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Dealing with increased complexity. Teachers' reflections on the use of tablets in school

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ABSTRACT

This article focuses on the emerging complexity that schools and teachers are currently addressing – a complexity that comprises one of the key characteristics of society today. The article explores how teachers in primary school experience the opportunities and challenges posed by the use of tablets in terms of implementation, learning activities and classroom management. In group interviews teachers at two Norwegian primary schools thematise these issues. We argue that there is a need to elucidate the subjective interpretations of technology if we are to understand how teachers integrate tablets in teaching. The article highlights how and why we have to develop a wider understanding of the new complexity, which can make situations in the classroom unpredictable and problematic. Although the teachers seldom consider complexity as a subject worthy of attention, it is possible to see it more indirectly in how new methods and activities are presented, but also as part of how they underline the indisputable need for well-defined classroom management. The article concludes by calling for more knowledge about teachers' reflections on how to facilitate learning processes in the interplay between subject content, learning goals and activities, and organizational frameworks.

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Tablets; teachers; complexity; didactics; implementation; classroom management

Introduction

In recent years, a number of Norwegian primary schools have started to use tablets¹ as part of their teaching. This trend is in keeping with a long-standing policy to digitise Norwegian schools (Haugsbakk, 2010). Similar trends can be observed in many Western countries and also increasingly in other parts of the world (Clarke & Svanaes, 2014). This policy is underpinned by a desire to strengthen learning processes by increasing students' motivation and digital skills. It is a well-established fact that the use of digital technology in teaching presents new challenges in terms of planning and how to carry out teaching (Hashemi & Cederlund, 2016; Haugsbakk, 2010; Jahnke et al., 2017). We are interested in how teachers experience and relate to the opportunities and challenges associated with the use of digital technology. Our main focus is on didactic concerns. Based on Bjørndal and Lieberg (1978) didactic relations model, five factors of importance for teaching planning are described; subject content, goals, learning activities, evaluation and didactic

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preconditions. When new technology is used in teaching, other opportunities for communication are offered, and teachers are therefore forced to rethink their own teaching, thus creating a new layer of complexity in the didactic planning (Buhl, 2008).

Empirically, the article is based on how five teachers of 6th and 7th grade students (between the ages of 11–13) at two Norwegian primary schools have experienced the opportunities and challenges posed by the use of tablets in terms of implementation, didactic planning and classroom management. The analysis and discussions in the article are based on a selection of examples from the group interviews.

If we are to understand how technology is integrated in teaching, and why it is used as it is, we should consider the expectations, feelings and involvement of the individuals in relation to the characteristics of technology and the environment within which technology is used (Selwyn, 2011). The teacher's pedagogical craftsmanship has been somewhat sidelined and their reflections have to a large extent become invisible. For example, government action plans regarding the use of new technology in schools from the 1990s and onwards, have been characterised by political visions emphasising the importance of technology for school and society (Haugsbakk, 2010). This is destined to change, and researchers agree that one-sided views of the opportunities offered by technology are inadequate.

Research on teachers' use of tablets in school

How tablets can contribute to more active learning and engagement, thereby contribute to the learning process, has aroused a great deal of interest. Student activity is an educational point that finds its origin in Dewey's texts, which means that the students should be actively participating in their own learning process and in dialogue with practice (Dewey, 1910). By using tablets, students can explore opportunities, produce content individually and in collaboration with others, communicate and share their own and others' content (Hashemi & Cederlund, 2016; Lynch & Redpath, 2014). Tablets can also provide an opportunity for both teachers and students to record and listen to students' reading and problem-solving (Andersson & Hashemi, 2016; Berrum et al., 2016; Soto & Ambrose, 2016).

Studies from Norwegian primary schools show that students can write faster and produce more and longer texts with tablets, which increases motivation and the desire to learn. Teachers can also more easily adapt their teaching by, for example, supplementing text with sound (Berrum et al., 2016; Wollscheid et al., 2016). However, studies of tablets in early literacy teaching have raised some challenges in this regard noting that multiple modes of expression, more choices, and thus a greater degree of complexity, can result in reduced reading comprehension and memory (Dahlström & Boström, 2017; Mangen et al., 2019).

Many studies emphasise how framework conditions, such as school management and school culture have a significant impact on the implementation of technology into existing classroom practices, as well as shaping the intentions and opportunities of teachers to change practice (Andersson & Hashemi, 2016, p. 96; Berrum et al., 2016; Lynch & Redpath, 2014). A Norwegian study by Gilje et al. (2016) documents that tablets can contribute to more complex forms of collaboration and learning, but also to more efficient use of time. The authors conclude that the teacher's role as

facilitator, supervisor and class manager becomes more central when students use several learning resources (p. 44–56). Jahnke et al. (2017) call for a “digital didactic design” (p. 2) that emphasises well defined learning objectives and assessment criteria, as well as varied learning activities with multimodal elements to encourage production, process and reflection (see also Jahnke & Kumar, 2014). In line with the above problematizations of technology as a complexity-increasing factor in teaching, Keiding and Qvortrup (2014) offer a didactic framework that takes the increasing complexity of the education system into account. A didactic model that incorporates the complex system’s self-observation; a didactics of didactics.

The question of how potential technological opportunities may challenge classroom management, in the sense of handling non-subject related disruptions, and dealing with the shifting balance of authority in the student-teacher relationship, is also investigated in these studies (Blikstad-Balas, 2016; Krumsvik, 2013; Lynch & Redpath, 2014). Berrum et al. (2016) refer to several primary school teachers who emphasise good classroom management as crucial to success in technology-rich learning environments. Closely related to issues of classroom management is the issue of teachers requiring digital competence, as has been widely pointed out (Björgeren & Erstad, 2015; Blikstad-Balas, 2016; Fritze et al., 2017; Jahnke et al., 2017; Mulet et al., 2019). According to Krumsvik (2007), teachers who are digitally competent know *“how to use technology professionally and based on solid educational-didactic judgement that takes into account what it means for the students’ learning strategies and aspects of ‘Bildung’”* (p. 68²).

A review of the literature indicates that tablets can challenge existing practice and create more complex methods of learning and teaching. There is also a call for a more teacher-driven development in order for teachers to regain influence (Fritze et al., 2017; Hashemi & Cederlund, 2016; Haugsbakk, 2010, 2011). Although this is an important starting point for this article, in what follows we place more emphasis on what could be perceived as an extended concept of complexity (Qvortrup, 1998), adding new dimensions to the dominating literature in the field.

Theoretical basis

A basic premise of this article is the understanding of social development as increased complexity, and a perception of today’s society as being “hypercomplex” (Qvortrup, 1998). Qvortrup (2009) explains the development from a state of complexity to a state of hypercomplexity through a time and space dimension of complexity. Today’s society is changing faster than ever before, at the same time as globalization provides an opportunity for a far greater number of connection possibilities than we have the capacity for (p. 50). As a part of the world community, we cannot abolish complexity.

Within the framework of a hypercomplex society, the education system is one position from where the society can be viewed. Concepts such as knowledge, competence and learning are of great importance in understanding of today’s society, and for dealing with the increasing complexity. New learning contexts are formed, where the teachers’ authority is weakened, and where the knowledge is diverse and of uncertain origin. With increasing information and greater uncertainty, the tasks of technology become far more numerous than before. New technology offers more opportunities for

communication and for the production of information. Thus, new technology carries a paradox between dealing with complexity and increasing complexity (Qvortrup, 1998).

When a new technology is introduced in teaching, the shift from one arena or medium to another involves a rethinking of communication because the new situation offers alternative frameworks and opportunities. Technology has a dual nature: on the one hand it helps to solve problems and provide new opportunities, while on the other it involves a greater degree of complexity and unpredictability that must be handled by the teacher. Thus, paradoxically the teacher handles the learning-related needs and outer complexity through the use of new technology, while at the same time an additional inner complexity is required in order to handle this technology (Qvortrup, 1998). Therefore, the teacher must reflect on both the use of the technology itself as well as on how the technology may be used in teaching (Fritze & Nordkvelle, 2012).

Qvortrup (2009, p. 34) claims that the school with use of ICT can not only be considered as a place for teaching, but as a teaching resource that combines the strength of the place with the possibilities for placelessness. This is in line with Martin Heidegger addressing technology not as mere objects, but as possibilities (Introna, 2002). It also corresponds with the ancient Greek form “*techne*” based on a conception of technology as a system of practical knowledge not necessarily reflected in objects or hardware (Saettler, 1990).

We understand learning to be a result of participating in social activities in which cultural tools are used, and in relation to guidelines in the contexts within which the activities take place (Wertsch, 1998). Integrating technology into teaching not only changes the activities within which technology is used – it also contributes to transform how we think about and describe learning: “(. . .) *our expectations of what people should master, and how human skills should be cultivated*” (Säljö, 2010, p. 56).

Data collection and method

This study is based on group interviews with five teachers at two Norwegian primary schools; two interviews in 2016 and two in 2017, with the same teachers who participated the year before. All interviews were arranged in groups of two and three teachers at each school. We also planned another round of interviews with the same teachers in 2019. However, only the teachers from one of the schools were available for interviews. The selection of teachers was both strategic and practical, with the intention of meeting teachers who had significant experience of using tablets. All participating teachers, three female and two male, had between 4 – 15 years of working experience, and we therefore considered them to be suitable representatives of the teaching profession. Contact with the teachers was managed through the school principal.

Both schools may be characterised as average with regard to the number of students and teachers, the management and organisation. Having participated in the municipality's pilot project where all 5th grade students had been using tablets since 2015, both schools had experience using tablets. Qualitative data was chosen as the main source since the focus was to shed light on the essentials of the teachers' experiences and obtain their articulated experiences (Kvale et al., 2015, pp. 42–44). The analysis is supplemented with impressions from planning documents, an evaluation of the pilot drafted by the school administration, information from the website of one of the schools, and from visits in two classroom sessions at both schools.

The article focuses on revealing the subjective experiences of the use of tablets and how the experiences could vary from teacher to teacher. Key topics were included in a relatively open and semi-structured interview guide, including issues regarding the role of school management, teachers' training and involvement (Berrum et al., 2016), learning activities and resources, changed practice and competence requirements (Gilje et al., 2016; Jahnke et al., 2017; Jahnke & Kumar, 2014), and the importance of rules and guidance (Krumsvik, 2013; Lynch & Redpath, 2014). While developing the interview guide we continuously discussed the relationship between key themes and sub-themes.

All group interviews took place at the schools, ranged from 40–60 minutes in duration, and were recorded and transcribed. Based on a thematic analysis approach (Bernard & Ryan, 2010), we aimed to obtain descriptions expressing teachers' understandings related to the key themes mentioned. Main descriptions expressing patterns and variations in the material were analysed based on themes from the interview guide as well as on new themes emerging. The following main categories have come about based on our theoretical framework and the empirical material:

- Implementation of the pilot project
- Learning activities
- Classroom management

When presenting results, the descriptions regarding these themes are largely reproduced as they were expressed in order to reveal interpretations and attitudes. The statements were partially edited in order to clarify the meaning (Kvale et al., 2015, p. 212). In the interests of anonymity, and since age and gender were irrelevant, the participants are referred to as "teachers" and the schools as "school A" and "school B". The study is conducted in accordance with the ethical guidelines drawn up by the Norwegian Data Protection Services (NSD).

There are inevitably some limitations related to a study that is primarily based on analyses of five interviews. For example, the results cannot be applied to other situations where tablets are used in school. However, we suggest that others with the same theoretical starting point may discover similar content of meaning in similar interviews.

Results: teachers' reflections

Implementation of the pilot project

The pilot project was an initiative of the Chief Municipal Education Officer (CMEO, 2014–2015). Prior to commencement of the pilot project, a document describing the framework conditions for the introduction of the tablets, technical and practical considerations, plans for training and a milestone plan was distributed to the school principals (CMEO, 2014–2015). The CMEO stated that *"the students' enthusiasm and motivation for tablets will make them more productive, resulting in improved basic skills and learning outcomes"* (CMEO, 2014–2015, p. 2).

The teachers commented that both principals were so enthusiastic that the technical equipment and infrastructure were in place prior to commencement of the pilot project. However, no explicit work was undertaken to familiarise teachers with tablets or to

motivate them. At School B, the teachers were involved in the pilot project only once it had commenced.

Although they recalled that the initiative came from management, they were uncertain of the goals and why the 5th grade had been selected. According to these teachers, no effort was made to familiarise students and parents with the project. This impression is supported by the informants in the evaluation conducted by the school administration. Despite the lack of information for teachers and parents prior to the project, few signs of resistance were observed. The limited criticism from parents comprised concern about the lack of exercising handwriting skills, the need to limit the use of tablets at home, and problems with concentrating on schoolwork.

Both teacher groups interviewed in 2016 participated in the introductory course organised by the commercial actor RIKT.³ The courses focused on how specific apps could be used in individual subjects, while teachers designed and tested their own lesson plans in the classroom. The teachers agreed that training and supervision had reduced their initial scepticism and led to their discovery of new opportunities. From the interviews and the schools' website, as well as from the external evaluation, the impression is that these training courses were successful. From the interview in 2019, we know that all the teachers using tablets in the classroom had received training.

The teachers in this study considered themselves to be inexperienced regarding use of technology. Two of the teachers can be described as more experienced users, and these two served as colleague supervisors at their schools. Besides educational supervision in using tablets and apps, they were able to provide the teachers with technical support. On the recommendation of the course supervisor, teachers often collaborated on the use of tablets. They saw many benefits, but also challenges, particularly regarding technical matters.

Learning activities

According to the teachers at both schools, the tablets were most frequently used for teaching in the subjects of Norwegian and English, and less frequently used in subjects like mathematics, natural science, music and social studies. The scope of use varied according to subjects and to the teachers' prior experience with technology. Tablets were used in combination with textbooks. However, at school A tablets had replaced textbooks in English and mathematics. At both schools, teachers used tablets to create tasks to supplement the textbooks. Students submitted their assessments in Showbie,⁴ an app that had replaced previous learning platforms.

Teachers at both schools emphasised the importance of active learning. At school A, they used the expression "a more student-active teaching" that provided scope for exploration and increased content production. The teachers at school A compared the situation before and after the implementation phase, thus reporting on a shift from traditional teaching by using terms like "memorising" and "standing and talking" versus "production of learning". According to the teachers at both schools, students produced more text; work flowed more smoothly now than had previously been the case, especially with respect to the subject of Norwegian, and by using apps like "Book Creator", "Notability" and "iThoughts": "We have finally obtained a learning tool that works when it comes to creating composite texts". At both schools they stated that increased active learning seemed to foster motivation.

The teachers at both schools pointed out the importance of increased access to learning resources and methods of expression. The threshold for producing their own content was significantly lower. For example, students could make films in English using the app "Puppet Pals". They could practise English phrases while acting different roles. The teachers at school B said that students decided themselves which roles they wanted to play, the environment in which the events would take place, the challenges the character they acted might face, and how they would solve these challenges. Teachers at school A highlighted how tablets gave students the opportunity to record an explanation for the teacher about how they were thinking when solving, for example, tasks in mathematics. Tablets contributed to more varied activities, and to students working longer on each task based on different angles. Teachers believed that such opportunities contributed to in-depth learning.

Internet connection made it easier for students to explore and choose pictures and ways of expression, *"so that they can create a nice product themselves, something they are proud of"* (teacher, school B). At both schools, the teachers described how they facilitated the class so that students could show the texts they had produced to the rest of the class by connecting the tablet to the projector. The teachers viewed sharing as important for the students' sense of being seen and to experience themselves as successful:

Everyone succeeds. I keep seeing those students who previously never put their hands up to show anything (...) but sharing on the iPad is quite another matter. It looks nice and neat, and they feel as though they are succeeding (...) I really do think that a sense of being seen is a success factor (teacher, school A).

Being able to express oneself in more than one way and being recognised for this were elements teachers associated with new opportunities in the assessment work. Tablets made it easier to keep an overview of individual students and to assess how they expressed themselves, both in writing and orally. The teachers at both schools underlined how access to multiple forms of expression made it easier for students to perform self-assessments, particularly when reading aloud and recording their own reading. They also felt that tablets made it easier to differentiate and adapt tasks and feedback based on individual needs: *"I can sit on my sofa with a cup of coffee and listen to Per, Kari and Elise read their homework, and give feedback on the spot by recording it"* (teacher, school A).

All participating teachers agreed that the use of tablets resulted in a more efficient use of time, something they experienced as more motivating for students. The following statements were typical: *"Everything moves faster"* and *"we get more done."* Teachers at both schools agreed that more time was required for lesson preparation than previously. According to a teacher at school A: *"I have far more focus before the lesson, I am more focussed on establishing the criteria. And gradually the children get involved in setting the criteria"*. The teachers described the importance of planning and preparing clear learning objectives, activities and criteria prior to the lessons. They also agreed that thorough preparation freed up time for individual guidance and feedback, enabling them to use more time on supervision in the classroom while students worked on tablets: *"I notice that I am more thorough in my feedback perhaps because it is so much easier to type compared to when you have to write by hand"* (teacher, school B). In the interview from 2019, teachers at school A pointed out that being more thorough also required better prioritisation, for

example, in terms of length and focus of comments, and the number of students getting feedback each time.

Along with new opportunities, new challenges arose in terms of clarity when using the tablets. The teachers concurred on the need for structure and clear rules for use.

Classroom management

One of the appendices to the document distributed from the (CMEQ 2014–2015) to the schools concerned the rules for use of tablets. These rules comprised precise instructions for use and stated that tablets could only be used for schoolwork, and not during breaks. Furthermore, the document stated that using the internet without the teacher's consent was not permitted. Social media such as Facebook, Instagram, Twitter, Blip, Myspace, blogs and so on were not to be used during school hours (CMEQ, 2014–2015, p. 2).

Taking these rules as the basis, the school principals, teachers and students at the pilot schools had a clear framework for tablet use. The teachers appeared to have incorporated these rules into their work, claiming that classroom management was perceived as important in connection with introducing technology in the classroom: *“Classroom management is more important than ever. It is very clear who decides when the iPad should be used and for what purpose.”* (CMEQ, 2014–2015, p. 2).

The teachers said that students followed the lesson plan and the apps chosen by the teacher. During breaks the tablets were put away. The organisation of the classroom, with students seated so that they faced outwards from the centre of the room towards the walls, allowed students' screens to be monitored at all times. There were consequences for students who failed to observe the rules:

The first thing we teach them is the message “apple up”, meaning we want their full attention and they should turn their iPads outwards . . . , if they don't comply, we confiscate them, and it is really annoying to be given a book and pencil instead (teacher, school A).

The teachers said that with this type of management, they seldom found students engaging in learning activities unrelated to schoolwork. The teachers' digital “control app” also enabled them to monitor students' tablet usage, even allowing them to lock undesirable apps when misuse was detected. During the interview conducted in 2019, the teachers admitted that it was not always easy to control students' use of private apps. Therefore, only apps introduced by the teachers were allowed.

Discussion: opportunities, challenges and dilemmas

The article's material reveals several opportunities, as well as challenges and dilemmas, for the use of tablets in teaching. Although these challenges may not be entirely clear, they are connected to key research findings in the field (Dahlström & Boström, 2017; Haugsbakk, 2010; Krumsvik, 2013; Mangen et al., 2019).

An underlying premise for this article is the dual nature of technology as outlined above (Qvortrup, 1998). It might be perceived as contributing to progress and improvement, but also brings new challenges and new complexity in its wake. As is evident in our material, classrooms with students who possess PCs and tablets entail new expectations and opportunities, as well as other forms of complexity and unpredictability which are far more evident

now. Today's society, including the school, will have complexity as a basic premise in as much as there are no simple formulas to deal with (Haugsbakk, 2010). This new complexity creates challenges both for schools and the teachers. It is therefore important to develop strategies to deal with it. The dilemmas discussed in this article will appear in different ways.

Implementation – great expectations, the importance of teacher training and involvement

Berrum et al. (2016) highlight how important it is that the school management notifies teachers and parents well before implementation of new technology and ensuring that the technical equipment and infrastructure are in place. The introduction of new technology in schools has received much attention, in the form of adulation and the promise of big visions. Some of this might be changing. Recently these approaches are more restrained. Today they are characterised by greater sobriety, likely due to teachers and didactic perspectives becoming more prevalent. However, some exaggerated reactions also followed the launch of the tablet project at the two schools in this study. The CMEQ (2014 - 2015) expressed expectations of increased learning outcomes, and the distribution of the tablets was like a party event with media presence.

Whether the CMEQ's arguments in his information letter to the schools show a somewhat oversimplified understanding with technology itself as the means to solve learning-related problems is a matter for debate. Such an understanding of technology excludes the teacher and the teacher's importance in the didactic facilitation of teaching and learning, and it appears one-sided and instrumental. As we have seen, it is not the distinctiveness of tablets as a technology in itself that can make learning more engaging, motivating and experience-related. What is important is primarily the teacher's way of facilitating, the framework conditions, school management, and how the students interpret the digital practices (Jahnke & Kumar, 2014; Krumsvik, 2016).

A key part of the implementation process concerns *training* in the use of tablets. Courses, testing and cooperation have helped teachers increase their competence in the use of tablets for educational purposes. Literature on the introduction of ICT in school emphasises the importance of training, support from management and cooperation between colleagues (Berrum et al., 2016). This article confirms the importance of training and collegial collaboration. The teachers who were involved in the project's beginning phase reported that satisfactory training is important for successful teaching in the classroom, and it appears that all teachers using tablets in teaching had received good follow-up.

The implementation phase is particularly important as the technology brings new complexity to the classroom. To handle this, training in the use of tablets, apps, etc. can be seen as a first step. Oversimplified statements of technology might have the opposite effect. In general, the accumulation of technological and didactic knowledge on the use of tablets creates an inner complexity which enables teachers to deal with new challenges.

Learning activities – increased activity and efficiency and addressing the duality of technology

The examples presented illustrate how the introduction and use of new technology contribute to changing practices, concepts and terms that were used to express how

learning was understood and what was important for mastering new and more complex teaching situations (Säljö, 2010, p. 56). The material contains rich descriptions of how tablets had provided new opportunities, such as adapted supervision and increased *active learning*, especially in the form of greater content production (Gilje et al., 2016, p. 162). The term “active learning” occurred frequently at both schools, expressing expectations mediated by tablets and by the school principals. The teachers agreed on the point that the implementation of tablets meant a shift away from traditional teaching, which in turn promoted student motivation and learning. The teachers at both schools were interested in ensuring that the students were able to share what they had created, so that they could experience a sense of increased mastery and feel included in the classroom as a learning community (Soto & Ambrose, 2016). It also emerged that increased access to resources, such as more apps and the internet, opened the way for students to choose how to work with and present the tasks. Much in the material suggests that the teachers’ didactic and educational facilitation for content production and sharing had a clear focus on student activity and on ensuring their sense of being successful. The descriptions of the choices the teachers made regarding working methods with tablets reflected their digital competences. Our results are supported by corresponding studies (Gilje et al., 2016; Jahnke et al., 2017). At both the schools teachers appeared to be aware of how tablets should be integrated into their own educational practice and into the school culture.

Noteworthy is that teachers at school A used the term “production of learning”. They compared what they called “active learning” with “drilling” and traditional methods where students repeat information the teacher had imparted. At this school, they had replaced textbooks with tablets in English and mathematics. In line with Säljö’s (2010) reasoning, these examples illustrate how implementation of new tools contribute to changing educational practice, as well as the concepts used to express interpretations of learning and technology (p. 56). The examples also show how focusing on subjective interpretations can help us to see how teachers make sense of educational use of tablets, in light of how they consider teaching and learning in school (Rasmussen & Lund, 2015; Selwyn, 2011).

The material indicates that while tablets provide access to a wider range of expressions and learning resources, which may contribute to greater student activity, as well as a variety of methods, teachers must find the suitable balance between existing and new forms of methods and learning resources. The interviews show that the teachers’ role as a facilitator and supervisor assumes greater importance (Gilje et al., 2016, p. 72; Jahnke et al., 2017). The teachers reported that they used to supplement digital resources with material they had produced and adapted themselves, thus becoming what Rasmussen and Lund (2015) describe as “designers” of lesson plans (pp. 16–17).

The teachers in our study agreed that they found that tablets facilitated cooperation and the sharing of knowledge. The main impression gained from talking with students, as well as from classroom observations, was that to a large extent they continue to work individually and send their texts and voice recordings to the teacher.⁵ In our interviews with teachers, the topic of critical evaluation of sources was not mentioned as a topic. It is somewhat surprising that this topic as well as student cooperation received minimal attention in our conversations with the teachers, since this is emphasised in the current curricula as well as in research on digital competence in school (Krumsvik, 2013; Rasmussen & Lund, 2015). This may indicate a traditional approach focusing on individual

students' work with the textbook as the main resource, at the expense of more cooperation-oriented teaching and critical work with sources.

In the same way as tablets appear to create experiences of differences internally at the individual school, studies show that several school leaders are concerned that the development may give rise to increased differences between schools based on funding (Berrum et al., 2016, p. 4). This is obviously problematic. However, no mention was made of this in this article's studies, which mainly focuses on challenges and dilemmas in general. Nevertheless, it is possible to claim that the dual nature of technology is apparent.

The material in this study contain several examples that tablets enabled the teachers to differentiate their teaching. The use of tablets can make teaching processes more accessible and visible to co-students and teachers (Kongsgården & Krumsvik, 2016). For teachers, however, it can be demanding to deal with the increased visibility in a satisfactory manner. Increasingly more technological solutions, software, apps and genres combined with regular, unforeseen technical challenges and largely individualised learning processes in themselves contribute to increasing the complexity. An interesting example is the teacher who equated simplification with students now being able to read aloud for the teacher, who could then listen to each student afterwards. This means that every student had a chance to read, and it provided increased flexibility for the teacher (Soto & Ambrose, 2016). As an overall solution, this could make excessive demands on resources. And when one of the teachers emphasised that the student's use of tablets freed up the teacher's time for supervision, it was also necessary for the teacher to prepare more extensively in advance, which was more time-consuming. To a greater extent students must have comprehensive plans prepared in advance. Thus, the "simplification" can ultimately make the situation more challenging and complex for the teacher, and it's important that the new complexity gets more attention.

The idea of "speed" might also be related to a dilemma. Teachers emphasised that through use of the new technology they could obtain a quicker overview of students so that they could continuously differentiate their teaching (Berrum et al., 2016). Advantages and new opportunities can clearly be documented related to the students' learning activities. The question is whether the argument of speed is equally relevant in all contexts and applicable to all types of learning. Some learning processes are inherently tedious, demanding and time-consuming, and this certainly adds to the complexity in the classroom.

Moreover, speed is to some extent linked to the individualisation of learning activities. The fact that each student gets their personal tablet may in itself be considered from the perspective of increased individualisation. More schoolwork is being performed individually with the help of apps and internet access. In spite of showing their work to other students, they mostly sent their texts directly to the teacher. Could this have led to less focus on collaboration-oriented teaching? This teaching method could also be affected by the same kind of criticism raised against the "gamification" of teaching. This poses the risk that more emphasis would be placed on activity and vitality and that learning should be "fun", rather than on the cognitive and more challenging aspects of learning activities (Buck, 2017). In this way, increased activity risks being mistaken for increased learning. Moreover, the discussion on school and computer games illustrates well the increased complexity inherent in the use of new technology in teaching contexts making teaching more challenging. Teaching and

games are fundamentally different in purpose and are built on different types of logic. For some students, games in specific situations could motivate learning, where for others games may be distracting. While it is necessary to use the new opportunities provided by technology, firm class management is required and this will take time (Buck, 2017).

The research presented in this article shows that teachers experience new opportunities regarding methods and learning activities associated with using tablets. Keywords such as “simplification” and “efficiency” are central, but so also is the idea of being able to work in new ways that stimulate more student activity. However, it is crucial to be able to actively relate to the duality of technology, to be aware of the fact that a consequence of technological development is increased complexity in the classroom. Furthermore, it is important to consider whether the experience that “things move faster” implies that the more instrumental parts of the learning processes are prioritised.

Classroom management or management of rules – facing complexity

Classroom management is seen as especially important in the implementation and use of digital technology in the classroom (Blikstad-Balas, 2016; Krumsvik, 2013; Norwegian Ministry of Education, 2008 and 2011). Our study shows that teachers at the two schools enforced the rules on the use of tablets set out by school management, and the result was that they experienced fewer challenges with non-subject related disruptions. However, the guidelines issued by school management and the teachers at one of the schools appeared to give precedence to the rules, while other aspects of classroom management were neglected. Blikstad-Balas (2016) emphasises the importance of not reducing classroom management to enforcing discipline and ensuring calm and order. She underscores instead that teachers should also look at other aspects such as creating a positive learning environment, collaboration, and motivating students to make an effort. An instructive example in our material is the way that students at one of the two schools were seated in the classroom. All students were seated so that they faced outwards from the centre of the room towards the walls so that the teacher could monitor their screens more easily. However, this sort of seating arrangement eliminated any possibility of eye contact and therefore did not enhance collaboration between the students. On the other hand, individual work could be stimulated.

The enforcement of rules was a preferred way of meeting the new situation in the classroom. Although this was not mentioned by the teachers, we might see this as their way of handling or facing the new complexity. At the same time other aspects of classroom management might have been toned down (Blikstad-Balas, 2016). One consequence is that the new complexity in the classroom is not addressed in full scale.

Concluding comments

Being aware of some of the limitations of the study as mentioned above, we are still of the opinion that the subjective reflections surrounding the use of tablets as presented in this article, may add substantially to our knowledge of the complexity and changes regarding teachers’ teaching practice. We find support for these findings in other studies of tablets in schools (Hashemi & Cederlund, 2016; Jahnke et al., 2017), as well as in studies of ICT in

school in general (Rasmussen & Lund, 2015; Selwyn, 2011). It has been the intention to contribute to the wider discussion surrounding technology in school and the complex interplay between technology, teachers' didactic planning and contextual frameworks.

The article contributes, on a theoretical level, to an increased understanding of a type of complexity that schools have to deal with – a complexity that is prevalent in today's society. We believe that it is important to recognise and relate to this complexity which is inherent in the technological solutions. In the existing research literature, limited attention has been paid to what is perceived as an expanded understanding of complexity that also includes the unpredictable and problematic. Further, this understanding is seldom addressed by our interviewees. Rather, it is seen as an aspect of the way teachers present new methods and learning activities and as underpinning their emphasis on the need for clear classroom leadership. We have not observed the same tendency at school management level. However, this could itself lead to an unnecessary increase in complexity.

Based on the findings of this article and the research on the use of tablets in school, it is possible to conclude that it is inadequate to just search for implementation strategies or for teachers' pedagogical competence and classroom management. It is necessary to address the questions of the interplay between technology use and intentions, didactic matters and organisational frameworks (Hashemi & Cederlund, 2016, p. 27; Säljö, 2010). In this regard, an increased understanding of the new complexity in today's society is a challenge requiring our urgent attention. Teaching with new technology thus becomes part of a complexity paradox, where complex situations are handled by adding new complexity.

Notes

1. We use the term tablet to avoid any references to commercial products or providers. Exceptions are where interviewees referred to iPads. Any examples presented, and the discussion part, might be relevant to any commercial product or provider.
2. The authors' translation.
3. The acronym RIKT refers to "Romerike ICT" and to the concept of learning (<https://rikt.net/>).
4. <http://www.showbie.com>
5. Results from an unpublished manuscript based on interviews with students at the same schools. The findings will be published in due course.

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No potential conflict of interest was reported by the authors.

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References

- Andersson, P., & Hashemi, S. P. (2016). Screen-based literacy practices in Swedish primary schools. *Nordic Journal of Digital Literacy*, 11(2), 83–100. <https://doi.org/10.18261/1891-943x-2016-02-01>
- Bernard, H. R., & Ryan, G. W. (2010). *Analyzing qualitative data: systematic approaches*. Sage.
- Berrum, E., Halmrast, H. H., Helle, M., & Lønvik, K. (2016). Erfaringsoppsummering blant skoler som opplever at de har lykket med innføring og bruk av nettbrett og/eller pc i sin grunnleggende lese- og skriveopplæring. In *[Evaluation of successful use of tablets in early literacy education]*. Oslo: Rambøll, 1–36. http://www.statped.no/globalassets/laringsressurs/dokumenter/rapporter/ramboll_rapport_iktsenteret.pdf
- Bjørgen, A. M., & Erstad, O. (2015). The connected child: Tracing digital literacy from school to leisure. *Pedagogies: An International Journal*, 10(2), 113–127. <https://doi.org/10.1080/1554480X.2014.977290>
- Bjørndal, B., & Lieberg, S. (1978). Nye veier i didaktikken? En innføring i didaktiske emner og begreper *<italic>[New ways in didactics]</italic>*. Aschehoug.
- Blikstad-Balas, M. (2016). Faglig og ikke-faglig bruk av teknologi i klasserommet. In R. Krumsvik, Ed. *Digital læring i skole og lærerutdanning 2 ed.*, [Academic and non-academic use of technology in classrooms], pp. 136–150. Universitetsforlaget.
- Buck, M. F. (2017). Gamification of learning and teaching in schools. A critical stance. *Seminar.net*, 13(1), 36–54. <https://journals.hioa.no/index.php/seminar/article/view/2325>
- Buhl, M. (2008). New teacher functions in cyberspace - on technology, mass media and education. *Seminar.net*, 4(1). <https://journals.hioa.no/index.php/seminar/article/view/2492>
- Clarke, B., & Svanaes, S. (2014). *An updated literature review of the use of tablets in education tablets for schools: family, kids and youth*.
- CMEØ (2014-2015). *iPad som pedagogisk verktøy i X-skolen*. pilot project 2014-15. X kommune. [iPad as educational tools - evaluation pilot project].
- Dahlström, H., & Boström, L. (2017). Pros and cons: handwriting versus digital writing. *Nordic Journal of Digital Literacy*, Oslo: Universitetsforlaget, 12(4), 143–161. <https://doi.org/10.18261/1891-943X-2017-04-04>
- Dewey, J. (1910). *How we think*. D. C. Heath.
- Fritze, Y., Haugsbakk, G., & Nordkvelle, Y. T. (2017). Digitale forstyrrelser i skolen - erfaringer med begrensninger av elevers mobilbruk. [digital disruptions in schools]. *Norsk Pedagogisk Tidsskrift*, 101(3), 201–212. <https://doi.org/10.18261/1504-2987-2017-03-02>
- Fritze, Y., & Nordkvelle, Y. (2012). Online dating and education. *Seminar.net*, 8(2), 105 – 119. <https://journals.hioa.no/index.php/seminar/article/view/2396>
- Gilje, Ø., Ingulfsen, L., Dolonen, J. A., & Skarpaas, K. G. (2016). *Med ARK&APP. Bruk av læremidler og ressurser for læring på tvers av arbeidsformer [with ARK&APP. Using teaching and learning resources across instructional contexts]*. Report. University of Oslo.

- Hashemi, S. S., & Cederlund, K. (2016). Making room for the transformation of literacy instruction in the digital classroom. *Journal of Early Childhood Literacy*, 0(0), 1–33. <https://doi.org/10.1177/1468798416630779>
- Haugsbakk, G. (2010). Digital skole på sviktende grunn – Om nye muligheter og dilemmaer. [Digital schools - dilemmas and possibilities]. Gyldendal Akademisk.
- Haugsbakk, G. (2011). How political ambitions replace teacher involvement. some critical perspectives on the introduction of ICT in Norwegian schools. *Nordic Journal of Digital Literacy*, 6(4), 239–256. <https://www.idunn.no/dk/2011/04/art03>
- Introna, L. D. (2002). The question concerning information technology: thinking with heidegger on the essence of information technology. In J. D. Haynes (Ed.), *Internet management issues: a global perspective* (pp. 220–235). Idea Group Publishing.
- Jahnke, I., Bergström, P., Mårell-Olsson, E., Häll, L., & Kumar, S. (2017). Digital didactical designs as research framework: iPad integration in Nordic schools. *Computers & Education*, 113(2017), 1–15. <http://dx.doi.org/10.1016/j.compedu.2017.05.006>
- Jahnke, I., & Kumar, S. (2014). Digital didactical designs: teachers' integration of iPads for learning-centered processes. *Journal of Digital Learning in Teacher Education*, 30(3), 81–88. <https://doi.org/10.108/21532974.2014.891876>
- Keiding, T. B., & Qvortrup, A. (2014). *Systemteori og didaktik [systems theory and didactics]*. hans Reitzels Forlag.
- Kongsgården, P., & Krumsvik, R. J. (2016). Use of tablets in primary and secondary school – A case study. *Nordic Journal of Digital Literacy, Oslo: Universitetsforlaget*, 11(4), 248–273. <https://doi.org/10.18261/1891-943x-2016-04-03>
- Krumsvik, R. J. (2007). Digitale utfordringer i skulen og lærerutdanninga [digital challenges in schools and in teacher education]. In R. J. Krumsvik (Ed.), *Skulen og den digitale læringsrevolusjonen* (pp. 18–63). Universitetsforlaget.
- Krumsvik, R. J. (2013). Klasseleing i teknologitette klasserom i ungdomsskulen og den videregående skulen. [Class management in technology rich environments]. In Krumsvik R. J. & Säljö R. (Eds.). *Praktisk-pedagogisk utdanning: en antologi* (pp. 553–590). Fagbokforlaget.
- Kvale, S., Brinkmann, S., Anderssen, T. M. & Rygge, J. (2015). *Det kvalitative forskningsintervju [The qualitative research interview]*. 3rd ed., 2nd issue. Gyldendal akademisk.
- Lynch, J., & Redpath, T. (2014). 'Smart' technologies in early years literacy education: A meta-narrative of paradigmatic tensions in iPad use in an Australian preparatory classroom. *Journal of Early Childhood Literacy*, 14(2), 147–174. <https://doi.org/10.1177/1468798412453150>
- Mangen, A., Olivier, G., & Velay, J.-L. (2019). Comparing comprehension of a long text read in print book and on kindle: where in the text and when in the story? *Frontiers in Psychology*, 10(38), 1–11. <https://doi.org/10.3389/fpsyg.2019.00038>
- Mulet, J., Van De Leemput, C., & Amadiou, F. A critical literature review of perceptions of tablets for learning in primary and secondary schools. (2019). *Educational Psychology Review*, 31(3), 631–662. 2019. <https://doi.org/10.1007/s10648-019-09478-0>
- Norwegian Ministry of Education. (2008). *Report to the Storting (white paper) 31. (2007-2008), Kvalitet i skolen*. Statens forvaltningstjeneste.
- Norwegian Ministry of Education. (2011). *Report to the Storting (white paper) 22. (2010-2011), Motivasjon – Mestring - Muligheter. Ungdomstrinnet*. Statens forvaltningstjeneste.
- Qvortrup, L. (1998). *Det hyperkomplekse samfund. 14 fortællinger om informationsamfundet. [The hypercomplex society - 14 stories about the information society]*. Gyldendal.
- Qvortrup, L. (2009). *Det lærende samfund. Hyperkompleksitet og viten. [the learning community. hypercomplexity and knowledge]*. Gyldendal.
- Rasmussen, I., & Lund, A. Læringsressurser og lærerrollen – Et partnerskap i endring? [Learning resources and the role of the teacher - a changing partnership?]. (2015). *Acta Didactica Norge*, 9 (1), 18. art. <https://doi.org/10.5617/adno.2352>
- Saettler, P. (1990). *The evolution of American educational technology*. Libraries Unlimited.
- Säljö, R. (2010). Digital tools and challenges to institutional traditions of learning: technologies, social memory and the performative nature of learning. *Journal of Computer Assisted Learning*, 26 (1), 53–64. <https://doi.org/10.1111/j.1365-2729.2009.00341.x>

- Selwyn, N. (2011). Digitally distanced learning: A study of international distance learners' (non) use of technology. *Distance Education*, 32(1), 85–99. <https://doi.org/10.1080/01587919.2011.565500>
- Soto, M. M., & Ambrose, R. (2016). Making students' mathematical explanations accessible to teachers through the use of digital recorders and iPads. *Learning, Media and Technology*, 41(2), 213–232. <https://doi.org/10.1080/17439884.2014.931867>
- Wertsch, J. V. (1998). *Mind as action*. Oxford University Press.
- Wollscheid, S., Sjaastad, J., & Tømte, C. (2016). The impact of digital devices vs. Pen(cil) and paper on primary school students' writing skills. A research review. *Computers & Education*, 95, 19–35. <http://dx.doi.org/10.1016/j.compedu.2015.12.001>