ICT AND DIGITAL DIVIDES

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Abstract

The purpose of this paper is to gain knowledge about what constitutes digital divides and digital inequality and how these relate to social background, marks and digital competence in upper secondary school, as well as what implications this may have for learning management in a digital learning environment. The study is based on data from 17,529 upper secondary school pupils and has a mixed method design. Findings from this study show that there is a clear connection between social background and the marks students earn. Furthermore, the study shows that there is a clear connection between social background and students' digital competence. The findings from the study will have implications for teachers' class management and digital competence in a digital learning environment in upper secondary school.

Keywords: Digital divides, digital inequality, digital competence, class management; ICT

Introduction

During recent years, digital competence has held a central position in a number of policy documents. In schools, it has become the fifth basic competence (L06). At the same time, upper secondary schools in Norway have a world-class technology park (1:1); pupils have their own mobile telephones, and they have high screen time – 36.9 per cent have over eight hours screen time per day (Krumsvik, Egelandsdal, Sarastuen, Jones, & Eikeland, 2013). All this makes for students who are well versed in the technology, and internationally these students are normally known as the Net Generation (Tapscott, 1998), Millennials (Howe & Strauss, 2000) and Digital Natives (Prensky, 2001a; 2001b). Thus, the stage is set to accommodate ample computer use in today's schools, and the earlier differentiation in terms of access to technology appears therefore to be much less today than previously – both nationally and internationally (OECD, 2015). Nevertheless, are there other types of digital divides or digital inequality between students and groups of students in the current digitalized school day? Moreover, how does the teacher's class management and digital competence relate to this topic? These are the questions that this paper seeks to answer.

The SMIL (Sammenhengen Mellom IKT og Læringsutbytte[1] study is one of the largest ICT-studies ever performed in Norwegian upper secondary schools and has encompassed 17,529 pupils and 2,524 teachers in seven counties in eastern Norway (Krumsvik et al., 2013). The Norwegian Association of Local and Regional Authorities (KS), the University of Bergen (UiB) and the Eastern Norwegian County Network (ØS) have initiated the study, and the research group Digital Learning Communities at UiB has been responsible for the research part. One backdrop for this paper is a wish to ascertain from the SMIL study whether there is a connection between parents' educational level and the pupils' mark average in lower secondary school, and how this relates more specifically to pupil's digital competence in the school. Do we find a digital "Matthew effect" here (Merton, 1973)? Or not? We know from the USA, for example, that Information and Communication Technology (ICT) implementation in school resulted in "…the creation of a technological underclass in American public schools" (Cuban & Tyack, 1998, p. 125) that followed traditional socioeconomic differentiation. Moreover, already 15 years ago, the Organisation for Economic Co-operation and Development (OECD) in its study, *Understanding the Digital Divide* (2001), warned of the risk of "falling through the Net" as particularly damaging to already vulnerable social strata and groups of students. Castells (2001) also claimed that if measures were not taken, ICT and the use of Internet would reinforce the already existent social differentiation linked with social class, education and ethnicity. In Norway, Frønes (2001) found tendencies toward digital divides between minority and majority pupils, and Nævdal's (2004) study showed tendencies toward digital differentiation between boys and girls in school in the ways they used their PCs and how this impacted their academic performance. Torgersen (2004) also found gaps between minority and majority pupils' access to and usage of PCs and found that this also had a certain relevance in terms of academic achievement. In the most recent study by The Programme for International Student Assessment (PISA), another phenomenon – digital inequality – is cited as a factor that increasingly more researchers are becoming aware of (OECD, 2015). Nevertheless, little is known about what constitutes digital inequality in Norway – and particularly about how this is reflected in the upper secondary schools.

Steffensen, Ekren, Zachrisen, and Kirkebøen (2017, p. 44, our translation) divide school results in the following manner; *pupils' background* (socioeconomic characteristics and past achievements), *contributions of schooling* (teachers, teaching materials, and classroom environment) and *coincidences* (variations in pupils' (actual) presumptions; pupils who have a bad day at a test/exam; noisy builders on the day of the test/exam, and random drills of a topic that the pupils will be tested on in a test/exam) that are necessary to examine.

In this paper, the pupils' background and contributions of schooling are of most relevance. Steffensen et al. (2017, p. 10, our translation) affirm that the contributions of schooling "can be interpreted as the grade point average or average result that we can expect that a school would have had if pupils at the school were average with regards to the characteristics of the pupils that are included in the calculations". We can observe that teachers, teaching materials and classroom environment are central factors in the contribution of schooling. These three factors are central in the teacher's classroom-management, and Marzano, Marzano and Pickering (2003) and Hattie (2009) point out in their findings that classroom-management has a positive effect on pupils' learning (d=0.52). In addition, Koedel, Parson Pdgursy and Ehlert (2015) show that teachers are not a homogenous group, and they find great variations between the contributions of individual teachers on pupils' learning (and where classroom-management makes out the actual core in this landscape). Furthermore, Chetty, Friedman and Rockoff (2014) have investigated the effect of teachers changing schools, and the study confirms the importance of teachers' contributions on pupils' learning. It is evident that the contributions of schooling are significant for pupils' success in school. In their report, Steffensen et al. (2017) note:

> The schools and the municipalities with the highest contributions manage to raise all the groups of pupils: they improve both pupils with and without parents with higher education, pupils with and without an immigrant background, and pupils with and without previous lower achievements. (p. 96, our translation)

Implicitly with these findings there are also great variations between the schools, and Steffensen et al. (2017) further argue that "[…] it seems that attending one of the schools that contributes the most over attending one of the other schools that contributes the least, is equivalent to one years' worth of learning progression for the pupils at the school" (p. 96). A comprehensive study from the United States shows the same tendencies: "[…] the most effective teachers generate learning in their students at four times the rate of the least effective teachers" (Wiliam, 2011, pp. 534-535). In the next part, we will take a closer look at social background and the contributions of schooling in a more digital learning context.

The fact that young people use ICT very frequently in their digital lifestyle is a well-known fact, but there is a need for research on academically oriented use of ICT (Litt, 2013). Different digital skills have also been associated with digital differentiation (Buckingham, 2006; van Dijk, 2008). The study of Büchi, Just, and Latzer (2015) revealed that research in the area demonstrates digital divides both within and between countries. In their own study, they found that digital divides in five different countries have changed from lack of access to technology (first-order) to different usage (second or third-level digital divide). Based on this backdrop, the main objective of this study is to gain knowledge about what constitutes digital divides and digital inequality, and how this relates to social background, marks and pupils' digital competence in upper secondary school. Moreover, what implications does this entail for teachers' digital competence and their class management in a digital learning environment.

The research questions are:

- Is there a connection between pupils' social background, marks and digital competence in upper secondary school and how do the school leaders and teachers perceive this relationship?
- Is there a connection between pupils' digital competence and digital patterns of usage, and how do the school leader and teachers perceive this relationship?

- What pedagogical implications for teachers' class management and digital competence in the digital environment does this study offer?

Digital Divides and Digital Inequality

Digital divides can be described as an expression intended to capture the manner in which digitization of society and the education system can create unintended side effects for various pupils and groups of pupils. This is often termed the digital gap, digital inequality, digital illiteracy, etc. Hargittai (2003, p. 2) defines the *digital divide* as "the gap between those who have access to digital technologies and those who do not; or the gap between those who use digital technologies and those who do not understood in binary terms distinguishing the 'haves' from the 'have-nots.'" Previously, access to technology was important in the overall picture, but it is the international consensus today that access alone is no longer a reliable indicator that permits assessment of digital divides or digital inequality (Dolan, 2016). This is due to the fact that access to computers has been significantly improved both inside and outside the schools in a global sense, along with the strong growth and spread of mobile telephony during the past five years (OECD, 2015). Hargittai (2003) has also seen that this development has changed a number of underlying premises for digital divides and has therefore revised his definition to take this development into account and to coin a more precise expression – digital inequality, "that emphasizes a spectrum of inequality across segments of the population depending on differences along several dimensions of technology access and use" (p. 2).

Krumsvik (2008) discussed some of these implications in his article. He posits several prospective digital divides and digital inequalities, all of which require more research-based knowledge. We need more knowledge about relevant phenomena, and about how digital divides and digital inequality manifest themselves in terms of how pupils master learning objectives, the courses, tests and exams in a digitized academic setting. For example, Wolfe, Bolton, Feltovich and Niday (1996), Russell (1999, 2002), and Horkay, Bennett, Allen, Kaplan and Yan (2006) detected clear performance-related differentiations between taking exams using pen and paper versus taking them on a computer, and they found that the digital divide and the pupils' digital competence played a clear role in achievement. Manger, Vold and Eikeland (2009) found in their study that the national test in English for 5th grade-level pupils measured primarily the pupils' digital competence and to a lesser degree their knowledge of English. Perhaps the most sensational finding was the results of the most recent PISA test (OECD, 2015) in mathematics, which revealed that when Shanghai pupils took the same PISA test on a computer, the results fell by 50 PISA test points (which corresponds to approximately one year of schooling) in contrast to when they took a paper-based version of the test (Jerrim, 2016). Pupils from the USA, however, scored 17 PISA test points better on a computer than on paper; Norway scored 8 PISA points higher on the digital version, and in Sweden (12 PTP) and Russia (7 PTP) boys did considerably better than girls in mathematics, despite no gender-related differences between these groups on the paper-based test. It is also interesting to note that there were fewer socioeconomic differences across countries on the computer-based PISA test than there were on the paper-based test.

From these studies, one can discern the outlines of a feature in which digital differentiation, digital inequality and digital competence appear to come into play, but at the same time, we must be wary of singling out a sole factor as an explanation in this complex area. Nevertheless, we must not exclude the fact that pupils' digital competence and digital inequality come into play when the pupils take quizzes, tests and examinations on their computers rather than using pen and paper. Dolan (2016) mentions that "just as the term 'digital natives' has become a defining feature of the Millennial generation, we are beginning to determine through research that these same tech-savvy students may lack specific online skills when evaluating text or performing other academic tasks" (p. 31). Therefore, it is important to acquire more empirical knowledge about what Dolan (2016) addresses: "Instead of a divide defined simply by the difference between the "haves" and the "have-nots", we might now define it as a divide between the "cans" and the "cannots"" (p. 31).

Does the SMIL study (Krumsvik et al., 2013) reveal that schools still reproduce various social inequalities with respect to social background and academic marks, and does this have an impact in terms of the field of digital competence in the schools? New international digital currents such as these need to be investigated more closely here at home – empirically, of course, but also theoretically. Because, as Dolan (2016) expresses it:

> The research reflects the actual use of technology is heavily influenced by the socioeconomic status of both the individual and the school they attend. This achievement gap has often been referred to as an "opportunity gap," defined as a difference in either economic or academic resources available to students. The integration and use of technology in schools are following this same pattern. (p. 32)

DeBell and Chapman (2006) find the same tendencies as Dolan (2016) found in his study. Goodwin (2011), Schnellert and Keengwe (2012), Downes and Bishop (2015), Thomas (2007, 2008), Wenglinsky (2005), and Wiburg (2003) find in their studies that teachers' (and schools') ability to integrate and use technology in a teaching situation directly or indirectly also reflects the very conception of why digital divides occur. With this as a backdrop, more in-depth knowledge is needed about whether the situation is the same in Norway and about what constitutes digital divides/digital inequality and how these relate to pupils' social background, marks and digital competence.

Theoretical Perspective

It is very solidly documented that students' social background is highly influential on their performance in school and for their acquisition of cultural capital (Aschaffenburg & Maas, 1997). In Norway, it has been shown that pupils' social background strongly influences academic performance in general (Bakken, 2014). What, then, about ICT and digital learning methods in this perspective? In a newly published review of literature pertaining to ICT use and digital differentiation, one international finding is that:

"Socioeconomic status appears to be one factor that is common across all findings, from the availability of technology to students to the ways in which students use the available technology in and outside of schools" (Dolan, 2016, p. 27). It is difficult to explain why this occurs based on any single theory, but some "theoretical lenses" seem to be of special relevance in this context. Boudon's (1974) theory of values emphasizes that school and education have different values in the working class and in the middle class. Goldthorpe (2000) takes a similar approach and underlines that educated parents know more about the educational system and value it much more highly than do less educated parents. Hernes (1974) emphasizes that parents from higher social strata are far more active in stimulating the same basic skills that school emphasizes already before young people start school. Furthermore, Bernstein (1975) is also concerned with language development as a premise in this new environment and finds that lingual socialization occurs differently in different social strata. Lareau (2000) maintains that the working-class parents delegate learning to the schools, are less familiar with the curriculum and the content of courses and in general take a more distanced stance to the school than those of middle-class parents. Bourdieu (1977) claims that this issue is linked with cultural capital and that the middle class's children will normally be socialized into developing for themselves a cultural capital that schoolteachers value.

These "theoretical lenses" mentioned above make a backdrop for being able to understand mechanisms and different "explanatory models" for how social background influences pupil performance in school. One might ask, nevertheless, whether these will have sufficient "explanatory power" in a digitized education system? Bakken (2014) says that the pupils' opportunity to use his/her digital skills is one of several factors that influence the pupils' learning environment in school, but we still lack empirical evidence in terms of how this contributes more directly to pupils' achievement. One might also ask whether or not digital divides and digital inequality have both similarities and dissimilarities in terms of the more established theoretical approaches to understanding this complex field. In accordance with the more "digitally theoretical" approaches to the field, the international view is the widespread notion that research on the digital gap and digital inequality has to confront particularly theoretical challenges. Thus, Leu et al. (2015) ask: "How can adequate theory be developed when the object that we seek to study is itself ephemeral, continuously being redefined by a changing context?" (p. 2). The extremely rapid technological development thereby presents special challenges when the research subject is in many ways a "moving target" in an era when today's digital technology quickly becomes "yesterday's technology" and thus creates obstacles to defining the field in consistent terms. At the same time, it is clear that by introducing the aforementioned "theoretical lenses," we bring Attewell's (2001) distinction of the first and second digital gap closer to reality. Attewell (2001) suggests that whereas one could speak of a digital divide as a more or less unambiguous term linked with access to technology, the term alone is no longer sufficient to describe reality. Attewell (2001) maintains that *access* to technology is an indicator that can no longer be evaluated in isolation – it must be seen in relation to patterns of usage, and we thereby move on to the second digital divide. Hargittai (2003) has a similar distinction in which the digital divide represents technological access; whereas digital inequality represents the way technology is used, for example in academic contexts. Both Attewell (2001) and Hargittai (2003) point out that when it comes to the second digital divide and digital inequality, several tendencies point towards this being linked with social background. However, since the area can still be characterized as a "moving target," there remains a paucity of grand-scale studies that can document this type of connection. Castells' (2001) perspective on the emergence of the network society and its side effects in relation to vulnerable groups also points in the direction of social background being the deciding factor in how individuals master technology both in education and in working life. North, Snyder and Bulfin (2008) build on Bourdieu's (1977) terms *habitus* and *taste* and argue that digital preferences among young people are influenced by distinctive features such as class, which is something more than merely socio-economic status. To gain a deeper understanding of what this pattern of usage is, a digital competence model by Krumsvik (2014) was used in the SMIL study. It was specially developed with the Norwegian school context in mind, as well as teacher training, and it is thus particularly suited to use with the data that the study encompasses.

In summary, one might conclude that the "theoretical lenses" mentioned above are an underpinning for the research questions in this study. Below, we will examine more closely the methodology in the study.

Method

Since this is a study that applies mixed method research, the research issues and research questions below were developed based on Tashakkori and Creswell's (2007) guidelines for mixed methods-issues, and process and variance theory questions are given equal weight (Van de Ven, 2007). Survey data among 17, 529 pupils in seven counties have been collected to answer the quantitative part of the research questions and thirty (30) individual semi-structured interviews and 10 observations (2 hours each) in the subjects Mathematics, English and Norwegian over an 8 week period comprise the main sources for answering the qualitative research question in the study. Choosing this type of design implies a linking of the different qualitative and quantitative element in both the design and in the analyses, so that they will supplement one another and provide a more holistic idea of the research area.

We have chosen to relate this design to an "explorative, sequentially mixed-methods design" (Creswell & Clark, 2011; Fetters, Curry, & Creswell, 2013). The *sequential design* means that the different phases build on each other and "in an exploratory sequential design, the researcher first collects and analyzes qualitative data, and these findings inform subsequent quantitative data collection" (Fetters et al., 2013, p. 2137). This implies a form of integration through *building* (Fetters et al., 2013), which in this study means that the results from the qualitative interviews generated items for inclusion in the survey. Further, we carried out an integrating through *narrative* where both qualitative and quantitative results are reported in the same article in different sections through *contiguous* (Fetters et al., 2013). The coherence between the quantitative and qualitative findings is mainly based on *confirmation* and partly on *expansion* in this article (Fetters et al., 2013).

To create theoretical and empirical robustness for the research questions, the theoretical supports are linked with digital competence (Krumsvik, 2014), digital divides (Attewell, 2001), digital inequality (Castells, 2001; Hargittai, 2003) and education and social background (Bourdieu, 1977; Hernes, 1974).

Results

In this section, we will present the quantitative and the qualitative results.

Quantitative Results

Table 1

Mark Distribution from Lower Secondary School in Relation to Mother's Highest Completed Education. Per Cent.

	Mother's Education				
Mark Average	Primary school	Upper secondary – vocational	Upper secondary - general	Univ. – short	Univ. – long
2 to 3	13.9	8.1	6.6	2.9	2.8
3 to 4	41.4	35.5	33.9	20.7	17.3
4 to 5	35.6	43.9	44.6	51.8	48.8
5 to 6	9.2	12.4	14.8	24.5	31.0
(N)=100 %	(2,162)	(3,552)	(2,861)	(5,134)	(3,615)

Note: χ^2=1 529.0, p<.000; gamma correlation=0.33.

Table 1 shows how upper secondary schools pupils' former marks from lower secondary school correlate with mother's highest completed education level. Fewer than one out of ten pupils (9.2 per cent) have obtained the highest marks when mother highest completed education is primary level. However, almost one out of three pupils have top-level marks from primary school when mother has a high university degree. At the other end of the scale, only 2.8 per cent of the pupils having mothers with high university degree got the lowest marks, while 13.9 per cent with mothers having only the lowest level of education got the lowest marks. The gamma coefficient indicates that the overall rank correlation between mother's education background and pupils' success in school, when it comes to marks, is moderate. (Using mother's or father's education level in this matter produced equal results; hence, this is not shown separately here.) The next question is, however, if we will see the same distribution pattern when the parents' highest completed education levels are different. Table 2 shows this.

Table 2

Distribution of Marks from Lower Secondary School According to Their Parents' Highest Completed Education, Where Education/Degree Levels Are Different. Per Cent.

	Father's or Mother's Highest Completed Education, Different Levels			
Mark Average	Upper secondary - vocational	Upper secondary – general	Univ. – short	Univ. – long
2 to 3	12.3	8.1	4.4	3.5
3 to 4	42.6	37.3	26.1	21.2
4 to 5	35.9	42.7	51.2	49.4
5 to 6	9.2	12.0	18.2	25.9
(N)=100 %	(959)	(1,810)	(3,037)	(3,597)

Note: χ^2=559.0, p<.000; gamma correlation=0.29.

The gamma coefficient now indicates a slightly lower correlation when the parents' education levels are different. However, the pattern we saw from Table 1 is more or less the same. One out of four pupils (25.9 per cent) with one parent having a high degree from university obtained the highest mark level from lower secondary school, while this goes for only 9.2 per of those with a parent having vocational school as highest. To analyse this further, we need to see what happens to pupils' mark distribution when both parents have the same level of highest completed education. Table 3 gives us the answer.

Table 3

Distribution of Marks from Lower Secondary School According to Their Parents' Highest Completed Education, Where Both Have the Same Education/Degree Level. Per Cent.

	Father's and Mother's Highest Completed Education, Equal Levels				
Mark Average	Primary school	Upper secondary – vocational	Upper secondary - general	Univ. – short	Univ. – long
2 to 3	17.8	8.7	8.2	1.9	1.9
3 to 4	45.1	38.1	36.3	19.3	12.6
4 to 5	31.7	42.1	43.4	52.2	49.2
5 to 6	5.3	11.1	12.0	26.6	36.3
(N)=100 %	(1,031)	(1,996)	(864)	(1,903)	(2,107)

Note: χ^2=1 383.30, p<.000; gamma correlation=0.46.

The rank correlation coefficient gamma is here 0.46, which indicates a strong moderate association between parent's education level and the children's lower secondary marks. Very few pupils at all get the lowest mark when both parents have a university degree, whatever level, only 1.9 per cent. More than one out of six pupils (17.8 per cent) got the lowest mark when both parents have only primary school as the highest completed level. Moreover, more than one out of three (36.3 per cent) of those with both parents having a higher university degree got top-level grades in lower secondary school; 5.3 per cent of those with both father and mother on the lowest level of completed education are to be found here.

We then ask if parents' level of education also have effect on the children's level of digital competence. In Table 4, we take into consideration the same background combinations as shown in Tables 1 to 3, in addition to mother's highest completed education level.

Digital competence is measured on a scale from 1, showing the lowest level of competence, to 7, the highest level measured. On average the pupils' digital competence was 5.5 on this scale (see Total in Table 4). The F-values indicate that the observed group differences are significant. However, they are small, and the eta coefficients show only a small effect.

Table 4

Digital Competence According to Various Combinations of Mother's and Fathers' Highest Completed Education Level. Means and Standard Deviations (St.D.).

Highest Completed	Mother's Highest		Mother's or Father's Highest, Different Levels		Mother's and Father's Highest, Equal Levels	
	Mean	St.d.	Mean	St.d.	Mean	St.d.
Primary school	5.3	0.96	-	-	5.2	1.02
Upper secondary - vocational	5.4	0.86	5.3	0.90	5.4	0.86
Upper secondary - general	5.5	0.85	5.4	0.84	5.4	0.86
Univ. – short	5.5	0.80	5.5	0.83	5.5	0.79
Univ. – long	5.6	0.83	5.6	0.82	5.7	0.82
Total	5.5	0.85	5.5	0.84	5.5	0.87
F value/p	59.5/.000		25.3/.000		56.0/.000	
Eta	0.12		0.09		0.17	

Moreover, we see equal pattern as observed from Tables 1 to 3 above. When the parents' highest completed education level is primary school, the children's digital competence score is at the lowest, increasing slightly when the parents' education level also do so, and when both parents have a high university degree, their children have the highest measured digital competence (5.7) among these pupils.

Qualitative Results (in Light of Quantitative Results)

In this section we will handle the qualitative results in light of the quantitative results. We found that indicators of secondary digital divides, i.e., "can" and "cannots," were evident in the focus group interview with the project group (consisting of 7 members from the counties involved in the project). Here, it became clear that the way that the pupils used ICT varied significantly according to their academic background, and that this usage of ICT could both inhibit and promote learning. While on one hand, the so-called weak pupils were easily distracted by ICT; the strong pupils used their digital devices as a way to take breaks in between tasks:

> (…) it depends on the pupils' prerequisites, motivation (…) I think that the clever, structured pupils would intentionally use digital medias as a headrest, while for the unmotivated pupils it [digital medias] would be a magnet to inhibiting learning. (P1)
>
> (…) the weakest pupils are the ones that are most distracted and the clever pupils manage to use ICT in a constructive way (…). (P6)

The leader of the National Pupils Organization mentions in the interview that:

> (…) I think that pupils that have parents with high education has been part of the digital professional expertise because the parents have seen that is important, while students from, may well say, less academic homes have not had parents that emphasized it. And then there is the competence of students has been acting about anything other than professional, so it's a social cohesion issues in here too. (EO)

What other factors seem to influence these patterns on a more concrete level? We find a correlation between parental education and how much screen time pupils use, where pupils whose parents have lower educational level have the most screen time. Screen time spent is clearly declining with increasing mark average. The variation (standard deviation) between students also diminishes. In several interviews the informants mention that they think pupils' screen time is too high and for some (weak) pupils unhealthy (they stay up late at night playing and are tired at school). The parents have the main responsibility for such issues, but one school owner mentions in an interview that schools are giving the pupils one laptop each and learning supportive infrastructure (digital teaching aids, learning platform, etc.), but they do "nothing to follow up what is happening in the home, where the pupils have a PC as their disposal 24 hours a day"(SEF5).

Several other informants state that a way to combat digital divides can be to improve the collaboration and dialogue between the school and the home. For instance, several informants mentioned that they provide tailored support to for pupils' use of ICT at home to those pupils and areas that struggle with poor Internet access and infrastructure at home. However, the school owner and school politicians mention that this arrangement is about the pupils having access to a laptop that they can take home with them and organization of learning aids (digital learning resources, learning platforms and so on). The informants that do mention that they provide tailored support for pupils' use of ICT at home, note that they arrange for access to computers at home and the use of teaching aids. Other arrangements that were mentioned in the interviews were:

- Homework can be handed in through the school's learning management system. (SLF12, LF11 & LF61)

- Lessons and links are made available on the learning management system so that pupils who are absent from school can work from home or prepare themselves for the next lessons. (SLF31, LF51, LF41)
- The teacher creates learning activities that instigate the use of ICT at home (LF32 & LF61). An example of this kind of learning activity is that pupils “are assigned tasks where they have to use sources on the Internet to answer the question” that they are to submit digitally. (LF61)
- One teacher mentions that she has tried out new ways of assigning and for pupils to submit task such as through flipped classroom learning.

On the other hand, the interviewed school owner and the school politician note pupils that struggle with poor Internet access have the possibility to work at the school. The school politician, however, expresses understanding that this is not without its challenges for the affected pupils:

> It is clear that it becomes difficult, and then the pupils must sometimes be at the school to work (…) and then ICT will be less used compare to if they could sit at home and use the computer, and get to know the tool. (FPF7)

However, in general the access to ICT is very good for the pupils, but the 8 weeks of observations in classrooms (in three subjects) shows clearly that the user patterns differ between different groups of pupils. Some pupils are more into “off-task” ICT use in classroom situations and are on Facebook, SMS, digital newspapers, watching YouTube-videos, etc. From the observations in classrooms it seems like these pupils lack motivation and are easily disturbed by digital distractions. From the quantitative survey we find that “off task”-use of ICT at school goes down the better the mark average is from secondary school. We also find that digital competence of pupils also helps to reduce “off task” ICT-use at all stages. Much screen time spent on PCs, mobile, etc. contributes also to “off –task” ICT-use when the other variables are controlled for. From the interviews with the school owners and school leaders we find the following statement regarding “off-task” ICT activities in classrooms:

> (…) it's great professional activity I would say on the one hand, but it is also too much activity in ICT in areas they should not be, such as Facebook. (SLF12).
>
> (…) It is much “off-task” activities and it is one of the frustrates teachers that students work with other things than they should. (SEF5 P195)
>
> We know it is a challenge because teachers report that they think it's too much “off-task” activity. (SEF3A P155)
>
> I think that the good, structured students will be able to use digital media as a calculated conscious breather, while for unmotivated students so I think it will be a magnet into the learning retardant. (P1)
>
> (...) The weakest students are those who are most distracted and the talented students they are able to use ICT in a constructive way (...). (P6, 483)

Some school owners and school leaders say that class management is a key word to avoid “off-task” activities:

> It is the sort of a question about the teacher's lack of leadership then. It's supposed to in my view not occur. (SEF3B)

In addition, nine teacher informants were asked about pupils “off-task” ICT use and the question: “To what extent do you believe there is a connection between low ability class leadership in teaching and high level of ‘off-task’ ICT use in classrooms among pupils?” All nine informants answered that they believe it "largely" is such a relationship. Two of the explain it further in the interviews:

> Yes, I believe it is a strong correlation. If the teacher don’t really cares what the pupils do, so the pupils do what they want. (LF32).
>
> Yes, I think that classroom management is very important for students not to use it for “off-task” activities. (LF21).

The representative from the National pupil organization states that:

> (…) what it really is all about, that you need teachers who set clear boundaries for when and to what ICT is used. (…)(EO)

From other parts of the SMIL-report we found that teachers’ digital competence is the most influential factor for good class management skills (Krumsvik et al., 2013; Krumsvik, Jones, & Eikeland, 2016). Teachers as role models also affect the pupils’ digital expertise at all stages and pupils who agree that the teachers have to be good role models, emphasizes ICT use as part of well-being at school to a higher degree than those who do not perceive that teachers are such role models.

But what other factors can directly and indirectly give us a broader understanding of digital divides and digital inequalities in the Smile-schools? The clearest effect on pupil’ digital competence has average mark of school and the more pupils feel dependent on PCs and mobiles, the lower digital competence they have. Much screen time spent on PCs, mobile, etc., contributes to “off-task” ICT use when other variables are controlled for and there is a systematic relationship between being dependent on mobile and PC-usage and “off-task” ICT use. We also find a tendency of pupils’ themselves recognizing “pitfalls” of digital distractions, because the lower parental education is, the higher the desire for teachers to take more control of computer use in the classroom and the lower the pupils’ digital competence is, the more teacher management pupils wants.

Implications

The first research question of this paper was: Is there a connection between pupils’ social background, marks and digital competence in upper secondary school and how do the school leaders and teachers perceive this relationship? The paper shows a clear and systematic connection between the parents' educational level and the pupil's average marks in lower secondary school. Barely one in ten pupils with parents whose highest educational level is lower than secondary school have an average mark of over five, while for the highest two educational levels it is one in four and almost one in three. At the other end of the scale, only just over two per cent of pupils with parents who had a university education have the lowest average mark from lower secondary school. There are also clear gender differences in average marks. Every fourth girl has an average mark between five and six, but only every sixth boy (15.6 per cent). There is a clear coherence between the quantitative –and the qualitative part in the study where the qualitative findings *confirm* the quantitative findings in the study. This social reproduction of social inequality is especially in line theoretically with Hernes (1974).

There is also a clear and systematic connection between the parents' educational level and the pupils' digital competence. Pupils of parents with long university education score 5.7 and pupils with parents with only primary school score 5.2. This difference is high and indicates digital inequality based on social background. There is also here a clear coherence between the quantitative –and the qualitative part in the study where the qualitative findings *confirm* the quantitative findings. This divide is in line with Dolan's (2016) terms the "cans" and the "cannots."

The paper's second research question was: "Is there a connection between pupils' digital competence and digital patterns of usage, and how do the school leaders and teachers perceive this relationship?"

We find that there is a connection between the digital patterns of usage attached to their digital competence and to their academic background in the quantitative part of the study. The qualitative data showed that the way ICT was used by the pupils varied significantly, and this usage of ICT showed that it could both inhibit and promote learning. The school leaders and teachers stated that while on one hand, the so-called weak pupils (with lower marks and low parents' education) were easily distracted by "off-task" ICT use, the strong pupils (with high grades and high parents' education) avoided this more and used their digital devices far more professionally. The quantitative – and the qualitative – findings in this part of the study can be described as *expansion* where the quantitative data show the strength of associations and the qualitative findings show the nature of those associations (Fetters et al., 2013). Also here we see a tendency of digital inequality between pupils' groups, which is in line with Attewell (2001) and Hargittai (2003) descriptions of such divides.

The final research question of the paper was: "What pedagogical implications for teachers' class management and digital competence in the digital environment does this study offer?"

The implication of the study is the awareness of the fact that the school seems to reproduce social inequality in the digital era and this is also attached to pupils' digital competence. The terms *net generation*, *millennials* and *digital natives* that often are used to describe todays' digital self-confident generation as homogenous, must be reconsidered in light of a more heterogeneous underpinning. In light of these clear findings, contributions of schooling

(Steffensen et al., 2017) become especially important. Here we find that teachers' digital competence and class management seems to be very important to decrease digital inequality (Krumsvik, Ludvigsen, & Urke, 2015; Krumsvik et al., 2016) and must be considered as the "ground pillars" of the contributions of schooling in the digital era. The pedagogical implications of this is that to avoid digital inequality to expand it will be very important to increase teachers' class management and digital competence in the years to come. This is line with Bolick and Bartel (2015) who underline that digital learning environments add new layers of complexity to matters of classroom management.

Note

1. When translated from Norwegian to English, the title means "the relationship between ICT and learning outcomes."

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