and design the teaching so that their pupils will be able to develop further, they will transmit academic knowledge with a didactic aim of improving the pupil's opportunities for learning. When using an iPad in the classroom, this demands, however, that teachers also possess technological academic knowledge that will enable them to fully exploit the opportunities of technology. Our survey shows that we need to look at teachers' overall skills when they are to plan, structure and evaluate their teaching with the help of the iPad. Our interviewees

believe that it is necessary to create a climate for sharing knowledge internally within the school so that they can further develop their digital skills and teaching practices in fellowship with their colleagues. In this way, they can inspire each other and perceive connections in which technology can be used didactically in relation to various academic subjects and pupil groups, meaning that over a period they will be able to develop a more unified skills base in line with Mishra & Koehler's (2006) TPACK model.

Summary

It can be difficult to change from traditional to new practices when introducing technology in schools. Traditional practices have a tendency to prevail unless focus is placed on the changes taking place in the field of practice as a result of the introduction of the iPad in teaching. This demands that the established didactic thinking be revitalised in line with the tools now available to the class leader.

The TPACK model gives us an image of what skills areas the teacher needs to possess and shows that changes in one area will affect other skills areas. Our research has illustrated the significant need on the part of teachers for increased skills in the didactic use of technology. In that, the teacher's role is to a greater extent concerned with enabling pupil-active learning with the help of technology, a need is created for digital didactics (Jahnke & Nordberg, 2013). This digital didactics creates new opportunities to emphasise the teaching actions of the teacher (Nordenbo et al. 2008), but it is crucial that the use of digital tools has a clear didactic goal. When, after introducing the iPad, an entire staff changes their teaching actions and begins to work based on a common teaching template, there will be a collective change in the didactic thinking. Such changes do not happen by themselves: it is necessary to enable collective sharing of teacher knowledge in order to develop a joint digital toolbox that integrates technology, pedagogy and content knowledge. Hargreaves & Fullan (2014) describe how schools gain the greatest benefit from sharing practice-based experiences with each other. If this is to be achieved it is primarily teachers who need to initiate and enable how

technology is to be used as a support for teaching and learning, but time and space must also be provided to exchange experiences concerning the use of tablet computers (Lorentzen, 2012).

If digital skills are to be implemented in the school, teachers need to have the understanding of the necessity for pedagogical-technical knowledge (Giæver et al. 2014). Teachers need to know how, with the help of technology, they can develop good methodological schemes based on pupils' prior knowledge and abilities, and they need enough academic content knowledge to know which technology will be the most suitable for the various subjects and vice versa. Technology is of no value in itself unless it is used at the right time and for the right purpose in relation to the particular needs of the subject. Teachers need understanding of how the technology they choose will contribute to changing and improving pupil learning. If these skills are not present, it may mean that teachers are not ready for the technology-rich classroom (Engelien, Johannesen & Nore, 2011). If, however, it is possible to create understanding of how technology, pedagogy and content knowledge function in mutual symbiosis, learning with the help of iPads and a revitalised didactic vision can be beneficial to pupil learning.

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Teaching at Stake! In Search of Teacher's Experiences from an Intervention with Minecraft

Abstract: *This paper addresses the teacher's experiences during a formative intervention in primary school. The teacher describes himself as a traditional teacher, but has repositioned his understanding of 'teacher' when working with Minecraft. The study suggests the understanding of the teacher as a breakthrough adopter and emphasises the need for conducting formative interventions to expand the practice in schools.*

Keywords: *digital games, formative interventions, classroom research, case study, CHAT*

Introduction

Statistics from the Norwegian Media Authority showed that Minecraft is the most popular game for boys between 9 and 14 and for girls between 9 and 16 years old (2016, p. 82). Despite the game's popularity, it is uncommon to use digital games such as Minecraft as educational tools in the classroom. Only 8% of children in primary school were offered the possibility to use digital games during their lessons (Norwegian Media Authority, 2016). It was not specified what percentage involves the use of Minecraft.

Different sources from Europe, the United States, and Australia have showed that Minecraft was used as an educational tool in different school subjects and class levels (Callaghan, 2016; Nebel, Schneider, & Rey, 2016). The use of Minecraft has been connected to motivation (Canossa, Martinez, & Togelius, 2013), creativity (Cipollone, Schiffer,

& Moffat, 2014), learner-centred classrooms and collaboration (Callaghan, 2016; Niemeyer & Gerber, 2015), and subjects like mathematics (Bos & Cook, 2014). Educational professionals are becoming increasingly interested in the possibility of using Minecraft as a working method for the future of teaching (Callaghan, 2016; Niemeyer & Gerber, 2015; Sáez-López, Miller, Vázquez-Cano, & Domínguez-Garrido, 2015; Sundqvist & Sylvén, 2014). However, Nebel et al. (2016) pointed out that recognizing the educational potential of Minecraft is connected to the teacher's interest and competence. This is often considered to be a limitation (Nebel et al., 2016, p. 360) because it places more pressure and demands on the teacher (Säljö, 2016, p. 127). However, this could also mean that technology is viewed as fun by teachers (Cipollone et al., 2014) or that is puts something at stake (Gadamer, 2012, p. 137).

This article focusses on what happens when a teacher uses Minecraft as an educational tool in school to reach defined goals. The article's purpose is to understand the teacher's role once the game is introduced. Studying this is important because it is not yet well understood how to integrate new technologies in pedagogical settings.

Digital competence is the fifth basic competence for every subject at every level of primary school in Norway. Technological tools are, then, a fundamental part of education in our classrooms (Directorate of Education, 2015). However, according to teachers, digital competence development for teachers has only a little presence in their schools (Monitor School, 2016). Consequently, there is an urgent need for more resources for pedagogical competence training in ICT use and in the integration of subject-specific learning resources. This article addresses the following research question: 'How does the teacher experience the use of Minecraft, and what are the implications for his understanding and involvement in the intervention?'

A formative intervention study (Engeström, 2015; Engeström, Sannino, & Virkkunen, 2014; Sannino, Engeström, & Lemos, 2016; Virkkunen & Newnham, 2013) was chosen because it provides insights into developmental processes and changes and offers the opportunity to gather this knowledge while working collaboratively (Engeström, Kajamaa, Lahtinen, & Sannino, 2015) with a teacher in a school context.

The following sections will briefly describe the school's context and the participating teacher and his class. This will be followed by a concise description of Minecraft, a review of the related research, and a description of the study's theoretical framework and research design. Finally, the article will conclude with a presentation of the research findings, an analysis, and the discussion.

The context of the study

The school in this study was purposefully selected (Creswell, 2013, p. 156) from a network of cooperating schools that are connected to my institution of higher education. The principal and one teacher, Mr. Todd, expressed a particular interest in exploring new practices connected to ICT use. The school is located near the fjord and mountains in a small municipality in northern Norway and offers education from the first to tenth grade. The school has around 300 students from native and immigrant families. The participating class had 11 girls and 16 boys, and six of the 27 students had a mother tongue that was not Norwegian.

For practical reasons, the class was divided into two groups in several subjects; this was also the case during the intervention. Group A consisted of 16 students who were doing well in mathematics. The smaller Group B consisted of 11 students who needed more support and attention. Mr. Todd is around 60 years old, teaches mathematics, and has a lot of experience as a teacher in a primary school. He found that his students were becoming less motivated to learn mathematics and were not satisfied with the books that he used in class. He wanted to expand his teaching by trying other educational tools. He expressed that this was his motive to participate in the intervention.

The teacher selected Minecraft to be the game to combine both ICT and mathematics. Through an informal study in his classroom, he found that most of his students played this game frequently during their leisure time. The intervention's object was clarified during a meeting in January 2015 as an attempt to restore the students' motivation to learn mathematics with Minecraft. From an ICT-responsible teacher, I learned that accessibility issues related to computers and busy school days had

prevented Minecraft from being an option for the teachers. With the principal's permission, the game was successfully installed on 16 school computers. Since the class was divided into Groups A and B, 16 computers were sufficient.

The sandbox game

Minecraft is a sandbox game (Canossa, Martinez, & Togelius, 2013; Ellison & Evans, 2016; Hanghøj, 2014; Mail, 2015) and is an educational tool from a constructionist point of view (Cipollone et al., 2014, p. 10), allowing players to create their own stories, fight, and cooperate with other players, and design sophisticated structures out of blocks. In the creative mode, the players have unlimited resources, face no threats, and can fly. If players want more action, they can play in the survival mode, where they are challenged by scary creatures every night. In the hardcore mode, the players are given only one life and must struggle to survive (Canossa et al., 2013).

The teacher and I got an inspiration for our tasks from websites, books, and the students. All of the mathematical tasks were connected to the national curriculum from the Directorate of Education (2015).

Related research

Sáez-López et al. (2015) showed that teachers' attitudes towards using Minecraft as an educational tool are, in general, moderately positive. Their research also showed that the majority of the school community in their research agree that Minecraft offers pedagogical benefits (Sáez-López et al., 2015, p. 126). In addition, Callaghan's research has shown that the teacher's role is critical in engaging and motivating students to work in Minecraft in school (Callaghan, 2016, p. 255).

To follow up on this, it is worthwhile looking closer at the teachers who are described by Cuban (2001) as 'early adopters'. The category of early adopters can be traced back to Rogers (1983) and his research on the diffusion of innovation in the tradition of educational research (Rogers, 1983, p. 62). According to Cuban (2001, p. 71), the teachers who are

early adopters differ from other teachers in their teaching methods and how often they use computers to teach. They are serious users in adopting technological innovations, and they believe in the power of technology as a teaching and learning tool.

Cuban provided an example where pupils worked in pairs or groups on projects while the teacher assumed the role of a facilitator, moving from group to group and supporting and challenging them (Cuban, 2001, pp. 69–70). Cipollone et al. (2014) were especially concerned about these 'early adopters' when they described the teacher in their own study as an 'early adopter'. This early adopter was willing to let the students be experts, seeing the use of technology in the classroom as a source of enjoyment. Learning Minecraft was not difficult for the teacher. Part of his motivation to learn to play the game stemmed from his own personal interests. Such teachers are typically the minority in their profession (Cipollone et al., 2014; Cuban, 2001). However, the presence of personally-interested teachers may imply non-traditional approaches to support pupils' learning that expand it from being 'a seat of knowledge' (Cipollone et al., 2014, pp. 9–10).

Krumsvik anchored his discussion about the role and focus of digital tools in classrooms and teachers' classroom management styles to several studies and reports, asking if broader understanding of classroom management is needed. This broader understanding may include conceptualising the teacher as a facilitator (Krumsvik, 2014).

Theoretical framework

The Cultural-Historical Activity Theory (CHAT) (Engeström, 2015) offers an approach for the development of learning processes (Engeström, 1999; Postholm, 2014), and it serves as this intervention's theoretical framework. CHAT is a tool used to change a school's learning and teaching practices (Lund & Hauge, 2011, p. 259). The main idea in CHAT is that people change the work. It is therefore necessary to focus on the process (Virkkunen & Newnham, 2013).

Contradictions are an important part of the development of processes at different levels and function as driving forces (Engeström & Sannino,

2010, p. 7). Primary contradictions are inner conflicts between user value and exchange value within each constituent in the activity system; secondary contradictions are contradictions between the different constituents in the activity system (Engeström, 2015, p. 70–71). A contradiction may be resolved within or between the acting subjects through the use of an artefact as a tool to reach the object and a desired outcome. When contradictions are resolved, new forms of activity emerge. They can be understood as solutions.

During this process, 'invisible breakthroughs' take place (Engeström, 2015, p. 73). One's initial reaction may be resistance to a contradiction, but then understanding happens in the form of invisible breakthroughs (Engeström, 2015, p. 73). As I understand Engeström, this invisible breakthrough is essential to continue the intervention.

The activity system

Engeström (2015) developed the model of an activity system based on what he described as the second generation of activity theory. This theory is based on Vygotsky's (1978) writings and ideas. An activity system is composed of six factors that exist in a mutual relation to each other (Engeström, 2015; Engeström & Sannino, 2010; Postholm, 2014). The factors are rules, subject, instruments (or mediating artefacts), object, community, and the division of labour. Together, they structure human activity. This is crystallized in the general model of an activity system (see Figure 1 below). The model's subject can be either an individual or a group. The acting subject can use instruments to obtain a chosen object and be on his or her way towards an outcome. Objects are carriers of motives, and the outcome is the actual product of the action. Any action exists in a context that is determined by three factors: rules, a the community, and division of labour. A community refers to the people who share the same objects. The division of labour means that the goal-directed actions are distributed among and conducted by all participants in the community. The division of labour makes it possible to distinguish between individual and collective activity. The activity in the system (illustrated by arrows in Figure 1) is determined by rules, includes community norms and conventions (Engeström, 2015; Engeström & Sannino, 2010).

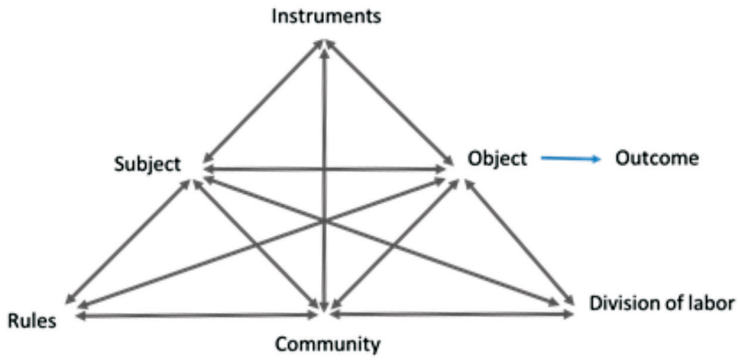

Figure 1. General model of an activity system (Adapted from Engeström, 1999, 2015, 2016).

CHAT as theory and method

In technology-rich learning environments in Norway and in other countries, CHAT has appeared to be a useful theory and method. Many researchers have shown that CHAT offers possibilities for studying school research and development (Anthony, 2011; Engeström, 2016; Hauge & Erstad, 2011; Lund & Hauge, 2011; Pontual Falcão, Mendes de Andrade e Peres, Sales de Morais, & da Silva Oliveira, 2017). The use of CHAT in this intervention study, in connection with Minecraft, constitutes a part of this discourse.

Research design and method

The method is based on a single case study (Yin, 2014), which implies an in-depth investigation of a contemporary phenomenon, an intervention, that is broadly studied in its real life context (Creswell, 2013; Yin, 2014), the classroom. A case study is a useful approach for formative interventions that involve the researcher cooperating with a teacher to try out new educational tools for a period of time (Postholm, 2014, p. 52). A case study focuses on a bounded system (Creswell, 2013, p. 148), which includes both processes and individuals (Stake, 1995, p. 2). The emic perspective (i.e., the insiders' perspective) of reality, is important in the development of processes (Fetterman, 2010, p. 20). Such perspec-

tive is necessary in order to recognize and accept multiple realities and is useful in documenting why insiders think and act as they do (Fetterman, 2010, p. 21).

The research was conducted in a single class. As indicated by Stake (1995, pp. 85–86), unlike other research designs, single cases do not serve as a strong base to generalize for a population of cases. Nevertheless, case studies are generalizable to theoretical propositions (Yin, 2014, p. 21), meaning that the study's theoretical framework can be used to establish logic (i.e., an analytical generalization) that could be applicable to other situations (Yin, 2014, p. 237). Furthermore, it is important to clarify the researcher's role (Charmaz, 2014; Engeström, 2016; Fetterman, 2010; Kvale & Brinkmann, 2015; Stake, 1995; Virkkunen & Newnham, 2013). The researcher's role in this study is to provide the readers with the necessary vicarious experiences that are interesting enough to learn from (Creswell, 2013, p. 200). This naturalistic generalisation (Stake, 1995) relates to the readers' experiences.

According to Engeström (2015), the key outcome of formative interventions is agency among the participants and the researcher (p. xxxi). During the intervention, I participated in the lessons and conducted participant observations (Yin, 2014, p. 115). This arrangement offered me access to several sources of data. First, I was able to ask Mr. Todd about his experiences in the classroom and his opinions about the intervention. This allowed me to confirm my views and have access to his and other alternative views (Yin, 2014, p. 117). The process can be understood as a methodological triangulation to confirm my interpretations. Such a process is even more valuable as a way to gather additional observations and interpretations (Stake, 1995, pp. 114–115). It can also strengthen the study's trustworthiness (Postholm & Smith, 2017, p. 89).

In addition, I asked the teacher to read my interview transcripts and give me feedback. This is a part of the technique of member checking (Stake, 1995, p. 115), which allows an interviewee to eliminate unwanted words or meanings. My observations, together with my conversations with Mr. Todd, the interview, and his approval of the transcript, serve as multiple sources of evidence (Yin, 2014, p. 121) that support the study's construct validity (Yin, 2014, p. 45).

Second, as a participant, I had access to what was going on in the classroom, and, if necessary, I was able to change the direction of the intervention. This kind of control allows a researcher to decide the agenda and can be used to manipulate minor events (Yin, 2014, p. 117). According to Virkkunen and Newnham (2013), the research interventionist 'provokes and sustains [a] collaboratively-led expansive transformation process' (Virkkunen & Newnham, 2013, p. 12). These processes should not be led only by the researcher, but also led and claimed by the practitioners (Engeström & Sannino, 2010, p. 15).

The teacher made me responsible for introducing Minecraft and most of the mathematical tasks. He stated that he believed that I and his students were competent and that he would not introduce Minecraft on his own because he lacked confidence to use the game. At one point, I challenged him by asking if he would lead a lesson, and I felt relief when he agreed. This was one of my attempts to correct the direction and make the teacher more involved in the intervention.

Data collection

I worked with Mr. Todd in his classroom during autumn of 2015. My initial goal was to make observations and take notes during ten hours of mathematics classes. However, I soon realized that the best procedure was to write down my observations as soon as possible after the lessons. I collected screenshots and Bandicam recordings of the students' products to document how they solved the tasks and to support my observations (Virkkunen & Newnham, 2013, pp. 15–16). In addition, the teacher and I had brief conversations during the lessons to reflect on what was happening in the classroom. Four of these conversations were recorded.

These conversations, along with the observation notes, assisted me in creating the semi-structured interview guide (Kvale & Brinkmann, 2015, p. 46) for the interview with the teacher at the end of the autumn term. This interview was conducted to summarize the half year of the intervention, and it played an important role in planning for the spring term. This interview was selected because the teacher presented his experiences and insights with exceptional clarity, highlighting who he was

as a teacher and making many reflections about what is needed from a teacher who uses digital games in his/her classroom. The interview was 50:31 minutes in length and was transcribed. The collection and storage of the data followed the requirements for personal data (NESH, 2016).

Data analysis

In this study, the Constant Comparative Method, developed from Grounded Theory, is used to analyse the data (Charmaz, 2014; Corbin & Strauss, 2008, 2015; Creswell, 2013; Strauss & Corbin, 1998). This method of analysis forces the researcher to be well-acquainted with the data when constructing theoretical concepts or categories and can be used in all qualitative studies (Postholm, 2010, p. 87). The use of memos (Charmaz, 2014; Corbin & Strauss, 2008) was essential to maintain my direction during the analysis, since I noted my thoughts and ideas early in the research process about where the data would lead me (Charmaz, 2014, p. 162). The analysis was an ongoing process where I moved between open coding, axial coding, selective coding and theory. I refer to this process as an interplay between induction and deduction (Strauss & Corbin, 1998, pp. 135–137).

The interview with Mr. Todd served as the primary source for developing the three main categories: (1) 'teacher's position', (2) 'students' motivation', and (3) 'Minecraft as an educational tool'. After these categories emerged, I returned to my observation notes and made comparisons in order to develop these categories further (Strauss & Corbin, 1998, pp. 93–94) and to see if any biases, assumptions, or beliefs intruded on the analysis (Strauss & Corbin, 1998, p. 97).

By answering questions such as 'When and why did the category show up', I was able to contextualize these categories (Strauss & Corbin, 1998, pp. 126–127).

When I asked what this research was about (Strauss & Corbin, 1998, p. 146), I returned to the same explanation that this research was to look at how the teacher positions himself when using Minecraft in the classroom. Strauss and Corbin (1998, p. 146–147) explain that a central category has analytic power when it appears frequently in the data. The concept of the 'central category', supported by theory (Cipollone et al.,

2014; Cuban, 2001; Engeström, 2015; Rogers, 1983), led me to develop an abstract central category that I called 'breakthrough adopter'.

The first main category ('teacher's position') consisted in the way the teacher understood his role. It captured the teacher's experience of being 'a teacher' both before and during the intervention. I also turned to several articles that described teachers' roles and their use of technology (Cipollone et al., 2014; Cuban, 2001; Krumsvik, 2014; Nebel et al., 2016; Säljö, 2016).

The second main category ('students' motivation') consists of Mr. Todd's and my interpretations of the students' attitudes towards Minecraft and their dedication to the tasks. The teacher called these the signs of dedication 'motivation'. This category is supported by other studies that connect the use of Minecraft to motivation (Callaghan, 2016; Canossa et al., 2013).

The last main category ('Minecraft as an educational tool') consists of Mr. Todd's and my thoughts about the various tasks and the possible uses for the tool in the future. Other studies have emphasised the opportunities created by the use of Minecraft in schools (Callaghan, 2016; Niemeyer & Gerber, 2015; Sáez-López et al., 2015). These categories structure the presentation of the findings. The analysis and discussion connect the findings to the central category ('breakthrough adopter') in order to uncover the implications of the research (Strauss & Corbin, 1998, p. 152).

Findings

Teacher's position

My first observation in the class was conducted during a math lesson that did not use Minecraft. The students received a short test, and, after the test, the teacher explained rotation and mirrored objects from their textbook on the blackboard. While he was checking their homework, they were solving tasks from their book. Is walking around, talking to the students about their tasks, and helped them when they asked. Some pupils expressed loudly that they could have solved these tasks in Minecraft instead.

During the interview, Mr. Todd described himself as a traditional teacher, but he said that he tried to be open to new things. He admitted that he would not introduce Minecraft on his own, saying:

> *You [the researcher] have introduced Minecraft. You have been a resource, because you can do this. I was a little bit tense, I have to admit it, because maybe I am traditionalist [laughing]. But at the same time, I am open to these kinds of projects. The class wants to be a part of it, I can tell. They are thrilled, and they are curious. They know that they can use Minecraft. These technical things are under control, so it makes it easy to start.*

He described the class as a 'boys' class', explaining that there is a lot of competition, especially among the boys. Partly because of that, the students needed to be in a controlled learning environment. He said:

> *Yes, it is a big class with 27 students, 16 boys. It is a 'boys' class,' and saying that I mean that they are very competitive. They have been like this all the time. They are making a kind of arrangements where competition is important. Some handle it well, but others do not handle it quite as much. However, they need to have some peace when they perform. They are too interested in what others do, so the learning environments must be very controlled.*

Although the students are competent in ICT, Mr. Todd said that he needs the support of other more competent people to work on a project like this.

> *I have no problem loosening up my classroom management a little bit. But you must have some reasonable limits. You must have some thoughts about what this is good for. You must make use of students' knowledge, but I also think that you are dependent on some knowledge from other adults too, to feel safe and to dare to use it [Minecraft] and to let it be a part of your teaching practice. It has not been odd for me to think non-traditionally.*

According to the teacher, I served as this necessary support. He acknowledged that we did some fundamental work over the course of the autumn that allowed us to continue our planning under more defined aims.

He said that the teacher should be close to his students, and he expressed that the teacher does not occupy the role of the one who conveys knowledge, but who needs to be there and help students if they need it.

> *It is just that you are a walking facilitator. You will be a facilitator all the time. In addition, you have to be aware that maybe you are*

> *learning too? You have to catch what this is about; you have to ask the right questions. You have to have this knowledge yourself, at least to help the pupils to be even more curious. It does not mean that you shall give them solutions, but that you make them think about how they shall use this to do that. Try to think differently. It is also about situated learning, a way of thinking that is mentioned in the overarching curriculum.*

When I asked what Mr. Todd was thinking about this position of the teacher he is drawing, he said that he thought that the role was very interesting, but it also required a lot of effort from the teacher. He said that the teacher should be enthusiastic about these kinds of educational tools and ask the right questions. He said that he was afraid to give answers to his students, believing that they should be challenged to come up with answers on their own.

Students' motivations

The students were joyous when they saw that the computers were on. Several of the boys were loud when they came into the classroom, and their positivity made it easy to start with the lessons. The lesson started with Mr. Todd giving information on the blackboard. His students listened carefully to him, and then to me, as we explained what we were going to do. Then they received their computers.

The students talked a lot about what they should do or should have done in Minecraft. They helped each other and proudly showed each other their different solutions. Overall, the students showed great enthusiasm and worked in a dedicated manner. This was especially visible in Group B. One girl built a sophisticated house with windows that she could lower to the ground and then bring up again by pulling a handle. One boy built a floor that lit up using Redstone, and he showed how the sun could be stopped so that night did not come. The students, surprisingly, did not want the lesson to end. On their way out, two boys said that this was an enjoyable lesson.

Mr. Todd pointed out during the interview that Minecraft was not only for boys but also for girls: 'So I see that this is not a thing for boys

only. Many girls know this Minecraft world as well as the boys do. This is a little bit fun'. Additionally, he expressed several times that there was no doubt that the students were motivated to work with Minecraft. Including that the game was about reaching them in their world. He said:

> *At the same time is it out from their conditions, their viewpoint. They shall figure out things. It is a curiosity-based way of thinking [problem-based learning]. You can see the enthusiasm. When they do manage to solve things, they are very satisfied, and they show it. In addition, they have to do things together. I like this a lot. They are motivated. They have taken it [the tasks] and just solved it.*

Mr. Todd mentioned several times that it was important to vary work methods. He said that adding variety could be as simple as giving students the tasks that were hidden in Minecraft, which we tried. They were tasks that could have been solved on paper, but they could also be solved in their digital gaming world. He expressed that including Minecraft in the classroom was about being in, and understanding, the students' world, which required a special effort on the teacher's part. 'Adults are usually late in adopting new things. We depend on books. Pupils are curious about new things', he said. He continued:

> *Maybe learning happens in a better way when it happens in their world [Minecraft], where they have a lot of experience. And maybe it is not so much about learning outcomes, but about variation. We did start with area and measurement. I am not sure if this did help them understand the term 'area' yet, but I think that it has been motivating to start this topic with this kind of variation. They are very motivated to use Minecraft. It is just this one word 'Minecraft' and then they are motivated. Yes!*

Minecraft as an educational tool

Using Minecraft as a tool to solve math problems did not present any obstacles for the students. They were eager to show how well they knew the game, and they were clearly interested so I stopped and listened to them. Students struggled to finish all their tasks within the allotted time. There was also good atmosphere in the classroom as the students collaborated and discussed different solutions.

During the interview, Mr. Todd informed me that some students did not like to work in groups, which had been an issue at conferences with their parents. 'Life is about collaboration, so we are trying to work together. We have this at our schedule,' he said. He talked about a task that involved measuring their classroom. It required students to collaborate when measuring the classroom and reconstructing it in Minecraft. Collaboration must be learned, he said, and his students were able to collaborate for this lesson by using Minecraft. He saw many other possibilities for using the game, saying:

> *There are many unimagined possibilities, as I have seen. Think about arts and crafts. Is there anything they can pick up about patterns? To work with design? I am thinking about it, and yes, a subject as mathematics is close. You have this three-dimensionality, depth, terms in geometry, and possibility to work with scale.*

He also expressed that lessons must be planned beforehand, presenting a few thoughts about fractions:

> *It is very difficult to understand fractions and decimals, a part of the whole, to put things in relation to each other and try to understand comparable values. So I think that this is a very interesting topic. This is a suggestion for the next lesson. I even think that I would start in Minecraft. If they did understand what fractions are about, they would see things in a bigger or in another perspective. I understand that this is a part of their world [Minecraft]. Maybe we are also talking about being able to reach their world. In addition, maybe we can find parts from their world, from their experience, that we can use for learning.*

When asked about the constraints connected to his experience with Minecraft, he said that there must be restrictions:

> *It must be connected to consciousness where there is some learning outcome in different subjects or topics. If it is just a happening, then I think it is a limitation. However, you must also have the awareness of these different ways of thinking [students], and when you have a suitable topic then you can use it. This is just like any other way of working [digital games] and you should have variation in teaching methods. So, you have to ask questions. What is the value of learning here? Could this be done differently? Are there*

> *any learning outcomes? Alternatively, is it just that we are working in a different way?*

Identifying specific learning outcomes for these mathematics lessons was not easy at this stage. In any case, Mr. Todd emphasised the importance of asking questions and explained that pupils should receive the assessment of their learning outcomes. However, a test in Minecraft could be a challenge. A collaborative test could be possible. He exemplified this with fractions:

> *And think, now I am back to fractions again, you have built a house, and you have walls. You know how many blocks you have used. Then you are using different colours. You build one-third in blue and one-third in red. How much will it be together? You could build a wall, and somebody else could have built a wall, and then we could be working with comparable fractions. How much is two-fifths and one-tenth? Yes, there are lot of possibilities.*

Analysis and discussion

This article is driven by the following question: 'How does the teacher experience the use of Minecraft, and what are the implications for his understanding and involvement in the intervention?' Mr. Todd described himself as a traditional teacher. He used a blackboard and depended on a mathematics book. However, with support from the researcher, he was open to new experiences. He expressed that a teacher must have goals when using educational tools (Cuban, 2001); it should not be something that merely happens.

As highlighted in the interview, Mr. Todd experienced new insights into the position the teacher should take when working with Minecraft in this kind of a learner-centred working context. He found himself more like a facilitator in action (Cuban, 2001) than a traditional teacher in front of the blackboard (Cipollone et al., 2014). To be a facilitator, the teacher must be in situations with his or her students, trying to meet them within their lived experiences (Callaghan, 2016). The teacher should be present and be able to answer questions.

Mr. Todd expressed that the teacher can also learn when using digital games as educational tools. This view requires the understanding of the teacher's efforts; however, it does not necessarily mean that the teacher must be genuinely interested in Minecraft or other digital games (Cipollone et al., 2014). It means that the teacher must stay up-to-date and treat these games as he or she would treat any other educational tool

The implications that can be drawn for Mr. Todd's understanding and involvement are that the classroom management (Krumsvik, 2014) must be loosened up so that the teacher's role becomes more like a facilitator (Cuban, 2001). The focus is then on varying educational methods to increase students' motivation and find experiences that the students are familiar with that, which can be used for teaching. These implications can be understood as the repositioning of the teacher, and are captured the in abstract understanding of the teacher as the 'breakthrough adopter'.

The concept of the 'breakthrough adopter' concerns Mr. Todd's understanding of himself as a teacher when he acknowledged that the teacher should be more like a facilitator when using Minecraft. With this understanding he reconsidered the position of the teacher and brought forward the developmental processes (Engeström, 2015), creating a new type of agency that corresponded to what the new activity required (Engeström & Sannino, 2010, p. 7).

The model of the activity system (shown in Figure 1) can be a helpful analytical tool to visualize what Mr. Todd experienced during the intervention. Figure 2 condenses Mr. Todd's experience. It shows that there are contradictions in every constituent that is connected to his understanding of himself as a traditional teacher and the repositioning of the teacher as a facilitator through the invisible breakthrough. Mr. Todd discovered that his students were not motivated and were dissatisfied with their mathematics books. His objective was to restore motivation, but he needed a new instrument to do so. This secondary contradiction (Engeström, 2015, p. 70) was solved by using Minecraft as a new educational tool with the intention that the development process could proceed. Very quickly, the objective was attained when his students showed explicit motivation to work with Minecraft in mathematics.

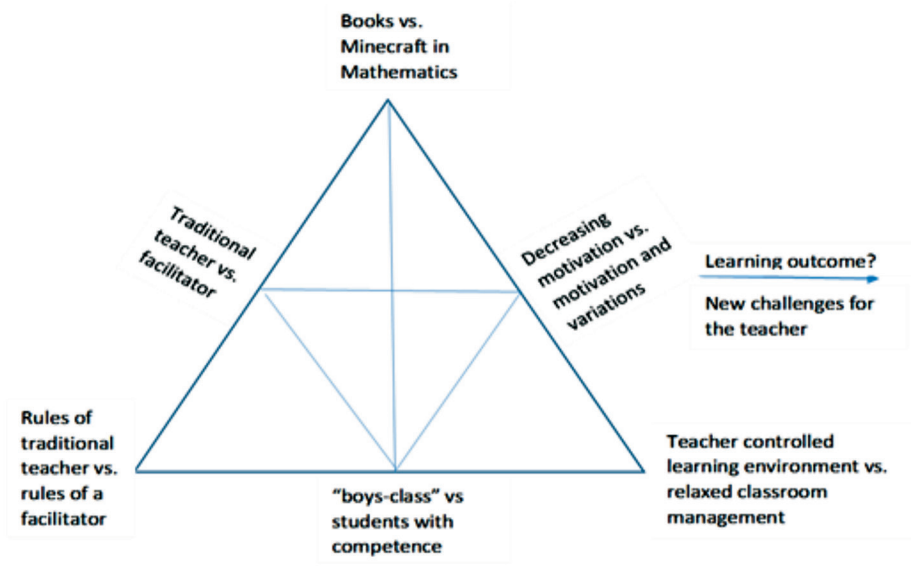

Figure 2. Teacher's contradictions from the formative intervention. Source: Own study (informed by Engeström, 2015).

The introduction of Minecraft had several implications for the teacher's position at the level of primary inner contradictions. Mr. Todd had to relax his classroom management, recognize his students' competence, and follow different rules as a facilitator. He does not fit the description of an 'early adopter' (Cipollone et al., 2014; Cuban, 2001; Rogers, 1983), even though he identified a few qualities needed by a teacher working with Minecraft that fit descriptions of early adopters. The findings suggest that, in addition to the term 'early adopters', there should be room for 'breakthrough adopters': the people who need time to assure themselves, from their own pedagogical experiences and not from external pressure (Rogers, 1983; Säljö, 2016), how and why they have to adjust. Mr. Todd has now experienced Minecraft. This does not mean that he will adopt Minecraft, but that he has expanded his practice as a teacher and can now decide if, when and why, he will choose to use Minecraft, or another digital game.

Since most teachers are not early adopters (Cipollone et al., 2014; Cuban, 2001), the picture must be presented in a more multifaceted

manner. It must be able to describe those who are not early adopters, the reasons why they do not use digital games, and whether it is worth including digital games in teaching (Krumsvik, 2014; Säljö, 2016)? The answers to these questions must be provided by the teachers working from their own subjective reflections when they introduce something new in their classes. Formative interventions (Virkkunen & Newnham, 2013) can provide support to these teachers long enough so that an invisible breakthrough can happen. This case study shows that considerations about choosing new educational tools, such as Minecraft, can be anchored in expanded learning opportunities instead of the teachers' lack of experience.

So what? About teaching at stake

According to Gadamer, in order to access new understanding, we must be open about our prejudices (Gadamer, 2012, p. 316). We must take risks with new assignments and put something at stake, knowing that an assignment may fail (Nebel et al., 2016, p. 360). Only when we put something at stake we can have these kinds of new understanding (Gadamer, 2012, p. 137).

I believe that Mr. Todd came quite close to Gadamer's point when he introduced Minecraft into his classroom. Though he represented himself as a traditionalist teacher, he was able to experience an unfamiliar artefact during this intervention. By being courageous and risking his teaching style and classroom management, he gained new insights into Minecraft and began to understand a students' world as a resource. He was forced to reconsider the teacher's position. However, he also expressed that he needed support to do this.

This study shows that conducting a formative intervention was a suitable approach to expand Mr. Todd's practice. In a survey from the Monitor School (2016), teachers themselves identify the need for more digital competence training. In a formative intervention, the researcher is present and is able to support pedagogical competence enhancement in ICT use. The experience suggests that formative interventions can be used as a way to meet the expressed need for more pedagogical digital

competence training for teachers. In addition, the connection between the invisible breakthrough and the breakthrough adopter needs to be explored in more detail. It would be worthwhile exploring this abstract concept, breakthrough adopter, further and its place in the future of school research and development.

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Review of Selected E-learning Models: Theoretical Foundations

Abstract: *The article introduces model theoretical perspectives presenting the online learning process in different contexts. The presented considerations may constitute a theoretical basis and a directive for the implementation of an effective learning process in the online environment, and for the improvement of this process. It is necessary to undertake conceptual, design and research work related to the creation and evaluation of theoretical e-learning models to understand the new contexts and requirements of the present day better.*

Keywords: *modeling, e-learning, educational technologies, teaching and learning, quality of education*

Introduction

Better understanding of the online education process is supported by the analysis of theoretical models that show the essential elements of the process and inspired me to offer these theoretical considerations and empirical research. Models are understood as theoretical and hypothetical constructions presenting a simplified but, at the same time, as clear as possible picture of reality. They show dependencies between different phenomena, specific categories that make up the perception of the phenomena, their functioning and changing. Accepting simplified conceptual assumptions and using them is essential and necessary in education studies. The aforementioned models facilitates the analysis of educational phenomena and processes, reflects their essential features

and essential problems that are worth identifying, exploring and examining.

In the area of online education, early models focused on the role of technology in content delivery and access to electronic services (MacDonald, Stodel, Farres, Breithaupt, Gabriel, 2001, pp. 9–30). On the other hand, newer models refer to the challenges posed by fast-developing technologies, and are to a large extent conditioned by the availability of next results of empirical research, describing: ways of designing the course and e-learning materials[1], virtual cooperation (Karpova, Correia, Baran, 2009, pp. 45–52), interactions (Garrison, Archer, 2007, pp. 77––88; Garrison, Anderson, 2003), and the involvement of learners (Coates, 2007, pp. 121–141). The authors of the courses realized that the content itself is insufficient and not necessarily a success condition in learning over the Internet. They began to appreciate the participation (presence of the teacher and learners) and care for staying in contact (mutual interaction and cooperation). It has become important to take care of the quality of learning experiences, reflections, discourse, social climate, and creating a community of learners in a virtual classroom.

In the models devoted to the instructional design of e-learning courses, one can notice common features such as:

– student's profile (needs, expectations, goals, and motivations, attitudes, learning styles, culture, professional experience, previous knowledge, computer skills, etc.);
– organizational support for e-learning (vision and mission of the university, implementation costs, stability, the experience of ex-

[1] It is possible to indicate a group of models focused on the design of instructional training materials, e.g., the ADDIE model, which is being developed and presented in the following book: Michael Allen, Richard Sites, *Leaving ADDIE for SAM. Leaving ADDIE for SAM. Faster, Better Learning Product Development,* ASTD Press, 2012. In the Polish edition, the model description can also be found in the book by Marek Hyli, *Przewodnik po e-learningu*, Wolters Kluwer, Warsaw 2016, pp. 164–166, aggregate model presented by Grażyna Penkowska, *Meandry e-learningu*, Difin, Warszawa 2010, pp. 133–137; 5-stage education model by Gilly Salmon, *E-Moderating: The Key to Online Teaching and Learning,* Routledge, New York and London, 2011.

perts, designers, technical infrastructure, availability of resources, strategic plans, etc.);
– selection of methodology according to the requirements of the subject (goals, teaching methods, evaluation, interaction, development strategy) (Engelbrecht, 2003, pp. 38–47).

E-learning models help one to identify key differences between the current and desired state, affecting the teaching outcomes and functioning of the educational institution. These are also essential studies for strategic planning by highlighting the issue of the quality of education, educational materials, and support (Ibidem). The models refer to educational principles that should be implemented in educational practice in order to improve the quality of this form of education.

The review of selected models of the online learning process

The models that the author of the article selected focus on learners and allow one to understand the specificity of the online education environment. Teachers can use rich information provided by the models to ensure high quality and effective learning activities and resources in the online course. This knowledge will determine what is important and valuable in the experience of learners, which may have consequences for the quality of their learning. A prerequisite for the high effectiveness of a teaching and learning process is the development of a scientific theory of online learning. Its scope should include theoretical investigations explaining the course of this process due to the teaching purposes and the conditions in which it takes place; as well as the research objectively defining the quality of online education. One should bear in mind that this is an extremely complex process, involving many conditions of a substantive, methodical, technical and implementation nature. Following the current assumptions, the student becomes a genuinely active subject of learning, having self-education skills and being able to achieve success in both independent and team-based creative online learning. The following models confirmed the aforementioned.

The community of inquiry model – D. Randy Garrison, Terry Anderson, Walter Archer

D. Randy Garrison plays an essential part in the development of adult learning and teaching and online education (Garrison, Archer, 2007, pp. 77–88; Garrison, Anderson, 2003). In cooperation with Terry Anderson and others, he proposed a theoretical model of e-learning environment design which aims at creating the conceptual framework for the use of the computer-mediated communication (CMC) in supporting educational experiences. The authors assumed that educational experience aimed at achieving a higher order of learning outcomes is best embedded in the community of students and teachers. It is based on the shared reconstruction of experience, learning in cooperation, supporting cognitive independence and, at the same time, social interdependence. The model consists of three primary components: social presence, cognitive presence, and teaching presence. In the discussed model, *social presence* is defined as the ability of learners to participate in the project, to cooperate and to perceive themselves as members of a learning community. *Cognitive presence* concerns the critical discourse in which learners can participate and become involved. The third element is teaching presence, referred to as designing, facilitating and managing cognitive and social processes for the implementation of valuable learning outcomes. Therefore, the role of the teacher as a moderator of the learning process is essential. D. Randy Garrison and Walter Archer (Ibidem) believe that teachers must understand that online learning has a unique character, which makes it possible to create a critical learning community, regardless of time and place. In other words, teachers must provide new and more effective learning situations that would encourage learners to become involved in critical discourse and reflective thinking and get to know how to learn in this environment. This requires the cognitive and metacognitive understanding of the whole process and the lasting commitment on the part of the leaders. D. Randy Garrison (Ibidem, p. 82) developed a list of educational principles which are worth quoting here:

- creating the atmosphere fostering a community of learners;
- initiating critical reflection and discourse that will support systematic exploration;

- maintaining the community by expressing the cohesion of the group;
- promoting and supporting progress through gratification;
- developing cooperation and responsibility for success in learning;
- providing metacognitive development.

Learners construct personal knowledge to be supported by interacting with other group members. This group is less formal and guided by authoritatively established educational goals, as well as norms and principles of work that determine the personal affairs of each member. Social interactions are necessary to initiate and develop an educational community.

***The Conversational Framework* – Diana Laurillard (Pachler, C. Daly, 2011, pp. 184)**

The uniqueness of e-learning is expressed through multidimensional communication and interaction, possible thanks to the use of synchronous and asynchronous communication tools (Engelbrecht, 2003, pp. 38–47). Recently, the importance of online communication in the educational environment has been increasingly emphasised, and it significantly facilitates contact, makes it more real and closer, giving a greater chance to motivate learners to participate in educational projects carried out in the Internet space. The discussed model is based continuous interaction between the learner and the teacher. It can be used both during classroom teaching and e-learning classes. The teacher is responsible for defining the theory which the learner should get to know later, as well as designing the tasks to be performed. In order to achieve the assumed learning outcomes, the technology that is supposed to be an element supporting the teacher's activities and learning experience should be appropriately used. The learning process is equated with the "conversation" between the teacher and the student. The model can be seen as based on a three-step cycle of theorizing, designing and evaluating. The correctness of the argument is important. Learning heads towards a range of values and opinions. Learners converse with themselves and with other students and teachers. It is claimed that learning is the most effective when the student is controlled, able to test ideas by doing experiments,

asking questions, working with other people, seeking new knowledge and planning new activities.

***Typological model of student engagement styles* – Hamish Coates (2007, pp. 121–141)**

In the framework of the model, there are two crossing dimensions of engagement: academic and social, within which four styles of student involvement were identified. Following an empirical analysis, their definitions were proposed: intensive, cooperative, independent and passive. The author of the model emphasizes that these labels refer to states of involvement, not different types of students or their permanent personality traits. Students expressing intensive style are very involved in online learning, want to communicate and cooperate with others. They perceive themselves as active, motivated and imaginative persons who willingly cooperate with others in the group and outside of it, willingly undertake activities for the university and maintain contacts with teaching staff. The independent style of engagement is focused on a scientific rather than social approach to learning. Such learners perceive online systems as a significant part of their university education. They are not likely to cooperate or interact with other students when using the systems. These students tend to seek new educational experiences. They depend mainly on information obtained from the academic staff, which can be helpful in their learning. Also, they consider themselves as participants supporting the learning community. These students perceive academics as approachable people who respond to their educational needs and encourage them to reflect and provide feedback. These learners, as the author claims, seem less cooperative in relation to other participants. It is unlikely that they would take part in events or activities for the benefit of the university.

Students who opt for the cooperative style appreciate the social aspects of university work and life. They are eager to engage in various projects at the university and maintain contact with various people (teaching staff and students) in the classroom and beyond.

Students with a passive style rarely participate in educational activities and make contact with other people. It can be said that they are withdrawn in some way.

This model can play an essential part in conducting the discourse about students learning in an online environment. It allows one to understand individual differences between learners better and gives tips on how to work and take into account their needs and engagement styles. Having the above knowledge, for example on the style of cooperation, it is possible to provide them with independent educational experiences contrary to their intended purpose. This model contributes to the better understanding of the activation of learners.

***Community-embedded Learning* – Michelle M. Kazmer**

In the context of these considerations, the model created by Michelle M. Kazmer (2007, pp. 311–327) is worth mentioning as it presents a new approach to online learners and their conditions, links with the local community, emphasizing the support of interpersonal relations. Students bring their knowledge, skills, experience, values and cultural norms to an online class and share them with other participants. They are influenced by this community and are also shaped by it. They give feedback to relatives, try to use their new knowledge in practice, often in their work, volunteering, etc. In both worlds, learners engage in relationships with others, share ideas, support each other, and collaborate in pursuit of their goals. M. Kazmer mentions the interpenetration of the spheres of personal life with the Internet and learning. The modern student is characterised by the fact that he or she resides in "hybrid places," i.e., virtual and, simultaneously, physical space.

Among the members of the online community of learners and the local community, knowledge transfer is possible through:

- providing the group of learners with knowledge and information on personal and professional life (of the local community);
- using the knowledge gained in the course in professional work;
- transferring the knowledge from the course that may be useful in personal life, relations with loved ones, the educational and social environment;
- rebuilding the weak bonds and social contacts, specific to online learning communities, with local ones that are characterized by stability and continuity;

– institutional connection: e-learning provides the opportunity to build partnership and university relationships with local communities and other institutions.

Knowledge transfer is possible thanks to peer learning, frequent contact, activity, and cooperation in the group with other students and teachers, and the local community.

There are many benefits to this approach. Firstly, one should consider developing the ability to cooperate in acquiring information, sharing it, and creating a new one. It is also necessary to verify individual knowledge and be able to apply it independently of the whole group. Another benefit is the initiation and development of professional contacts using ICT, social media, etc. Established contacts in the virtual classroom may be sporadic in the future.

***LEEP Learner – Leader Model* – Rae-Anne Montague**

What is also inspiring is the Rae-Anne Montague model *(*Haythornthwaite, Andrews, Kazmer, Bruce, Montague, Preston, 2007; Kwiatkowska, 2019, p. 63), which emphasizes the role of learners as people striving to be responsible for their learning process and thus become active participants in the learning community. This sense of bond is continually being strengthened and promoted. Learners get involved by making a personal contribution, gaining knowledge and sharing it, together with their own experience. They can play a crucial part in certain situations and give a new direction to activities in the learning community as a result of their own learning experiences. Individuality is promoted to maintain and increase the creative tension in the group. The results are conditioned by the contribution and efficiency of learners' work in order to achieve the assumed goals of a collective project. The learners' active participation manifests itself through numerous interactions in the formal as well as informal conditions – for example during group cooperation or through participation in student organizations, social forums, etc. Therefore, they create a community of learners, thanks to which they improve their learning process and have the opportunity to learn from each other for personal and professional development. The online learning environment carries with it various individual and collective

problems. Namely, some students have to be able to deal with several roles and responsibilities assigned to them. They have the opportunity to acquire new skills, build and strengthen relationships as well as mutual understanding.

***Model of Virtual Collaboration* – Elena Karpova, Ana-Paula Correia, Evrim Baran**

Elena Karpova, Ana-Paula Correia and Evrim Baran (2009, pp. 45–52) propose a model of applying technology in virtual collaboration among international teams with emphasis on multidimensional communication. They distinguish the following stages of the process:

- problem definition,
- sharing,
- problem-solving,
- getting a solution in collaboration.

Initially, teams work with each other based on brainstorming, which is to allow the problem to be defined. To this end, audio – or video-conferencing systems can be used as the primary means of communication. In the next stage, asynchronous communication makes it easier for teams to exchange ideas, and agree on strategies and ways of operating within the project. At the stage of solving problems, synchronous communication methods are recommended when making critical decisions, which enables one to include non-verbal signals to communication. At the last stage of the virtual collaboration process, the teams are preparing for the presentation of project results. They can use popular Google Docs services, a board in a video-conferencing system, etc. At this stage, it is possible to undertake further interactions. Therefore, the exchange of personal and professional information takes place using various technologies. The joint creation of knowledge and action generates a continuous flow of information at all stages of the collaboration process. What is an essential factor conducive to the high effectiveness of virtual teamwork is the atmosphere and relationships prevailing in groups. The model of applying technology at various stages of virtual collaboration may contribute to supporting its activities and increasing the potential of international teams, which will facilitate further cooperation within uni-

versity programmes. The authors of the model emphasize that it can be useful for people involved in the design and implementation of courses, training, and classes at various stages of education. The analysed model, as the authors admit, has been designed to formalize the stages of the process of virtual international collaboration, which may make solving complex problems and generating recommendations relating to appropriate technologies possible at every stage of cooperation. The authors recognize the need to undertake further research, allowing one to verify and develop the presented model on a larger sample of participants, not just students.

Conclusions

The discussed online education models are instrumental in theoretical reflection and empirical research. However, one should bear in mind, as I mentioned earlier, that the educational process is complex and conditioned by numerous factors that cannot always be taken into account so as not to lose their nature, function, and clarity. By following these models in practice, one makes sure that students' ability to actively learn and interact is supported. The distance and indirectness of contact specific to e-learning can entail a sense of isolation and loneliness. It is therefore recommended to design an appropriate e-learning course and implement it to overcome these feelings. The educational effectiveness of learning by the form of education (classroom, online) is similar, as evidenced by numerous research results (e.g., Navarro, Shoemaker, 2000, pp. 197–204; Wang, Kanfer, Hinn, Arvan, 2001, pp. 1–20; Kwiatkowska, 2011; Wagner, 2011). The proper structure of the content and the methodological and technical background allowing one to shape the cognitive process consciously, including enabling the learner to think independently, with critical thinking supported by mutual interaction, is fundamental.

Cognitive models in the field of e-learning underline the critical issues related to the implementation of the learning process, and they are worth considering with regard to establishing the facts, the need to improve the teaching and learning process, and incorporate this form of

education into the educational offer of universities. The quality of online learning experiences, the quality of online education programmes, and the support of an educational institution (administration, technical facilities) determine the competitiveness of the latter and its ability to meet new challenges.

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The Electronic Register in Polish Schools. Studies from the Level of Early School Education

Abstract: *The purpose of this paper is to present the results of the research on the manner and degree of use of e-registers by teachers in early school education. On the basis of conducted analyses, I identified three levels determined by the presence of the e-tool in the classroom. As a result, in addition to its natural use, which is to document the teaching process, the computer register was an appropriate tool to support the process of education. What is more, owing to its numerous functions, it assists teachers in preparing various types of lists, breakdowns, summaries, and certificates.*

The analyses presented in the text are based on data collected from surveys supported by a partially controlled interview. The selection of the research sample (126 people) was random.

The presentation of the results is preceded by a brief introduction in order to show the new technologies currently used in Polish schools.

Keywords: *electronic register, documenting the teaching process, information technology, new media, education, teacher support, early school education*

Introduction – New technologies in the Polish school

Tools of information technology have become a permanent element of equipment in Polish schools. Among them, the most popular and most commonly used are computers. At the level of primary, middle, and high schools of general education, the proportion of institutions that are equipped with the mentioned devices amounts to almost 100%[1] (part of

[1] A slightly lower number was recorded at the vocational school level.

the equipment, however, includes desktops from the years 2006–2008) (Departament Informacji i Promocji Ministerstwo Edukacji Narodowej, 2016). The analysis performed at the turn of 2013/2014 showed that the average ratio of the number of pupils to the number of computers connected to the network is 9 to 1. "In cities, there was one computer and a computer with Internet access to 13 students, and in country areas, this ratio was 6 and 7 students to 1, respectively" (Żyra, 2014: 110).

The number of interactive whiteboards (Krzemińska, 2015) and tablets (Wyborcza, 2015) in schools has also been increasing by the year. In November 2015, the Ministry of Education approved a set of electronic textbooks intended for early school education. Interactive materials containing numerous exercises, films, and recordings are compatible with those tools.

When discussing issues related to modern teaching, one cannot ignore the fact that the Ministry of Education, in collaboration with the Centre for the Development of Education, plans to prepare fourteen new e-books, and 13,505 e-materials in the form of audio books, videos, multimedia lessons, etc. The collection is to enrich lessons in the history of art, knowledge of culture, Latin, history of culture, music, art, and advanced level classes in nature, the humanities, mathematics, and computer science. Activities for vocational education are also planned in the near future. It is expected that 150 e-books and 800 e-resources containing videos, recordings, photographs, graphics, diagrams, documents, and exercises will be developed for vocational education (Departament Informacji i Promocji Ministerstwo Edukacji Narodowej, 2016).

E-learning courses have also enjoyed great interest for several years now. Particular attention should be paid to the first Polish first-degree e-learning studies in the field of media pedagogy, launched in the academic year 2016/2017. This course (an initiative of the faculty members of the Department of Teaching and Media in Education, Faculty of Educational Sciences, Nicolaus Copernicus University in Toruń) provides complementary training in the specialisation called 'new media in education, or on-line education'. According to the guidelines of the Ministry of Science and Higher Education, the ratio of the number of hours realised as a full--

time course to the number of hours realised as an on-line one is 4: 6, with a total of 1,800 hours (Internetowy System Aktów Prawnych, 2011).

Currently, we are also witnessing most interesting changes related to the introduction of electronic registers into Polish educational institutions. These tools were introduced into schools on the basis of the Regulation of the Minister of National Education on the manner of keeping the records and documentation of the course of teaching, educational, and care activities, and the types of this documentation, by public preschools, schools and institutions (Internetowy System Aktów Prawnych, 2009).

Several factors have contributed to the growth of interest in the tools of information technology in Poland. Firstly, the Ministry of Education obliged teachers to "create conditions for students to acquire the following skills: searching, sorting, and using information from various sources, and using information and communication technology effectively" (Internetowy System Aktów Prawnych, 1999). Secondly, the experience of educators and their innovations began to be analysed during the procedure to obtain professional promotion. Another factor affecting the positive attitudes of teachers to widely understood IT tools was the regularly updated results of studies in favour of the new media (Majewska, 2014, 2016b; Siemieniecki, Majewska, 2015). What was also of great value were the Polish professional literature introducing the assumptions of media pedagogy (Siemieniecki, 2007a, 2007b), multimedia teaching (Morbitzer, 1994; Kozielska, 2003; Penkowska, 2009), and the pedagogy of creativity in the context of computer work (Siemieniecka, 2012; Siemieniecka-Gogolin, 2005), cognitive studies (Siemieniecki, 2013, 2010), distance education with computer use (Juszczyk, 2003; Kwiatkowska, 2014), open educational resources (Skibińska, 2011), and others located in the area of modern didactics.

Currently, activity in the digital environment and, thus, the work of teachers supported by information technology are facilitated by educational applications, multi-books, didactic games, web pages, or thematic portals developed by publishers, scientific centres and educators (Skibińska et al., 2014).

What is an electronic register?

According to the guidelines of the Ministry of National Education, an electronic register is a tool that ensures data security (owing to the selectivity of access and internal security measures), and the ability to save and copy resources (thus protecting them against loss, destruction, or damage). E-registers make it possible to print materials and export of information (mark sheet, attendance record, etc.) to the XML format (Internetowy System Aktów Prawnych, 2009). Any modifications made to the e-register are recorded so that any changes made are not anonymous.

Apart from the provisions of the Act, the electronic register can be described as a computer program used to record and analyse information about a pupil – personal data, marks, behaviour, timetable (Działdowski, 2015). For their proper functioning, most devices require connection to the Internet and access to a web page where the login window is located. It is worth mentioning, however, that there are also mobile registers available on the market, "working on the basis of wireless devices reminiscent of portable minipads" which allow both on-line and off-line data recording (Dreamtec, 2015). Working with a mobile device connected to the Internet makes data migration take place in real time. This system enables you to make changes even if you are not connected to the network, so there is no way to disorganise classes as a result of the lack of access to the e-register. Data synchronisation and information storage occur only after getting connected to a system embedded in the Internet cloud (according to the manufacturer's idea, it may take place during a break when the device connects wirelessly to the server in which the documentation is embedded). The above solution may seem less unreliable and less expensive, for it lowers the cost of use resulting from the necessity to equip each classroom with a computer with Internet access. In this case, just one device connected to the network is enough (e.g. in the teacher's room), using which the data from the tablets are transmitted to the server.

While choosing e-registers, schools may turn to free software, which has both supporters and opponents. The main disadvantages of this so-

lution include the high costs of purchasing and maintaining servers in the school building, the need to carry out tool-related work, and the transfer of responsibility for data security to the educational side. In this context, the exemption from the fee for using software seems to be a minor incentive in favour of the aforementioned solution (Czerski, 2010).

To meet the needs of users, some IT companies have started providing services related to the notifying, by the programme , of any changes made to an e-document. As a consequence, parents can receive information about their children's grades, attendance, remarks, etc. through a text message sent to their telephones.

Looking at the tool from the perspective of headmasters of educational institutions, there is no doubt that the simplicity of functioning of the products available on the market and their usefulness in the context of the organisational function should be appreciated. The electronic register is extremely helpful in preparing documentation (compiling marks, attendance, remarks, etc.) needed during parents' evenings and meetings with parents, where the results of pupils' work are discussed. It also facilitates the day-to-day management of the school (preparation of the timetable, appointing supply teachers, totalling the number of hours of work of a particular teacher etc.) The results of the study conducted by Wojciech Czerski (2010, 117–118) show that, in the context of working with e-registers, in addition to the organisational function and easy and intuitive operation of the tool, teachers value the possibility of a successive change of marks and attendance, entering into the system all the topics for a given school subject and their subsequent selection from the list, and interaction of the tool with other programmes used in the educational institution. Schools are more eager to choose a particular model of the electronic register in a situation in which they are certain that problems with the Internet connection will not prevent them from using the tool.

The fees associated with the keeping of an electronic register are chargeable to the educational institution. As a consequence, schools are supported by the Parents' Council, and/or seek funding from the municipality, offices, or private companies (Dreamtec, 2014). In 2014, the Ministry of National Education issued a regulation on charging parents with additional fees. This action was a response to the unfair approach of

manufacturers that interpreted the regulations in force in the following manner: "access is to be free of charge, but only at school. Thus, parents have to pay for the ability to check their children's marks, or go to the school to see the register" (Kozioł, 2014) .

Currently, the e-register operates in more than three thousand schools in Poland (Stasik, 2015).

Information technology in the process of education

It has been known for a long time that learning plays an important role in the process of education. Thanks to analysing literature, talking with educators, and properly taught lessons, children learn patterns of good behaviour. They learn morality, responsibility, distinguishing good from evil. In nature classes, they contemplate the beauty of the world around us and have a chance to observe and understand what respect for life is. Through the various forms of activity concentrated around different topics and classes, they acquire empathy. They develop social attitudes, learn "to appreciate the truth, but also to recognise lies" (Korczak, 2012, 139–140). Consequently, the emotions that accompany the properly implemented educational process shape the specific attitudes and thinking of young people.

Recently, the media and also new technologies have been playing a major role in the process of education. These tools may, to the same extent, develop both positive and inappropriate patterns of conduct. Everything depends on the content and plot of the message. An experiment conducted in Canada in the 1970s showed that television may trigger negative emotions. Its presence also contributes to an increase in the number of aggressive reactions. Based on the performed calculations, it was concluded that two years after the installation of television transmitters (and, thus, the introduction of television), the number of disturbing incidents increased in a given location. Verbal aggression doubled, and physical violence almost tripled. The described changes concerned both boys and girls (Williams, 1986; Majewska, 2015: 79–80). "However, in our analysis of the media, we cannot focus only on the negative aspects of their use, and not see the values that they can convey" (Huk, 2011: 168). Consequently, it should be made clear that television can be help-

ful in gaining knowledge and experiencing new phenomena, stimulating positive emotions, and providing entertainment (Podolsky, 1999: 139).

Today, the importance of television in the lives of young people has somewhat decreased. Its place has been (primarily) taken by social media and the Internet. Henryk Noga (2008: 13) emphasises that these tools disseminate specific patterns of conduct. The phenomenon referred to is not marginal, as evidenced by statistics updated on a regular basis. The collected data show that over 18 million Poles already have an account on a social networking site, which represents 99% of Polish Internet users (Noga, 2008).

When analysing the impact of multimedia on the education of the younger generation, one cannot overlook the issue of computer games. Some of them teach the principles of cultured and honest behaviour, savoir-vivre-based living, patience, etc. (Skibińska et al., 2015: 165–194). At this point, it is worth mentioning that in some countries the production of games promoting patriotism and attachment to homeland is financially supported (Noga, 2008: 39).

At present, electronic registers are playing an increasingly important role in the process of education. These tools ensure better contact between home and school so that parents can respond to educational problems on a current basis. Access to the e-tool means the ability to continuously monitor a child's attendance and progress in learning. From the teacher's point of view, it is also valuable to be able to make lists and breakdowns, and keep track of the number of pupils' unexcused absences, the number of negative remarks made in a given semester, the average learning outcomes for a given subject, etc. The above data enable the pedagogical staff the to react quickly according to the pupils' current needs and problems (e.g. activation of prevention programmes, change of school regulations, etc.).

The course of the experiment and research questions

The actual study presented in the research paper was implemented under the 2210-NP grant, in connection with the need to analyse the changes resulting from the introduction of electronic registers into schools. The research procedure began in the 2014/2015 school year and ended in 2015/2016. It was preceded by a pilot study that helped to

verify the correctness of the planned activities (Majewska, 2016a). The selection of the research sample was random and was conducted among teachers of early school education in the Kuyavian-Pomeranian province in Poland. The analysed resources included data on twenty-six people, which were obtained through a survey and an interview. Thus, the presented data are both qualitative and quantitative. The main assumption behind the actions taken was to determine the level of acceptance, the manner of using the tool, and the purpose and frequency of use of the e-register by teachers from the level of early school education. During the interviews, I also attempted to determine whether and what problems teachers struggle with while working with the tool discussed. The actions taken were dictated by the following research objectives:

1. An analysis and assessment of the level of acceptation of the e-register by early school education teachers.
2. An analysis and assessment of the form, and the extent of use of the e-register in the process of students' education.

The following issues and detailed questions were to help solve the above problems:

1. Do early school education teachers accept working with the e-register?
   1.1. What percentage of early school education teachers accept the changes related to the introduction of the e-register, if any?
   1.2. Is there a relation between the age of early school teachers and the level of acceptation of the e-register?
   1.3. What percentage of early school education teachers have problems related to working with the e-register, if any?
2. In what way do early school education teachers use the e-register in the education process, if at all?
   2.1. For what purposes do early school education teachers use the e-register in educational practice?
   2.2. How often do early school education teachers use the e-register to inform children's legal guardians about the students' educational and upbringing situation, if at all?
   2.3. Is information given to the students' legal guardians through the e-register of general or detailed character?

2.4. Does the e-register facilitate the flow of information between the teacher and the child's legal guardian?
2.5. Does the e-register contribute to decreasing the amount of educational and upbringing problems?

In order to check the statistical significance and the direction of dependence, the Chi square test of independence was used.

Own research results

The surveys conducted with early school education teachers have shown that approximately 82% of them accept changes related to the introduction of the e-register into the teaching process. It is worth mentioning, however, that 23% of the people in the aforementioned group emphasised that the period of keeping double documentation – both paper and electronic (the so-called transition period), was superfluous and compelled the educators' attention too much (according to the provisions of the regulation of the Ministry of National Education, public kindergartens, schools, and the institutions referred to in the title of the regulation may keep registers in one of three forms (Majewska, 2016a): paper, electronic and paper at the same time (Komorowski, 2016a), and electronic (Komorowski, 2016b).

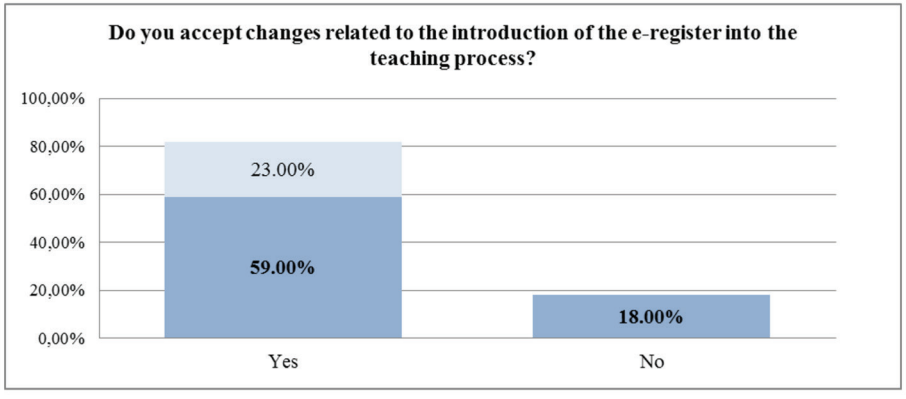

Figure 1. The level of teachers' acceptance of the e-register. Source: own study.

On average, 81% of the respondents declared that the tool was not especially difficult to handle. Being aware of the numerous benefits of the proper use of the equipment was also conducive to this positive attitude. According to the teachers' comments, electronic registers enable the making of fast and automatic compilations (according to 81% of the respondents). The function is very useful since it eliminates the need for the manual making of calculations and lists needed at meetings with parents, or during the Teaching Staff Meeting. Among the other advantages of using the e-tool, the teachers mentioned:

- the ability to access the documentation without having to actually take the register from the teachers' room – approximately 71% of the respondents,
- the ability to use the documentation also at home, after logging into the system – about 78% of the respondents,
- the ability to quickly pass on information and consult with most parents – about 68% of the respondents.

Despite the need to supplement their knowledge and skills related to the operation of the tool, the teachers noted that "working with e-registers is first and foremost comfortable...". Consequently, knowing the advantages of using the equipment, the educators decided to take part in additional training.

The Chi-square test of independence (as in the case of the pilot study (Majewska, 2016a)) showed a statistically significant relationship between age and the level of acceptance of the tool. The asymptotic significance of the Chi-square test was 0 (for a = 0.05). The results of the above tests can be considered reliable since all the cells had the expected frequency greater than 5. The negative attitude towards the e-register was predominantly characteristic of persons over fifty-five years of age, who depreciated the value and need for the inclusion of modern information technology devices in the process of education.

The unfavourable attitude towards the tool was due to the lack of operational skills and the high level of stress associated with working in the information technology environment. On average, 18% of the teachers owned up to experiencing problems with the operation of the e-register. What caused trouble to these people was mainly the operation

of the module related to the making of lists and breakdowns, catching up with entering missing lesson topics, changing standard settings. The appearing difficulties were overcome under the guidance of the system administrator or other educators, usually a computer science teacher.

The analysis of the use of the electronic register has shown that it improves activities related to the teaching process, preparation of school records, and education itself. The clarification of the last of the fields is extremely important. Technology can support the process of education both by promoting appropriate patterns (e.g. educational films and games), and by tightening relationships and streamlining the flow of information between teachers and pupils' parents. It is also important to be able to actively supervise and consciously undertake educational activities, which was still more difficult a decade ago. A study carried out by Krzysztof Konarzewski between 2002 and 2003 in primary and lower secondary schools in Poland revealed that, on average, 30% of head teachers did not know the number of pupils' unexcused absences. The situation was similar in the case of the awareness of occurrence of inappropriate and reprehensible behaviour (Konarzewski, 2004: 41–43).

The electronic register is used		
in the teaching process	*in the process of preparing the school documentation*	*in the process of education*
– automatic collection of data on pupils' activity, – ability to give weight to specific marks, – ongoing monitoring of pupil's average marks, – ability to enter in the e-register topics covering the whole school year, – ability to import data into the e-register[A] (e.g., topics of lessons or form periods from previously developed text documents), – ability to remind pupils about a test, extra home assignment, etc.	– automatic compilation of lists including remarks on pupils' behaviour and preparation for classes, as well as their attendance, activity, marks, etc., – automatic filling in of school certificates and preparing them for printing , – assistance in the development of the timetable, appointing supply teachers.	– faster contact with a pupil's parents than in the case of notebooks for correspondence, – ability to smoothly exchange remarks and analyse a child's educational problems on a continual basis, both in the parent-teacher and teacher-teacher direction, – fast and uncomplicated access to the statistics related to a pupil's behaviour (allows reaction of the teaching staff focused on specific needs).

[A] The software also allows the export of data from the e-register.

Figure 2. The areas of use of the electronic register.[2] Source: own study.

[2] A summary list prepared based on the answers of teachers who used different

The conducted study shows that an average of 82% of teachers use the e-register to contact parents. The tool under discussion, as emphasised by educators, has largely replaced the traditional pupil's record books and notebooks for correspondence. Using e-mails, parents and pupils are reminded of the formal outfit, tests, meetings, etc. Currently, the tool also significantly supports the process of education. Teachers use it to inform parents of their children's being unprepared for classes, their inappropriate behaviour, interpersonal issues, etc. Certainly, in the case of more serious problems, parents or guardians are invited to come to the school for an interview. However, a significant part of issues can be solved on a regular basis, using virtual mail. Aware of the situation, parents are also more willing to co-operate with the school, and take appropriate educational decisions.

The teacher's contact with their pupils' parents (using the e-register) can be very uneven. The conducted analyses show that teachers use e-messages mainly to inform parents about their child's inappropriate behaviour (approx. 48% of teachers). Among the respondents, it was possible to distinguish persons (on average 33%) who used the e-register on a regular basis. Their actions were aimed at the summarising of the past period and providing information regarding an activity planned in the near future. It is worth emphasising here that in many schools the e-register has replaced traditional pupil's record books or notebooks for correspondence. The analysis of the collected data proves, however, that despite unfettered access to the tool, some educators do not use all the options it offers. As a result, a group of teachers was found during the study who limited their contact with the computer register to a minimum. The said 18% reached for the e-tool only to call the register, or give a mark. All remarks and information were provided using notes jotted down in the traditional pupil's record book, or in a notebook for correspondence. Only one person was identified in the study group who, in order to better establish contact, simultaneously reached for the electronic tool and a traditional notebook for correspondence.

types of the e-register.

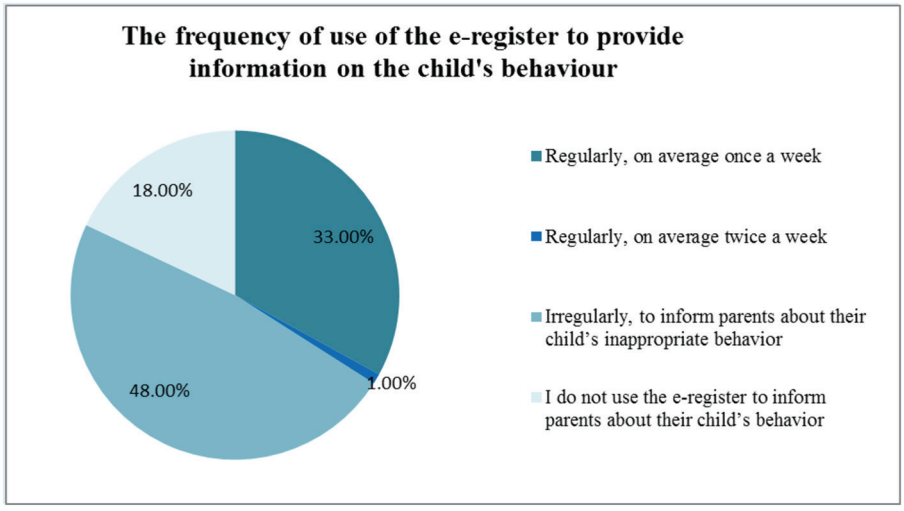

Figure 3. The frequency of use of the e-register by teachers. Source: own study.

Disturbing as it may be, about 16% of parents (despite their young age, i.e. between the ages of 30 and 40 (Stańczak et al., 2015)) do not log regularly into the e-register, which hampers co-operation and the exchange of information about their child's behaviour (or the child's preparation for classes). According to the teachers, this situation is conditioned by several factors. These include: limited access to the Internet and computer equipment, negative attitudes to IT, lack of the habit of regularly checking e-mail, too much work and lack of time (Batorski, 2014: 357–384). In addition, it is worth quoting the words of Yves Winkin (2007: 178): "any system forces you to find balance on the introduction of a new element", which requires time and patience.

The irregular use of the tool by these parents did not discourage the majority of the respondents from using Internet mail. According to the observations of the educators, this form has many advantages, among which confidentiality should be especially emphasised. Pupils' accounts, similarly to those of teachers, are protected by a password. This provides a two-way flow of information, without access of third parties (including pupils themselves, which was not possible in the case of traditional pupil's record books or notebooks for correspondence). Owing to this,

correspondence conducted in this way is detailed and comprehensive.

The implemented studies have shown that regular contact with parents using the e-tool reduces the number of emerging behavioural problems (it does not solve them altogether, though). As a consequence, teachers who use the electronic register continue to witness negative phenomena related to their pupils' behaviour. The reported problems relate largely to children whose parents do not maintain permanent contact with the school. This situation affects an average of 16% of families, which in the reality of a 25-pupil class amounts to 4 people.

On the basis of the observations made by teachers (71%), it can be concluded that, owing to regular co-operation between the form teacher and parents, pupils have started to prepare better for classes. 80% of educators are also convinced that along with the introduction of the e-register the number of delays and absenteeism have decreased. A similar number of people (79%) believe that, thanks to the constant contact with the family, the number of instances of inappropriate behaviour has decreased.

Conclusions

Referring to the results of the study described above, one should be aware of the fact that information technology tools began to appear in the Polish educational system later than it was the case in Western Europe, or in the United States. The Internet has been present in our country since 1990, when the first e-mail was sent via it (Malik, 2011). Access to the network for private people became possible only five years later (Baran, 2013). Nowadays, however, although less and less frequently, we can still find schools that do not have access to the Internet. Interactive whiteboards, tablets, or smartphones started to appear in classrooms around the year 2010. This situation has not remained unchanged in the context of the competence of, and the level of technology acceptance by teachers who, *de facto*, are making themselves familiar with the secrets of modern education only right now. Bearing in mind the above, it can be said that electronic registers have been positively accepted by the teaching staff in Polish schools, which was stated by 82% of the respon-

dents. This situation, as evidenced by the provided answers, is related to awareness of the benefits of the presence of the electronic register. The e-tool makes it possible to compile attendance records, calculate average marks, automatically fill in certificates and print them. The use of the electronic tool also ensures better contact with pupils' parents, which in turn correlates with a decrease in the number of instances of negative behaviour and coming late to class. It has also been observed that, being aware of constant parental control, pupils are better prepared to classes. Consequently, it should be assumed that with time, the importance of electronic registers will gradually increase owing to the continued education of teachers and parents, while the tool itself will be applied more consciously, and adjusted to the needs of individual learners.

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Creative Teaching – How Can One Make Student Performances Based on Myths? Current Problems and Challenges

Abstract: *The aim of this article is to consider myths and show how this kind of oral narrative has established the basis for making student performances for children in primary and lower secondary school. Here, it is shown how a specific performance came into being. We will also define and specify what kind of myths exist, what was written about myths in the Lecture plan at the time when student performances were made in 2003, and what points of the plan made up the basis of this work. For many years, I have conducted myth collection work, and some of these traditional materials have become the basis for performances. Working in groups on myths in connection to theme work needs to be considered as a process when several people cooperate in order to make a product where the material one possesses is being furthered all the time.*

Keywords: *Myth, cultural heritage, education, cultural history, myth performances*

Introduction

The aim of this article is to consider a North-Norwegian myth[1] and show how this kind of oral narrative has established the basis for making a student performance.

[1] A myth is a cultural or religious story. The Norwegian term for the text about to receive treatment is called, sagn. However, I will use the English language uniform, by choosing the term "myth" instead.

What Is a Myth?

A myth[2] is a folk-like presentation of memorable happenings, a short tale that has existed in the minds of people and has been passed from relative to relative. We say that the myth is time-decided because we know when it happened, and that it's place-decided because we know where it's happening. In the myth, we often find name-given people who live now or lived in the past. Myths present themselves as truth, as the person who experienced the happening means it to be. We are talking here about the subjective truth the myth tells about. It evades objective truth criteria in the scientific sense because the event cannot be accurately recreated. However, there are still many myths which narrate about fantastic personal experiences which several people, independent of one another, can speak of.[3]

The myth occurs in many different varieties and can be shared within many sub-genres dependent on content-criteria. Olav Solberg[4] splits up myths into four sub-categories: *nature mystical myths, historical myths, origin myths, and urban myths*.

Nature mystical myths concern supernatural occurrences and phenomena. The mystical dimension in the myths that contain the supernatural as a theme has big appeal for youths. This is why it's regrettable that the material is often neglected at school, because this material contain a big potential for learning. It's particularly the nature mystical myths students like to work with because it stimulates their curiosity. This type of myth opens up many possibilities. It sets thinking into motion, as well as awakening feelings and appealing to the creative imagination, by either discussing a legend or writing a text around it.

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[2] Larsen, Roald and Levit, Lev 2008: *Norwegian Folklore.* A teaching aid for Russian speakers. Arctic Publisher.

[3] Bjerkem, Johan Einar 2004: *The Narrative Pedagogy*. Folk poetry before and now. Gyldendal Norwegian Publisher.

[4] Solberg, Olav 1999: *Norwegian Folk Poetry*: literary-historical lines and thematic perspective. LNu. Cappelen Academic Publisher.

Historical myths tell us about historical events and historical people and have this as a main subject. This does not mean that myths are historically true or that they narrate about actual real events. It is, however, a historical person, a historical base or a historical connection that catches interest and makes myths come to life. Historical myths are separated into two: national historical myths and local historical legends. Examples of national historical myths are the myths of Saint Olav, the Black Death (Svartedauden), or the war against the Swedes. Local historical myths gladly tie themselves to particular events or known people. These myths are easier to trace down to their roots. Here we can find, for example, myths of local heroes or wise wives. This type of myth can often wake more interest among students than a more traditional history book can do because historical myths often give us an inside look and story as to how people acted within the timeline and area related to special events taking place, both locally and centrally speaking.

Origin myths are tales that explain the origin to distinctive and conspicuous phenomena and formations in nature. In Norway, we often find tales of trolls who become stone when the sun comes out, and thus create special formations in mountains and rocks. These myths suit the lowest class in primary school as they sound a lot like fairy tales. At the same time, the tales focus on the nature in the local society, and that's something children can recognize. Origin myths can also serve as an appetizer to make oneself acquainted with the local environment, and also to think and to fabricate on one's own, to make up own explanations to special phenomena within the landscape. Origin myths give us geographical knowledge in another way: it's easier to remember the name of, for example, a mountain when you receive a story along with the name to associate with. At the same time, the myth also reveals a lot about popular beliefs, and in these stories we can find many traces of pre-Christian beliefs. In addition, the myth stimulates imagination and wonder over the current conditions' mysteries, and has therefore a strong aesthetic dimension.

Oral Storyteller Traditions and the Lecture Plan

When the project began, I understood that it would have big relevance for primary school[5] because it was part of fulfilling the intentions of the lecture plan (at the time) in 1997 (L-97). However, this local material was difficult to find; little was written down – and if it is just that, tales would only be sporadically found in year books and village books.

The background for this work was thus the strong focus on the oral story and folk poetry within the lecture plan. According to this lecture plan, folk poetry was to be introduced to each school grade with the exception of the 7th grade. Children were to be told tales as well as tell them to others from the first grade in primary school, and it was emphasized that local traditional material should become part of education.

Theme Work

In connection with the topic "Traditional texts", different student groups of Practical aesthetic education,[6] the second academic year, in the period of 2003 – 2012 worked on myths in the context of an interdisciplinary theme work. The task in this interdisciplinary theme work was to make a performance for the intermediate grade in lower secondary school based on different myths. The students were divided into groups of approximately five people being responsible for one performance using myths and incorporating different subjects which played an important role.

[5] My students at that time would become future teachers on this level within the school network. It was therefore important that the teacher plan at the teacher education corresponded with the equivalent plan in primary school.

[6] This refers to my teaching at UiT The Arctic University of Norway. Through Professional teacher education in practical and aesthetic subjects (PELU), the students got expertise in teaching different arts and cultural subjects in primary and lower secondary school, and in addition they got insight into artistic-pedagogical work, as well as the interdisciplinary and aesthetic learning processes. Training also concerned another teaching practice connected to professional and cultural activities with children, young people and adults, especially comprehensiveness-oriented training in artistic subjects in a musical and culture school.

Norwegian language (literature)

I have been responsible for literature course in the Norwegian language/native language[7] (which comprises literature and language subjects). This theme work was based on the work which had been done earlier in the academic year in my Norwegian classes in connection with the topic *popular stories* where I had delivered lectures, writing practice, training in group processes, oral presentations etc. The Norwegian language was then the central subject in connection with this project. Through the whole work process connected to the interdisciplinary theme work the Norwegian language was the central subject. The process of writing myths itself when this theme was considered made up the necessary basis for the performance. In the period of theme work, I also played the role of a teaching supervisor in connection with making a program magazine in terms of its special and linguistic contents, as well as paper choice etc. During the presentations, some groups operated with an oral narrator, and much of this training had already been done during oral presentations in Norwegian classes.

Other Subjects

Other subjects were naturally incorporated into theme work. The *music*[8] staff got a central place in connection with the responsibility for producing sound effects and vocal presentations. The *drama*[9] staff contributed in relation to myth editing and dramatizing considering the audience (mainly pupils of primary and lower secondary school).

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[7] The main books used in the Norwegian subject: Larsen, Ann Sylvi and Larsen, Roald (ed.) 2002: *Headless Men and Frozen to Death Hitchhikers*. Eureka Publisher; Drannikova, Natalia and Larsen, Roald (ed.) 2007: *Following the tracks of the Chudes*. Arctic Publisher; Tønnesen, Elise Seip 1992: *Opinion in Mass Media.* Text and film. Oslo.

[8] The main book used in the music subject: Hanken and G. Johansen 1998: *Didactics in music teaching.* Cappelen.

[9] The main books used in the drama subject: O'Toole, J. and Haseman, B. (1995): *Drama and Theatre – a Pedagogical Method*. Drama Publisher; Guss, Faith G. (1997): *The Game Drama.* Oslo University College, Colon 1997, nr. 40; Hernes, Leif et al. (1993): *Theatre for Children*. Tell Publisher.

The *arts and crafts*[10] staff was responsible for poster design (illustrations and design) and theatre wings (used during the presentation). One student in each group got a task to put together a program for the presentation. It concerned modelling the text and making a picture. It was useful to have had training in this subject as the students had learned different techniques depending on which setting one wanted to depict. In this subject, the students were also taught to make different kinds of costumes depending on the necessity.

The *pedagogy* staff played a role in relation to the drama-pedagogic aspect, i.e. how one would communicate myths. As some students in different groups had strong opinions on how parts of the project had to be shaped, a lot of different viewpoints were expressed. Conflict is not an unnatural part of a working process in groups (especially in the beginning), and here the pedagogy staff by making ~~contributed in such a way that they in these situations made~~ suggestions how to resole conflicts. As the groups were supposed to work together only for three weeks and they could be short of time, it was important to make students understand that it was both rational and necessary to show self-discipline and find one's role in group work which helped to strengthen the unity. Gradually, as the stage image started growing up in the classroom for drawing, most doubts and problems disappeared. The students had a feeling that it was going to be a good presentation, and the spirits rose little by little. Afterwards, the students were fairly satisfied with their cooperation. It turned out to be that in difficult situations, particularly with technical faults and other practical challenges, it was often a close-knit team which fulfilled this kind of tasks without a moment's hesitation. The groups had three available instruction hours. As they had good knowledge of myth genre, they didn't need help until the last week when they worked on the presentation design.

[10] The main books used in the arts and crafts subject: Elvestad John, Ådne Løvstad and Linda Strømme (2006): *Visual Artistic Subjects,* Gyldendal; Haabesland, Anny Å. and Ragnhild Vavik 2000: *Arts and Crafts, What and Why*. Professional Book Publisher.

Work Process

Group work on myths in connection with theme work has to be seen as a process where a number of people cooperate in order to make a product, with the continuous development of the material one possesses. Group work is a challenging working method. The experience which the students get on their way through the challenges they meet is important and will in particular be useful in similar theme work. In such a group process, one is confronted with a lot of tasks, and therefore it is important that the group one is working in is functioning well. It means that group members are capable of using competence and ideas which every individual has. Each student usually has his/her own «special knowledge» within different subjects, and it can be useful in different ways in various presentations depending on what myth one has chosen. However, it can be difficult to succeed in a work process where all the students feel that they contribute something meaningful in relation to the presentation. Here all the students should be listened to so that their suggestions and competence will be used as long as it is possible.

As it has been mentioned, working on myths in connection with an interdisciplinary theme work can be a great challenge for different student groups. The first group meeting started usually with the members of different groups reciting myths to each other. Later, they made a decision of using the myth which was found the best to be dramatized. The greatest challenge when one is going to make a performance is how one will manage to create the right atmosphere so that the myth is animated in an exciting and expressive way.

Experience as a Significant Factor

The aim for the students of Practical aesthetic education was to produce a ten-minute performance for pupils of the fifth grade in primary school. On average, approximately half of the students had had drama subject before, and their experience in this subject was adequate. As for some students making performances was a kind of routine, it was easier for them to get started, and at the same time they had some overview of what was needed to achieve the aim. Therefore, it was important that all

the groups had some students who had acquired this competence. When the myth had been written in advance (and usually didn't need a lot of editing), the students started dramatizing the story relatively quickly. The students didn't need to spend so much energy on agreeing on and understanding the plot itself as they otherwise often needed to do when they were going to make performances in drama.

Time Frame

In 2003, the students got three weeks in order to make a performance. As there were always some inexperienced professionals participating in this theme work, the teachers wanted to operate with broad time frames in order to be absolutely sure of accomplishing this work process in a proper way. Although efficiency wasn't of the same high level in all the groups due to different reasons, many students meant that three weeks was a too long period of time for preparing such a performance, two weeks were superfluous, and some student groups indicated that they had managed within just over a week. Some students also said that for an exam in drama the preceding spring they had a time frame of three days in order to make a performance which lasted for 10–15 minutes, but at the same time they experienced that it was much more time-consuming to incorporate several subjects into the performance in a way which was demanded by theme work. There is much more work in involving several different kinds of subject teachers in supervising work, but it is also more difficult to get when one is going to make a performance, as then one gets an "aesthetic rise", which appears through a complex and functional artistic expression. When we as subject teachers evaluated the myth project later, we agreed that the time frame of three weeks was too wide, taking into account what has been mentioned above, and the situation that the students had had a substantial in-depth study of this genre in Norwegian the preceding year where they had particularly written a reflection log connected to the genre. In drama, they had had a group assignment about myths. The following academic year (2004), the students of Practical aesthetic education got only two weeks for this myth project, and, based on evaluation, most groups meant that it was a reasonable time frame for making an interdisciplinary performance.

How Does a Performance Appear?

Now I will give an example of how a student group[11] actually produced its performance. As mentioned, in the first year the students had three weeks to work on a performance for pupils in lower secondary school. In the beginning, the group spent time mostly on planning the performance. The first week the students of this group spent mainly on agreeing on how they wanted their performance to be. They discussed back and forth how they wanted the presentation to be. As the aim was to have the technical elements in position at first the group started rehearsing late. They distributed some of the tasks between themselves, in particular designing program magazine and poster, as well as working on technical and artistic effects. Not all work distribution was thought-through to the same extent as they didn't realize clearly what parts required most work load. Here it was me who spent relatively long time on their supervision.

The second week they started slowly rehearsing, but as the group had chosen to produce a performance with a lot of effects, there was something that needed to be obtained, prepared to perform and enacted.

The last week was rather busy. The performance was to be staged in the drawing classroom, and it was not vacant before Monday afternoon that week, but now the majority of students agreed on group dynamics so that they mostly worked well together all the time. On Friday of the third week, the group held six performances for pupils of the fifth grade in different schools of Tromsø. All the performances were held appropriately, without any complications, and the group result was a good final product.

As the students had worked with myths in the Norwegian class the preceding year, they were well familiar with the genre to a large extent regarding the general definition of different myth types. Therefore, they avoided spending time on going into this genre. It was only to find all the myths which had been written before and choose those which were best suited to being used in a performance. Before the group agreed on what myth they would use, each student recited his/her own myth for the oth-

[11] From the academic year 2003–2004.

er students of the group. Choosing the «right» myth for the performance was a little bit difficult task. Here there were a lot of considerations to deal with; therefore, the choice process was time-consuming. Since the students were well familiar with the genre before the discussions, as mentioned before, they were on average productive and constructive because they understood better what work they were going to do.

Myth Choice

The group chose to use the myth "A huge bird in the Stetind"[12] as the group agreed that this myth was best suited for dramatizing. One of the students used this known myth as the basis and made up its version a year before. The informant was hers. Here follows the most known version of the myth written by Thorbjørn Storjord[13]:

A Huge Bird from the Stetind

Once upon a time, long, long ago, a huge bird settled down in the Stetind. There, the bird built a nest of shrubs and even small boats which it fetched from the fjord. When younglings hatched out, neither people nor livestock were protected against the huge bird. The younglings needed a large amount of food and only the best was good enough for the bird.

In Storelva, there lived an old Sami, who had to watch this huge bird steal both goats and sheep from him, but he couldn't finish it off. He didn't reach it either with an arrow or an axe. But then the man found a way out. He took the largest sheepskin he had in the shed, found a kettle, flint and fire steel and appropriately cooked food. He put it all into the rucksack, as well as the longest rope he had in the boat-house. Outside in the meadow he sewed himself into the sheepskin and lay down to wait.

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[12] The most well-known version of the myth is in the book of Storjord, Thorbjørn1991: *The Lule Sami Fairy-tales and Myths*. Bodø Teacher University College, Bodø.

[13] Thorbjørn Storjord from Tysfjord was a lecturer at Bodø Teacher University College. In addition to collecting the Lule Sami fairy-tales and myths he has for instance published articles on local history subjects and the Sami and Norwegian place names.

Within a short period of time, the huge bird came flying and stuck the claws into the skin. Then it took it upwards, but as soon as it had let the man fall to the younglings in the nest, it flew down the mountain top on a new raid. The man cut himself out of the skin and set the nest on fire.

Thrice the huge bird came, and its wings were full of sea water which it threw over the heat. The third time it flew so closely that it burnt the wings and fell down the mountainside. Now the man wanted to cook his food. He thrust the kettle into a little lake situated a little bit away from the nest, and on the instant the water turned into pure gold. Then, he filled up the sack with gold and started walking down. It was good to have the rope and he came safe down with gold. People never saw the huge bird again.

The Presentation Place

What the first group did after they agreed on dramatizing the myth "A huge bird from the Stetind" was to find a suitable presentation place. As the student class was relatively large that year, there appeared many groups and they competed on who could use the "best" places in the institution building for the performance although appropriateness had naturally something to do with the contents of the particular myth. Since it was going to be a *myth wandering,*[14] there was also supposed to be some distance between group performances, and it naturally contributed to greater room shortage. The group which was dramatizing this myth, after having coordinated with the other groups, chose the stage in the gymnasium as the basis for the performance. When performance planning just started, the group was informed that they anyhow couldn't use the stage and, after some debate,, they decided to use the classroom for drawing in the Arts and crafts department. After the room had been carefully inspected bearing in mind the performance idea, the group made some outlines where it was clear what intentions they had, taking into account the sequence

[14] Teachers and pupils in primary and lower secondary school were invited to watch different performances placed here and there in the institution building. A student from each group brought the audience in turns to the place where his/her group held the performance.

of events/happenings in the performance. The sequence was important. As the group couldn't customize prior to the last week before the performance, they did other important tasks at first. The scene appeared plain, without many details, according to the wish of the group. The group had clear plans in advance on how the whole performance would be perceived.

Sound and Special Effects

There was a lot of discussion in the group concerning the performance. Although there were many contradictory ideas and viewpoints, the group members agreed early on producing a special presentation of this myth. In the myth presentation, the group chose to focus on some senses people have, in particular sound, scent and the atmosphere in general. The group wanted to focus on sound and special effects in preference to traditional dramatizing. The performance was meant to consist of a visible story-teller on the stage, while the rest of the group was supposed to work offstage.

At an early stage, the group realized that they had to use some sound effects which would simulate different sounds, such as for example bonfire, bird scream, rummaging and the wind. On the Internet, they got hold of some sounds which they could use, and the rest they produced themselves in the sound room at school. It was challenging to adjust the sounds to the myth concerning the moment when they would appear and how long they would last. One of the students undertook the job of a sound engineer. He was controlling the process and partly advanced technology in such a way that sound reproduction and sound timing functioned without a hitch.

Joik

The myth was originally a Lule Sami,[15] and the group wanted to focus on the effects which strengthened the Sami in the myth as the main character in the story was also a Sami. The group had many good ideas, and the

[15] *The Lule Sami* is a Sami language spoken by totally 2,000 Lule Sami, 1,500 in Sweden and 500 in Norway. The Lule Sami grammar was written down already at the beginning of the 19th century by a priest Lars Levi Læstadius. Drag school in Tysfjord has taught the language since 1985 and Knut Hamsun upper secondary school at Hamarøy has since 2008 had a three-year teaching offered in the language which is carried out in Drag.

most logical of them was to try learning one or two joiks.[16] As the myth was from the Sami open-air environment and had mysterious contents, the work involved emphasizing the atmosphere which reflected this with the use of effects which generated light, scent, sound and joik. A picture of the Stetind was shown on a computer projector.

Gradually, as the students managed to concentrate on some of the ideas which were introduced, they started to call different people who, as they thought, could be of help during the process. The group figured out that the performance needed two joiks, but a joik couldn't be presented for no special reason. Therefore, the group contacted Tromsø museum and a researcher there who specialized joik and the Sami culture. The specialist explained to the students what joik meant and how it was built, and they got his crash course in two nature joiks. The specialist didn't have any joik which suited a large bird, but he found two joiks referring to bears and wolves which he taught the students to use. One of the students became so good at performing that when she later sang this joik to the Sami person he could distinguish what kind of joik it was. During the presentation, these two joiks were performed with accompanying instruments, such as the drum, rain-stick and different kinds of rhythm instruments. There were several reasons for including a joik in the performance. One reason was to frame the story in an original and evocative way; another was that the students considered it to be a golden opportunity to become absorbed in their own cultural heritage. A lot of students were from Nord-Troms, and many had the Sami blood.

Distribution of Responsibility

In the last week, the group took on raising the theatre wings and other special effects. The group chose to use plain aesthetic expression. Only

[16] *Joik* is a traditional Sami music form. It can be found over the whole Sami settlement area. It has always had an important function among the Sami. In old times, it constituted a central part of shamans' rituals both in practicing the pre-Christian Sami religion and as an ecstasy-provoking medium. Source: *The Great Norwegian Encyclopedia* (The Great Norwegian Encyclopedia is an Internet-based encyclopedia published by The Association The Great Norwegian Encyclopedia.)

one of the students was on the stage as a story-teller. The rest of the group was standing behind the curtain and directed light and sound. Backstage, they were responsible for the performance to be produced without a hitch, in particular to release sound effects in the right moments of the performance. A small room was constructed within the room for drawing with a place just for the audience and the story-teller. The myth was originally rather short, scarcely half of a computer written page. The story-teller used a little bit less than a minute to recite the myth. When the students were supposed to dramatize this myth, it had to be for this reason more embroidered and made richer in detail. The story was extended by the student story-teller herself, and it was a demanding task which she finally succeeded in. Here and there, the student added a little bit extra concerning traits of character, action and environment placement, and thus the myth got more fullness and became informative and long enough to make up a performance taking into account the time frame. It came off naturally and well that the student who was supposed to be a story-teller was also the person who prepared the myth thoroughly, and thus the story-teller was especially well acquainted with the myth. The intention was that the audience would get a feeling that the story-teller herself had heard something which had happened a long time ago, and she succeeded in that illusion. Prior to this work, the group got supervision and impulses from a drama teacher concerning how they could adjust the myth to the performance, what was needed to increase the excitement, where the ultimate excitement top should be, etc.

Room and Light Setting

The aim was to create an intimate dark room, lightened just by a bonfire of a red bulb. There was also green light in the small room which was meant to represent a corridor (the first room we come into when we enter a house), and in addition there was blue light which lit up the story-teller. The black material and refuse bags were hung up on the walls in the drawing room in order to create an intimate and a little bit mysterious atmosphere, and when this work had been done, the room became unrecognizable.

Creating the Illusion of a Large Bird

"A large bird at the Stetind" is a dramatic and exciting myth as such, but the group wanted to intensify it by making a large bird which was supposed to come whizzing over the audience at a dramatic moment of the performance. The main moment of excitement for the students was connected to creating the illusion of a performance about a huge bird. Under the ceiling in the small room, there hung something which was meant to represent a large bird which the group had tried to "recreate". The bird was formed and inspired by *Ring-wraiths* in the novel series *The Lord of the Rings*.[17] The intention of the group was that the bird in this version of the performance would be flying in the room, just above the heads of the audience. The challenge here was to create a huge bird and cope with the mechanism so that the bird would actually come whizzing. It was also important that there would be an opportunity to use this mechanism in more performances in a sequence. It was discussed for a long time in the group how they would solve this problem, but by means of a fishing line and a good but plain method, they managed to achieve the purpose. The old boat mooring trick was used to make the bird fly over the heads of the audience. The effect was intense and gloomy.

Projector

In order to create magic atmosphere, the group used a picture of the Stetind painted by Peder Balke.[18] The group used a projector[19] which

[17] The most reprinted Norwegian translation of the novel series The Lord of the Rings was by Torstein Bugge Høverstad and it was published in 1984 by Time Norwegian Publisher. A film was produced based on the three books, *The Fellowship of the Ring, The Two Towers* and *The Return of the King*. In Tolkien's universe, Nazgûl were lords of people who in the second era got nine rings of power from Sauron. All of them were influenced by the power of the rings and turned into *Ring-wraiths,* creatures without a body who were neither dead nor alive. They became Sauron's most powerful servants and obeyed him without any strings attached. It is possible that he got power over them as he controlled their Rings.

[18] *Balke, Peder 1864: The Stetind in the mist.* Picture. Material and technique: Oil on the canvas. Theme: Landscape.

[19] A projector, also called a multimedia projector, is a technical appliance

showed the picture of the Stetind on the white screen. Under such hectic preparation it is almost "allowed" that something unforeseen happens. And it did in this case. Just before the final rehearsal, the projector stopped working, and the group tried persistently to start it, but in vain. Thus, the students experienced how fragile technical equipment could be and how easily everything could go wrong. The ICT-section of the department helped the student group: they lent them another projector. In addition to the projector, the music (soundtrack) and stage lighting were used as a means during the presentation.

Target group

All the time, the students focused on a performance atrgetted at pupils of the fifth grade in the primary school. If one was supposed to capture the pupils' attention, one had to make the myth dramatic and exciting. As regards the myth dramatizing work, the text had to be partly rewritten concerning time sequence, intrigue (exciting complication which makes up the gist of the plot), heroes (characters the reader can be identified with) etc. so that it would reach the target group in the best way according to the expected maturity level. The children liked the performance – it was proved by the evaluation[20] afterwards.

Conclusion

Group work on myths related to theme work has to be considered as a process where several people cooperate in order to create a product, and where all the time there is the ongoing development of the material one possesses. This working method has a lot of challenges. The experience which the students get in this process will be particularly useful in similar theme work.

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which projects slides on a surface by means of light, an optical lens and an image source.

[20] The teachers of primary and lower secondary school were responsible for this evaluation. By means of questioning and talking with their pupils who had been the audience during student performances, they registered a high level of satisfaction as regards to the presentations.

My article shows how one can produce a student performance based on myths for children in the primary and lower secondary school. The article defines myths and what formed the basis for this work having regard to the Lecture plan.

In order to document exactly how a myth performance originates and what problems and challenges are connected with, it I have provided the example of how the process took a course in a student group.

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