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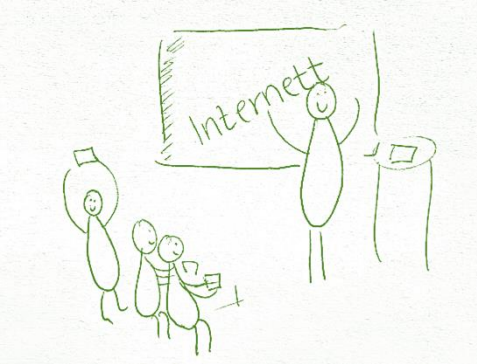
Perspectives on digital technology in education from the pupils' point of view

Pupils' perception of their teachers' digital competence, and the possibilities and challenges they perceive using digital technology while learning.



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Abstract

Introduction: The use of digital tools and software in schools has increased dramatically since the turn of the century. Norway has one of the world's highest numbers of digital devices per pupil in schools, and Norwegian classrooms are increasingly dependent on digital technology. However, we could not find much research on the topic of the pupils' perspectives on the use of ICTs in learning. This thesis aims to raise the pupil's voice and shed light on their experiences with the use of digital tools in their learning, and their views on their teachers' digital competence.

Theory and frameworks for analysis: The TPACK framework was chosen as a framework to code and analyse the pupils' statements about their teachers' digital competence. Theory on digital classroom management, the potential for disruptions from technology in the classroom and pupils' motivation and boredom is also used.

Method: The data used in this thesis was collected by the Norwegian DigiGen research group, as a part of a larger study on the impact of digital technology on the lives of children and young people. Data was collected through semi-structured interviews with children in the year of their transition from seventh to eighth grade, or primary to lower secondary school. The interviews were video recorded, and these recordings were used to create written transcripts which were then coded using NVivo.

Main findings: The pupils generally find that their teachers are good enough at using technology in the classroom, and they appreciate teachers who use digital tools efficiently. They are aware of differences in skill levels between their teachers – both when it comes to technological competence and digital classroom management. The pupils mention some challenges with using digital tools in learning, such as the potential for disruption, the risk of being exposed to false information on the Internet and issues with infrastructure, such as the internet connection being slow or unstable. However, they mainly express positive attitudes towards digital tools in learning, and state that digital technology makes learning easier by simplifying writing and editing, providing easy access to information on the Internet and organising tasks and teacher-pupil communication. They find learning with digital technology more motivating, and interestingly, they remark that the use of technology in class can free up time for the teachers to help pupils more.

Preface and acknowledgments

Education had been easy.

Learning things had been harder.

- Terry Pratchett, in Hogfather, a Discworld Novel

Som nyutdanna adjunktar møtte vi ein digital kvardag fire år med lærarstudium ikkje hadde budd oss på. Vi opplevde at det var stor skilnad på kunnskapen om digital læring og dei digitale ferdigheitene vi hadde tileigna oss gjennom studiet og dei krava som vart stilt til oss i skulen. Dei siste fem åra har t.d. Bergen kommune gått frå klassesett med laptopar på tunge traller til 1:1-dekning med Chromebooks.

Trass i at vi blei utdanna under Kunnskapsløftet, der digitale ferdigheiter var trekt fram som ein grunnleggande ferdigheit, opplevde vi ikkje at vi lærte så mykje om bruken av digitale verktøy i fag, eller kva digital kompetanse hjå læraren eigentleg innebar. Dette høyrde vi først om då vi byrja på masterstudiet i Digital læringsdesign på OsloMet. Dette gjorde oss nyfikne på korleis det eigentleg var stilt med lærarane sin digitale kompetanse i skulen. Var det fleire lærarar som var i same båt? Samstundes var vi interessert i elevane sine erfaringar med digitale verktøy og perspektiv på nettopp denne lærarkompetansen vi i eigen praksis opplevde som avgrensa.

Det er mange som har bidrege til at denne masteroppgåva kunne bli til – sannsynlegvis fleire enn dei vi hugsar på å takke. Vi vil først og fremst rette ein stor takk til Halla Bjørk Holmarsdottir og DigiGen-gruppa for støtte og hjelp, og tilgang til eit utruleg kult datasett med mykje interessant data. Tusen takk til elevane som stilte opp i ikkje berre eitt - men to intervju.

Hege vil gjerne sende ein hjarteleg takk til Halvor og Brage, som har vore tolmodige når mor har vore oppteken med skriving. Takk til mamma, pappa, broderen, svigers og alle

andre som har bidrege som barnevaktar og husmorvikarar i ein hektisk kvardag, og til Leos lekeland for å halde ungane i hevd og underhaldt. Ein særskild takk til min kjære Lars, som i tillegg til å trå til ekstra på heimefronten i sin eigen doktorgradsinnspurt har bidrege med innspel på den akademiske skrivinga, og lånt meg ut på helgebesøk til Haugesund og Stavanger. Takk til Opeth og In Flames som har hjelpt meg å halde fokus og stenge huslydar ute. Til sist vil eg berre beklage til den stadig veksande hybelkaninkolonien under senga. No skal de dessverre utryddast!

Eirin vil seie tusen takk til alle nære og kjære for å ha heia, støtta og trygga undervegs. Spesielt ein stor takk til dugnadsgjengen: Magnar, mamma, Kjell, Gunvor, Ellisiv og Marlinn for deira fantastiske innsats i klargjering av hus til sals midt i masterspurten. Eg vil også takke både PT Christine og Linda for å beordre meg på trening når eg helst skulle grodd fast i potetsekkposisjon framfor datamaskinen. Takk til alle på det herlege arbeidsrommet til 2. og 3. trinn for å ha bidratt til både latter og gode råd i eit hektisk semester.

Vi vil begge takke hamsteren Peder for emosjonell støtte og katten Pusipusi Sokkefangaren Skarpklo Au for å oppmuntre oss til å vere ekstra nøye med korrekturlesing etter fleirfaldige turar over tastaturet. Vi vil takke vener, familie og arbeidsstadar for all støtte, hjelp og tilrettelegging. Attpåtil takkar vi kvarandre for eit strevsamt, men triveleg år! Vi har kost oss med matlaging, filmpauser, sofaprat og innflyttingsfest under «jobbehelgene» våre. Vi har utfylt kvarandre på ein heilt eksemplarisk måte, der vi har bytta på å bære kvarandre gjennom forskjellige virusinfeksjonar og andre tumultar, og vi har hatt eit produktivt og harmonisk samarbeid.

Til slutt vil vi rette den aller største takken til Kristina og Rolf for framifrå rettleiing, oppmuntrande ord og konstruktiv kritikk. De har vore gode på å trygge oss og sende oss på rett veg på denne reisa, og det er vi veldig glade for!

Hege og Eirin

Table of Contents

1 Introduction

In this thesis, two aspects of the pupils' perceptions of the use of digital technology in teaching and learning will be examined. This chapter will attempt to describe the background for our thesis, and the goals of DigiGen, the research project of which we are a part. Terms used in the thesis will be clarified, then a literature review will be presented to demonstrate the relevance of the aim of our thesis. Finally, the aim and structure of the thesis will be presented.

1.1 Background

Norway is among the highest ranking countries in the world when it comes to number of digital devices per pupil in school, and ICT integration in education (OECD, 2015). The use of digital tools and software in schools has increased dramatically since the turn of the century and has surged since the COVID-19 pandemic began in 2020, which lead to widespread distance learning, and the implementation of a new curriculum in Norway in the autumn of 2020 (Fagfornyelsen). The new curriculum elicited increasing use of digital textbooks and learning materials, as previously used paper textbooks and learning materials became outdated in the context of new competence aims.

As this development is happening so rapidly, research on the topic of use frequency of information communication technologies (ICTs) and the quantity and types of digital devices and learning materials used has a short expiration date. Thus, fresh research in the field tends to be in short supply. Even more scarce is research on the pupils' views on the use of digital technology in schools. As researchers, politicians and other stakeholders attempt to set the course for a new age of digital learning, it is crucial that the voice of the pupils is heard. Their experiences and views on the use of digital tools in schools should be fundamental when developing legislation, policies and budget priorities for education.

In this thesis, we will attempt to shed light on two aspects of the pupils' perceptions of the use of digital tools in learning: How they perceive their teachers' digital competence

and which possibilities and challenges they perceive using digital technology while learning.

The thesis is connected to the DigiGen project, specifically Work Package 5 on ICT in education. The DigiGen project will be described in more detail below.

1.1.1 DigiGen

DigiGen is a research project funded by EU Horizon 2020 and operated through OsloMet. Its main focus is developing knowledge on how technological transformations are affecting children and young people in their everyday lives. Research institutions from eight different European countries are investigating how digitalisation and technology affect the digital generation, meaning the generation of children and young people who have not experienced a world without the Internet, smartphones or social media. The impact of technology is investigated in four areas of the digital generation's everyday lives: the family, in education, in leisure time and civic participation. The project focuses on taking a qualitative approach to this research domain and involves children and youths as co-researchers.

As this research involves children, DigiGen focuses on including the children's voices and taking them seriously, which is accomplished by focusing on willing and informed participation, as well as involving the participating children and youths as co-researchers. Furthermore, the child's perspective is the main focus of the project, albeit this is supplemented by relevant adults (such as parents and teachers) and other stakeholders' perspectives.

The Norwegian DigiGen research group collected the data used in this thesis for their work with digital technology in education. Research groups in five countries are participating in this particular part of the project: Germany, Romania, Estonia, Greece and Norway.

1.1 Clarifying terms

Some terms used in this thesis may have different interpretations depending on context; therefore, we wish to clarify some potentially ambiguous terms used.

Digital technology is used to indicate technical devices that can treat data (Selwyn, 2017, pp. 14-15). The interview guides used during data collection makes the interviewer specify what the term *digital technology* entails, listing digital devices such as phones or smartphones, portable and stationary computers, tablets and digital boards. When the term *digital technology* is used in this thesis, it generally refers to the devices listed here.

Technology-rich classrooms refers to classrooms where the pupils either have 1:1 access to digital devices, or digital devices are available when necessary (Blikstad-Balas & Klette, 2020, p. 57).

Teachers' digital competence can be understood in many ways, but in this thesis, it is understood as the skills and knowledge that teachers need to plan and execute lessons by integrating digital technology, as well as teach their pupils how to use digital technology themselves.

1.2 Literature review

As we began the literature review, we discovered that finding pupils' views in existing research turned out to be a challenge. The aim was mainly to find studies involving the pupils' perspectives or views on the use of digital tools in learning. Using the search engines EBSCO, Oria and Google Scholar, literature from the master's programme in digital learning design, as well as the snowballing method, led us towards desired perspectives to fulfil the literature review. In EBSCO, four databases were used: Academic Search ultimate; Education Source; ERIC; and Teacher Reference Centre. The challenge of finding the pupils' perspectives on the topic led to inclusion of both teachers' and school leaders' perspectives and experiences to some extent to cover the topic effectively. The articles and research used have been peer-reviewed.

The structure of the literature review is as follows: First, the pupils' voice in school research will be presented, followed by a sub-section on the teachers' digital competence, then the review will conclude with a presentation of the literature on possibilities and challenges with technology in learning and the use of digital tools in learning.

1.2.1 The pupils' voice in school research

The pupils' voice is understood as inviting the pupils to participate and share their views on their school (Arnot et al., 2004, as cited in Flutter, 2007, p. 344). The pupils' voice can be viewed as part of the wider term *pupil participation*, involving pupils actively participating in decisions regarding their schools (Flutter, 2007, as cited in Flutter, 2007, p. 344). The concept of *the pupils' voice* is not limited to listening to the pupils' opinions, but also entails investigating and studying their responses to understand them from their point of view (Hopkins, 2008, p. 394). Understanding these viewpoints can lead to new insights into the factors affecting the pupils' learning and development (Flutter, 2007, p. 352).

To improve the pupils' learning experiences in school, it is instrumental to know what their values and perceptions of school are (Nordahl, 2010, p. 14). An example of this is that many pupils have stated that the most important part of school is having friends (Nordahl, 2010, p. 33). Based on the mandate of schools, and society's expectations of the school as an institution, this is not very rational. However, when regarding what the pupils themselves view as important, the importance of friendships can be viewed as both rational and purposeful.

According to Cook-Sather (2002, p. 3), including pupils' perspectives in conversations about education can improve current teaching practice. Pupils' views on their own learning and thinking influence their learning (Nordahl, 2010, p. 26). The pupils have knowledge about themselves and their position – knowledge that is essential to leading an informed conversation about policy and practice changes in education (Cook-Sather, 2002, p. 12). When assessing the pupils' perceptions, it is their background, actions and values that should be the foundation, not how their views correspond with the teachers'

and the schools' perceptions (Nordahl, 2010, p. 33). Pupils should have platforms through which they may contribute with their opinions and views, which should be considered carefully when developing school policies (Cook-Sather, 2002, p. 4).

One such platform where the pupils' voice could be heard is in school research, but we have found few studies on school practice that have implemented the pupils' perspectives in their research on ICTs in school. Some articles also have commented on the shortage of studies examining the pupils' perspectives on teaching practice in schools, such as Harfitt (2017, p. 14), or Fransson et al. (2018, p. 2156), who comment specifically on the lack of pupil opinions in existing research on learning with ICTs. Considering that pupils are the main consumers of teaching, their perspectives should matter when attempting to better understand their learning environment and implement changes in practice (Harfitt, 2017, p. 14). Something to keep in mind when investigating pupils' opinions and ideas is that it is frequently the most adapted, well-spoken and highly accomplished pupils that are heard (MacBeath et al., 2003, as cited in Flutter, 2007, p. 349).

1.2.2 Teachers' digital competence

When reviewing literature on teachers' digital competence, research on the pupils' views on this matter was difficult to find, making us wish to fill this gap in literature. It was decided that for the purpose of placing the pupils' voice on the map, it was first necessary to draw the map. Therefore, this sub-section will present various groups' views on teachers' digital competence to draw a wider map of current research on this topic. First, some views from school leaders are examined briefly before teachers' views are presented. Finally, research on pupils' views on teachers' digital competence is introduced.

School leaders' views

In the following paragraphs, school leaders' perspectives on teachers' digital competence will be presented, starting with demonstrating school leaders' belief in digital learning technology. Next, implementation of ICTs in school culture will be discussed. Finally, some issues will be presented.

Scully et al. (2021, p. 175) surveyed Irish secondary school leaders concerning their perspectives on digital competencies and tool circumstances before and during the COVID-19 pandemic and found that secondary school leaders were confident technology users and believed digital technology can be used to enhance teaching and learning. Blau and Shamir-Inbal (2017, p. 770) reported similar results from their quantitative study that investigated school leaders' views on ICT integration in Israeli elementary schools. They found that higher ICT use frequency in classrooms indicated stronger beliefs among teachers that ICTs were supporting their pedagogy (Blau & Shamir-Inbal, 2017, p. 778). Considering that teachers felt more digitally competent, use frequency of digital content and use of digital design in their own teaching materials increased. Furthermore, increased frequency of digital communication between teaching staff, or between teachers and parents, increased the perception of ICTs as an integrated part of school culture. However, the findings also indicated that it takes time for these digital interactions to become integrated parts of the school culture (Blau & Shamir-Inbal, 2017, p. 779).

Some potential issues were identified: The researchers found that teachers rarely designed their own digital teaching and learning materials (Blau & Shamir-Inbal, 2017, p. 783). This may be the result of teachers not viewing themselves as sufficiently competent to design their own digital content, or it may indicate that teachers do not perceive the need to develop their own materials, as they have access to ample digital learning resources (Blau & Shamir-Inbal, 2017, p. 783). School leaders pointed to time as a limiting factor for teachers to plan for technology integration (Scully et al., 2021, p. 176). The findings also indicated that the teachers did not use technology for problem solving or knowledge creation, and instead used traditional teacher-centred teaching methods (Scully et al., 2021, p. 177).

Teachers' views

Teachers' digital self-efficacy is an important determinant for integration of ICTs into teaching practice (Siddiq & Scherer, 2016, p. 2). In the following part, the correlation

between teachers' digital self-efficacy and various aspects of their ICT skills will be examined before going into more detail as to which factors predict teachers' ICT competence and attitudes towards ICTs in learning. Finally, indications of what might inhibit development of the teachers' ICT skills despite access to relevant digital tools are presented.

Teachers' digital self-efficacy

Greater confidence in using ICTs influences the teachers' evaluation of information and their teaching practice (Hatlevik, 2017, p. 565). Siddiq and Scherer (2016) found clear correlations between the teachers' digital self-efficacy and Teacher Emphasis on Developing students' Digital Information and Communication Skills (TEDDICS), and that digital self-efficacy was increasingly important for TEDDICS as the age of the teachers increased (Siddiq & Scherer, 2016, p. 17). Hatlevik (2017, p. 564) reported, through his analysis of a quantitative study, that a significant correlation exists between teachers' self-reported self-efficacy in basic ICT skills and their self-efficacy using ICT in online collaborations with students.

Unsurprisingly, teachers' experiencing proficiency when instructing pupils in digital skills seemed to strengthen their self-efficacy (Siddiq & Scherer, 2016, p. 16). Significant differences between male and female teachers also were found, namely that female teachers may feel less confident when it comes to their individual ICT competencies in education. However, the data indicated that this gender difference is narrowing (Siddiq & Scherer, 2016, pp. 16-17). Blikstad-Balas and Klette (2020, p. 64) found cases in which teachers asked the pupils for help with technical challenges, as well as cases in which teachers used technology better than their pupils.

Predictive factors on teachers' competence and attitudes

Krumsvik et al. (2016, p. 219) found that demographic, personal and professional characteristics such as age, work, life experience, gender, screen time and ICT education – could predict teachers' ICT competence levels. In particular, characteristics linked to

formal ICT education and self-reported screen time were indicative of higher ICT competence.

In a quantitative survey amongst 100 Serbian primary school teachers, Maksimovic and Dimic (2016, p. 67) found that neither gender, years of service nor education level influenced teachers' attitudes towards ICT competencies in the classroom. The teachers deemed ICT competence as important for facilitating teaching and indicated that a lack of ICT competence would complicate teaching (Maksimovic & Dimic, 2016, p. 69).

Factors limiting teachers' use of ICTs in teaching

Bacher (2019, p. 28) found that despite availability, digital whiteboards were used infrequently. The data also indicated that the teachers in the study had not received training in the use of digital whiteboards, which might explain the infrequent use. An emphasis on updated digital learning technologies that target teacher training and technical support is likely to facilitate implementation of digital learning technology (Bacher, 2019, pp. 28, 31).

In a study in which 26 primary school teachers in Malta were interviewed, Spiteri and Chang Rundgren (2017, p. 524) found that although teachers in the study were equipped with digital whiteboards and personal laptops, they lacked incentives to create new content and knowledge, and rather relied on previous practices. Spiteri and Chang Rundgren (2017, pp. 530-531) point to the issue of lack of time and space for developing digital knowledge and creativity, or reflecting on teaching practices, and advocated for using the technological pedagogical content knowledge (TPACK) model to help teachers develop digital content and competence. This finding is similar to that of Scully et al. (2021), as mentioned above.

In their study of lower secondary school teachers, Blikstad-Balas and Klette (2020, pp. 64-65) found that the teachers' use of ICTs in the classroom was limited both in terms of quantity and variety. If it was used, the teachers usually did not have a goal for what the pupils should learn, or their expectations of their pupils were narrow and technical, and

not focused on developing more general ICT skills. The teachers mainly used ICT tools to present content to the pupils, and the pupils mainly used ICT tools to produce digital texts.

Pupils' views

In this part of the literature review, pupils' views on their teachers' digital competence will be presented. The only in-depth study we could find on teachers' digital competence from the pupils' perspective was Fransson et al. (2018), whose findings will be presented in detail in the paragraphs below.

Lindberg et al. (2017, pp. 127, 129), which is the same group of researchers as Fransson et al. (2018), found that upper secondary school pupils were able to differentiate between their teachers' level of ICT competence. These perceived differences were presented in more detail in Fransson et al. (2018), in which upper secondary school pupils' views on their teachers' teaching skills using ICTs were examined. It was found that the pupils viewed their teachers' ICT skills as good, but that some teachers did not have adequate technological skills. Teachers who were efficient were viewed as good at using ICTs, but inefficiency was not connected directly to poor use of ICTs. However, the pupils did report that the teachers who lacked adequate ICT skills wasted time during lessons, which annoyed the pupils and weakened their confidence in the teachers. Thus, teachers' reputation could suffer if they do not master ICT tools or utilise them in their teaching. The pupils became frustrated when they had to wait for help and emphasised the importance of the teachers structuring the lessons and providing support for their pupils.

The teachers who used ICT tools during lessons effectively possessed, among other qualities, good technical skills; varied their teaching methods and which digital tools or programs they used; and could teach how to use ICTs. The pupils found that these teachers' lessons seemed focused and well-planned, using carefully curated teaching materials, and they provided the pupils with a suitable amount of information, as well as clear instructions.

The teachers who used ICT tools ineffectively during lessons did not have good technical skills, according to the pupils. Therefore, their use of digital tools was limited, and much time was spent dealing with technical challenges. The teachers had a limited supply of digital teaching methods, and the teaching was found to be monotonous. The pupils viewed their lessons as unstructured, shallow and underprepared, the instructions given were unclear and the pupils did not receive help.

Fransson et al. (2018) stressed that dividing teaching with ICTs into 'good' or 'bad' is not necessarily representative, and that a sliding scale should be used. Furthermore, the pupils appreciated different aspects of their teachers and the lessons. Teaching is complex, and the teachers must consider many different factors when planning lessons. The teachers strive to plan fun, efficient and interesting lessons, and they do their best with the time and tools allotted, as well as the competence and skills they have.

The most prominent factors of good teaching that pupils cited can be viewed as purely pedagogical, such as clarity, progression and variety. It is possible that the pupils were more focused on the general learning situation because pupils generally view the use of ICTs in school as fully integrated, or possibly even transparent. The pupils do not necessarily desire the newest and fanciest technology in their lessons, but they seem to expect that common tools such as word-processing programs, presentation tools, digital boards and LMSs – should be integrated seamlessly into their learning.

1.2.3 Possibilities and challenges with technology in the classroom

Pupils identified both benefits and challenges from using digital technology while learning. Lindberg et al. (2017, pp. 129-130) found that pupils and teachers identified similar challenges, possibilities and uses for ICT in teaching and learning. One of the challenges that both pupils and teachers cited was the limited time allotted for learning subjects: The teachers found timetables restrictive and wanted to spend time on the subject matter, rather than on systematic training in ICTs. The pupils agreed that it would

be more fruitful to spend time learning the subject rather than learning ICT tools. The students also found it time-consuming and difficult using learning management systems (LMS) at their schools, while teachers found it difficult keeping up with the rapid developments in technology while also planning lectures and following up on pupils. Both students and teachers found that the use of ICTs in education opened a wide variety of possibilities for teaching and learning.

Schmid and Petko (2019, p. 80), while surveying eighth grade students in Switzerland, found a positive correlation between the pupils viewing ICTs as useful tools for learning and their self-reported digital skills. They also found that a learning environment that focused on open teaching methods combined with the use of digital learning technologies increased the pupils' self-reported digital skills and the perceived usefulness of ICTs in learning (Schmid & Petko, 2019, pp. 83-84).

Dahlström (2019, p. 1569) examined Swedish middle schoolers' perspectives on digital writing tools. The pupils perceived several benefits from using digital tools for producing texts rather than writing by hand. For instance, they claimed they could write faster, and it was easier to edit the text, including deleting and rewriting sections (Dahlström, 2019, pp. 1574-1575). The pupils also were less concerned about writing the wrong words and found that they could use more difficult or appropriate words in their texts by using digital tools to look up these words (Dahlström, 2019, pp. 1575, 1578).

An additional benefit was that the pupils could listen to their texts and, thus, recognise errors, which led to the pupils requiring less assistance from their teachers (Dahlström, 2019, pp. 1575-1576). A disadvantage that the pupils pointed out was that the texts looked less personal, as they were not handwritten and, thus, looked similar (Dahlström, 2019, p. 1576).

Engen et al. (2014) observed and interviewed pupils in second, fifth and seventh grades in Oslo when conducting research on tablets in school. They found that the pupils in second grade were more motivated to learn using tablets and that the pupils viewed it as

fun (Engen et al., 2014, p. 79). The older pupils found the tablets cool, but reportedly preferred using personal computers for games and writing. Engen et al. (2014, pp. 80-81) pointed out that pupils understood the tablets as a medium for games and that the pupils were rewarded with free time on the iPad. The researchers observed that the digital devices also were used for reading purposes or drill and practice tasks.

Egeberg and Wølner (2011) wrote in their final report, 'Board or Bored?', that the pupils like and are receptive to the use of interactive boards for teaching. The researchers describe how the interactive boards mainly are used to share information during lessons in the form of presentations (Egeberg & Wølner, 2011, pp. 44-49). They also described several technical challenges with using interactive boards, including issues tied to power supply and charging, internet access, calibration, driver installations and board and software functions. These technical challenges mainly involved issues related to the start of the lessons.

1.2.4 Use of digital tools in learning

In the ESSIE survey, it was found that Norway had one of the highest computer accessibility levels in education across Europe (shown in Figure 1), as there were only three pupils per computer in eighth grade during the 2011-2012 school year, compared with five pupils on average per computer in the EU (European Schoolnet, 2012, p. 6).

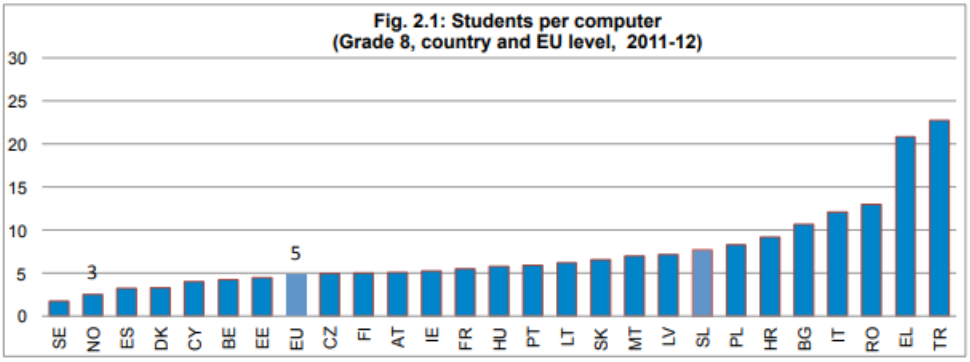

Figure 1. Students per computer in eighth grade in European countries (European Schoolnet, 2012, p 6).

According to the 2018 PISA survey, there was approximately one computer for each 15-year-old pupil (OECD, 2020, pp. 116-117). This indicates that the number of computers in Norwegian schools is increasing. Based on this rise in digital devices in Norwegian schools, it was estimated that after the 2020-2021 school year, at least two-thirds of Norwegian pupils each would have access to one digital device (Gilje et al., 2020, p. 11). The participants in this project all came from schools with a 1:1 ratio of digital devices to pupils.

In a report by the Nordisk institutt for studier av innovasjon, forskning og utdanning (The Nordic Institute for Studies on Innovation, Research and Education [NIFU]), it is shown that 99% of school owners (usually the municipalities) had acquired or were planning to acquire digital learning materials for the 2020-2021 school year (Vika et al., 2021, p. 109). Almost half (47%) of school owners had used all the funds allotted from the government for purchasing new learning materials for the new curriculum implemented in Norwegian schools in the fall of 2020 to purchase digital learning materials (Vika et al., 2021, p. 111). Furthermore, in a different report, 50% of teachers in secondary schools and 44% of teachers in primary schools stated that their use of digital learning materials has increased (Vika, 2021, p. 34).

However, adding digital devices to the classroom is not all that is required to ensure that they are used to improve learning and pupils' ICT skills. The use of digital tools in education is likely to change the teaching practice of teachers, which again will affect which learning processes the pupils experience, what content they are introduced to and their work methods (OECD, 2019, pp. 27, 29).

Planning lessons with digital tools requires careful preparation and can mean navigating a boscage of various educational software, digital learning resources and technical gadgets to find the right learning materials (OECD, 2019, pp. 27-28). This planning might require using significant time and resources, but it is crucial to plan ICT-supported lessons well because poorly planned lessons can lead to more distractions and less learning. In the ESSIE report, it was demonstrated that the most frequent ICT-based

activity that teachers performed was lesson preparation, which entails finding relevant resources, preparing presentations and creating digital learning resources for their pupils (European Commission, 2013, p. 80).

The ESSIE report also revealed a slight correlation between teachers using ICT tools and teachers implementing student-centred teaching (European Commission, 2013, p. 80). Student-centred teaching entails making the pupils the centre of their own learning process, in which they actively participate in their learning – at their own pace and by choosing which learning strategies and algorithms they would like to employ. In opposition to the student-centred approach is the teacher-centred approach, which entails the transmission of information from an active source (the teacher) to a passive recipient (the pupil), comparable to filling an empty vessel with knowledge (European Commission, 2013, pp. 83, 87).

Operating from pupils' perspectives concerning ICT tools and learning, Mulet et al. (2019) found several positive views on the use of tablets in teaching in their review article. The pupils found the tablets easy to use, adapted to learning needs and they developed a positive attitude toward using them (Mulet et al., 2019, pp. 645, 647). However, the researchers did find limitations in several studies, e.g., ease of using tablets was dependent on the tasks given, and writing with tablets was found to be challenging. In some cases, the pupils preferred to use books or pen and paper. Technical challenges also are viewed as a potential obstacle when teaching with tablets, as they interrupt learning and take time.

Using digital tools in learning has other glaring drawbacks. The pupils easily can get distracted by the constant connection to the Internet, and they might be tempted to use their digital devices for non-class-related activities, such as surfing the web, watching videos, playing games, checking social media, etc. (OECD, 2019, pp. 28, 30-31). In the SMIL report – Sammenhengen mellom IKT-bruk og læringsutbytte ('The Link Between the Use of ICTs and Learning Outcomes'), Krumsvik et al. (2013, pp. 92-93) found that 94.8% of high school students in Norway reported that they use their computer for

activities unrelated to class, and 44.7% of the pupils reported that they use the computer more than 30% of the time they spend in class.

This might elicit negative effects on students' learning outcomes. Students in higher education have reported that these digital distractions are not merely an issue for those who are straying from the class content, but also negatively affect the focus and learning outcomes of students sitting nearby (Sana et al., 2013, p. 29; Tindell & Bohlander, 2012, p. 4). Furthermore, there is no reason to believe that younger pupils are better at resisting the temptation to use their devices for non-class-related activities.

To sum up, Norwegian classrooms must be viewed as technology-rich, and Norwegian schools seem to be relying heavily on digital learning materials. This development has changed the learning landscape drastically, and these digital devices have elicited both promising possibilities and challenges with them. This changes how the teachers must plan their lessons in order to accommodate both potentially innovative uses of technology, as well as the new potential for distractions.

1.3 Aim of this thesis

The pupils are the end users of government school policies, and school legislation, funding strategies, curriculum decisions and their schools' social mandates affect them. Norwegian schoolchildren attend 10 years of mandatory primary and secondary education, and some of these pupils start using tablets as early as the first grade while learning their letters. The teachers' choices when it comes to pedagogy and didactics, as well as their competence and experience, influence the learning framework and which digital tools are used to support learning. How does this influence the pupils? Their perspectives on these matters should be crucial when developing school policy, training teachers or budgeting; however, during our literature review, it became apparent that the pupils' perspectives on the use of ICTs in learning has been underexamined academically.

This thesis aims to devote attention to the pupils' experiences and views on the teachers' digital competence, as well as pupils' perspectives on the use of digital tools in their learning. We aim to determine whether it is possible to categorise the pupils' views on their teachers' digital competence, and which possibilities and challenges the pupils themselves perceive when using digital technology in their learning.

With this thesis, we wish to contribute to increased knowledge and focus on the pupils' perspectives and overall voice in school research. Furthermore, we will attempt to answer the following research questions:

RQ1: How do pupils perceive their teachers' digital competence?

RQ2: Which possibilities and challenges do pupils perceive using digital technology while learning?

1.4 The structure of the thesis

This thesis is divided into five main chapters:

1. Introduction

Here, the background for the choice of research questions is presented, including a literature review on the state of the field.

2. Theory and frameworks for analysis

This chapter examines the theoretical concepts and frameworks chosen – and not chosen – to structure the data analysis.

3. Methods

This chapter provides information on data collection and analysis, as well as ethical deliberations and steps taken to ensure the study's validity and reliability, aiming for a transparent description of how this thesis came to be.

4. Results and discussion

The results of the data analysis are presented and discussed in two main subsections, one for each research question. Each section again is divided into different concepts in an attempt to lead a structured and coherent discussion of the various topics uncovered.

5. Conclusion

In this final chapter, we summarise our findings, discuss the study's limitations and suggest directions for future research.

2 Theory and frameworks for analysis

To interpret our data, we chose some theoretical concepts to allow for investigation and expansion. These are the lenses through which we interpreted our data.

Four different frameworks were considered to assess the teachers' digital competence from the viewpoint of the pupils: the DigComp framework (Ferrari, 2013); Krumsvik et al.'s framework (Krumsvik et al., 2016); Professional Digital Competence framework (Norwegian PfDK); and the Technological, Pedagogical and Content Knowledge (TPACK) framework (Mishra & Koehler, 2006). All these frameworks, except for the DigComp framework, originally were teacher-centred, but we wanted to consider whether we could find a framework that would give us suitable categories for analysing our data. We could not find any pupil-centred frameworks for analysing the teachers' digital competence.

The DigComp framework is used to assess the level of 'digital competence for all citizens' (Ferrari, 2013, p. 4). It likely would have been an appropriate framework for analysing pupils' or teachers' self-reported digital competence, but we concluded that it would be difficult to collect pupil statements that would be specific enough to use for assessing teachers' competence in this framework, with categories for digital competence including information, communication, content creation, safety and problem solving.

The Krumsvik et al. (2016) framework comprises five levels to assess and investigate teachers' digital competence: elementary digital skills; basic digital skills; didactic ICT competence; digital learning strategies; and digital bildung. Apart from elementary digital skills, such as using technological devices and having fundamental technical skills, most of the other skills described in this framework would be invisible to the pupils; thus, we would not have been able to place the pupils' statements in any category more complex than the first competence level.

The PfDK framework presents the teachers' knowledge, skills and general competence in seven areas of competency: subjects and basic skills; school in society; ethics; pedagogy

and didactics; managing learning processes; collaboration and communication; and change and development (Kelentrić et al., 2017). This framework is complex and detailed, and like the Krumsvik et al. (2016) framework, most of the knowledge, skills and competence described in this framework possibly would be invisible to the pupils.

The TPACK framework is based on dividing teacher knowledge into three main categories: pedagogy; content; and technological knowledge (Mishra & Koehler, 2006). The TPACK framework seems to be widely used as an analytical tool to assess the development of teachers' ICT competence in teaching. TPACK was chosen for this project as a possible framework to structure the discussion of the pupils' statements and ideas into clearly defined categories. It also was a framework we were familiar with, which allowed us to build on existing experiences with the framework.

A concept that is included in the TPACK framework to some extent is the teachers' ability to manage a technology-rich classroom. However, considering that we were particularly interested in the potential for disruptions from technology in the classroom, we chose to expand on this concept in its own section. Another aspect of the use of technology in learning that we wanted to investigate is its effect on pupils' motivation. This topic is not covered by the TPACK framework and also has been given its own section.

2.1 Using the TPACK framework for analysis

When using the TPACK framework as a tool for analysis, Mishra and Koehler (2006, p. 1029) emphasised that the separation of knowledge into these categories is theoretical and might not be easy to convert into reality. In their own design studies, they used the framework to code and categorise collected data using both the main knowledge categories (pedagogy, content and technology knowledge) as well as the subcategories achieved when combining the three main knowledge categories (subcategories detailed below) (Mishra & Koehler, 2006, p. 1042). It is important to note that this framework mainly has been used to assess teachers' self-reported digital competence, not for assessing the teachers through the eyes of the pupils. Thus, considering that the framework was not created with the pupil perspective in mind, it might not be well-

suited to place pupils' perspectives on their teachers' competence in the various categories, as they might not have the vocabulary or familiarity with the concepts required to use the framework.

Nevertheless, an attempt will be made to place the pupils' statements and notions about their teachers into the knowledge categories presented by Mishra and Koehler (2006). These knowledge categories will be used as coding categories when analysing the data and are presented in more detail below.

2.1.1 Knowledge categories in the TPACK framework

Mishra and Koehler (2006, pp. 1026-1027) presented the following definitions for different knowledge categories:

Pedagogical knowledge (PK) involves knowledge about the learning and development processes, underlying values in the education system, which factors influence the pupils' learning and classroom management etc.

Content knowledge (CK) is connected to specific subjects and includes facts, concepts, theories, scientific procedures etc.

Technology knowledge (TK) involves practical, technical and specific skill knowledge connected to various technologies, both transparent (such as books and pencils) and new (such as the Internet and computers).

As mentioned above, when these categories are combined, they overlap to create new subcategories (Mishra & Koehler, 2006, pp. 1027-1029):

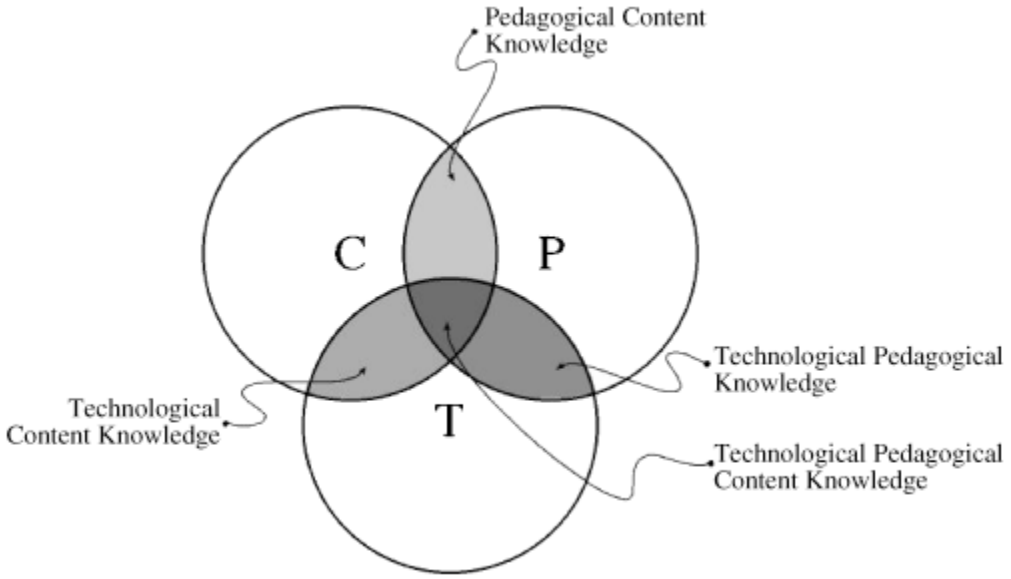

Figure 2. Representation of the TPACK model with knowledge categories and sub-categories (Mishra & Koehler, 2006, p. 1025).

Pedagogical content knowledge (PCK) is the category for pedagogical knowledge connected to specific content. Which pedagogical approach suits the subject, what previous knowledge do the pupils have about the content, how can the content best be structured for the pupils etc.

Technological pedagogical knowledge (TPK) includes knowledge on general digital learning tools, the digital learning landscape and how teaching in general changes when using these tools. It also includes knowledge on the use of digital administration tools, such as registration tools for absence, grading and digital communication tools.

Technological content knowledge (TCK) is concerned with knowledge on how the subject is influenced by technology, which technologies are specific to the subject and which general technologies are suitable for the content.

Technological, pedagogical content knowledge (TPCK) is the understanding of how content can be made available and comprehensible to pupils through the use of digital tools, as well as knowledge on what content can be made more comprehensible through technology. It is necessary to consider that no technological solution works for every

subject, teacher, class or pupil. Technology, pedagogy and subject matter are connected dynamically, in which changes within one category involve changes in the others.

2.2 Disruptive technology and digital classroom management

Digital classroom management can be viewed as part of the TPACK knowledge category TPK. This section will attempt to elaborate and expand on this concept.

In the OECD ICT framework, three dimensions of assessing lesson quality are presented, one of which is structure and classroom management (OECD, 2019, p. 31). Several different views on classroom management exist (Giæver et al., 2014, pp. 168-169): Classroom management can entail traditional values, such as discipline and obedience, or focus on establishing relationships between pupils and teachers, or building rich learning environments and conditions that nurture student-driven learning processes.

When digital technology is added to the classroom, both possibilities and new challenges come with it (Giæver et al., 2014, p. 168), which must affect the teachers' classroom management. Digital technology influences both the teacher and the pupils, as well as work methods, assessment modes and teaching approaches in the classroom (Giæver et al., 2014, p. 168; OECD, 2019, pp. 27-29). Possible challenges include digital technology being perceived as disruptive, teachers needing to compete with the digital technology for pupils' attention, technology found to be unreliable and teachers and pupils not necessarily having adequate technological competence to fix potential issues (Giæver et al., 2014, pp. 172-176).

In technology-rich classrooms, the classroom's physical structure as well as the teacher's technological confidence and competence impact how the teacher can nurture a learning environment in which pupils experience peaceful work sessions where they feel motivated and can progress in their learning (Giæver et al., 2014, pp. 169, 172-175, 183).

To manage a technology-rich classroom successfully, the teacher must establish routines and define rules, in alliance with the pupils (Giæver et al., 2014, pp. 179-181). The start of the lessons can be crucial and can be managed by the teacher, having prepared the

technological devices they will be using, ensuring that the pupils know what is expected of them, providing clear and firm instructions, and having mechanisms to gain the pupils' full attention before providing instructions (Giæver et al., 2014, pp. 173-174). The teacher must take control of the classroom, but still work together with both the pupils and the technology to achieve a smoothly run, technology-rich classroom.

In cases in which the teacher experiences technical difficulties, it is not necessarily admitting defeat to ask the pupils for help (Giæver et al., 2014, p. 175). In actuality, calling on the class to solve technological issues communally can be a good learning opportunity for teaching in the use of ICT and thus increase the pupils' digital competence.

Blikstad-Balas (2015, pp. 132-134) found that Norwegian Upper Secondary pupils did not pay attention to their teachers when they were giving presentations and instead used their digital devices to surf for online entertainment on the Internet. Such entertainment could be social media, news sites, game sites etc. (Blikstad-Balas, 2016, pp. 137-139). Rather than limiting Internet use, good classroom management should be a crucial factor in solving this problem (Fritze et al., 2017, p. 202). A firmly managed classroom that includes predictable consequences creates stability, the need for which is emphasised by the pupils (Fritze et al., 2017, p. 211). Kongsgården and Krumsvik (2019, p. 159) found that didactic digital skills and the teacher's lesson design played a crucial role in Upper Secondary pupils' learning and success on exams.

It is crucial to keep in mind that the pupils are likely to have established some digital practices already before interacting with digital devices in school (Blikstad-Balas, 2016, p. 145). If the school does not offer the pupils meaningful and relevant ways to use technology in school, the digital habits they already have developed will be transferred to learning situations. The best way to decrease the potentially disruptive use of digital devices in class is to increase and highlight functional and content-related use (Blikstad-Balas, 2016, p. 145).

To sum up, classroom management is an important factor for successful implementation of digital technologies in learning. Pupils get distracted by opportunities for entertainment, as expanded on in Sub-section 1.2.4, eliciting negative outcomes on their learning. Structure, predictability and good lesson design are key to a well-managed classroom, and it is important for pupils to gain experience using their digital devices as tools, and not merely as portals to entertainment.

2.3 Pupils' motivation and boredom

TPACK does not cover some relevant concepts, such as motivation. Considering that we find the motivation concept interesting in relation to pupils' perspectives on ICT in school, we have decided to add a section elaborating on the concept of motivation and boredom in school. *Motivation* can be defined as the drive behind the effort to learn and is viewed as a situational state that can be affected by values, experiences, self-evaluation and expectations (Grimsæth, 2013, p. 136).

Skaalvik and Skaalvik (2011), as cited by Grimsæth (2013, p. 137), examined motivation concerning help-seeking behaviour, i.e., when motivated pupils are in need of guidance or assistance, they seek a suitable source. This could entail asking a teacher, finding information in a book or seeking help online. In school, inner motivation and motivation to seek help drive pupils' independent learning.

In school, teachers are expected to create motivation (Imsen, 2011, p. 54), but teachers also should inspire, engage and encourage the pupils. It is not possible, however, to create motivation out of nothing. The teacher can do some things, like enticing with external rewards, but the motivation ultimately must originate from within the pupil (Imsen, 2011, p. 55).

Many factors might influence pupils' motivation, which can involve their needs, desires and hopes; the social situation in which they find themselves; and their perception of their situation (Imsen, 2011, p. 55). Motivation also is connected to former influences, values, interests, joy and achievements (Grimsæth, 2013, p. 147). What is important in the

pupils' lives says something about their goals, aspirations and what can build the pupils' desire for self-realisation. The pupils' motivation is dependent on a solid learning environment, as well as variation in teaching methods (Grimsæth, 2013, p. 139).

According to the 2021 Ungdata Report, 73% of Norwegian pupils in lower and upper secondary schools say they get bored in school (Bakken, 2021, p. 23). *Boredom* is a negative experience that can be the result of a lack of activity, or activity that is not engaging or pleasing (Fahlman, 2009, as cited in Macklem, 2015, pp. 1-2). Boredom can lead to difficulties with concentration, and effort is required to be cognisant of one's surroundings.

It has been found that pupils in the classroom are bored when they think the subject matter has no value to them personally (Daschmann et al., 2011; Macklem, 2015, p. 49). According to Pekrun, boredom also can be linked to the pupils' lack of control of the activity (Daschmann et al., 2011, p. 422). Explaining the value of the tasks or content may help reduce pupils' boredom (Macklem, 2015, p. 49). It also has been found that pupils are less bored during lessons with varied activities, or when the subject matter is adapted to the pupils' progress (Daschmann et al., 2011, p. 423)

Many factors influence pupils' motivation. Some are external, such as the teachers' ability to inspire and engage, but the most important factors are internal, such as the pupils' needs, hopes, goals, interests and experiences. Motivation drives learning, so it is a problem that most pupils get bored in school. Sources of boredom can be that the pupils do not perceive the value of what they are learning, that they have no influence on the learning activities or that the activities are too difficult or easy.

3 Methods

In this chapter, the methods used to collect and analyse data will be presented, as well as ethical deliberations and an assessment of the research's validity and reliability. Finally, a description of our collaborative process is presented.

3.1 Data collection

The object of this thesis was to shed light on pupils' subjective perspectives on ICTs in school, focusing on their views on their teachers' digital competence, as well as their attitudes towards using ICT tools in school. The data used in the thesis were collected by the Norwegian part of the DigiGen research group through semi-structured interviews, conducted online, with pupils in seventh grade (the last year of primary school), and then the same pupils after transitioning to the eighth grade (the first year of secondary school). The qualitative research interview as a method will be examined in detail in the following sub-section, followed by deliberations concerning the structural level of the interview guides. Furthermore, the recruitment process and selection criteria will be described before an account of the data collection process ultimately is presented.

3.1.1 The research interview as a method

The objective of the research interview as a method is to generate insight into the participants' world view and produce knowledge by trying to understand the opinions and attitudes of the participant (Kvale et al., 2015, pp. 20-22). This makes the research interview a well-suited method for investigating pupils' opinions, attitudes and experiences, as well as providing insight into the pupils' thoughts and perspectives. The DigiGen project aimed to develop a better understanding of pupils' views on the use of technology in their education, and the research interview was chosen as one of the methods for collecting data.

In this thesis, the interviews with pupils will help us answer our research questions by providing valuable insight on participating pupils' world view. The aim of this thesis is to investigate how pupils perceive their teachers' digital competence and use of digital

tools in learning, as well as the benefits and challenges they perceive from using technology while learning. Through the interviews, these pupils get the opportunity to express their subjective experiences, thoughts and feelings towards the topic of digital tools and their own learning.

Furthermore, the research interview grants the researcher freedom and flexibility (Cohen et al., 2007, p. 349), providing the possibility for both interviewer and participant to ask clarifying or spontaneous questions, thereby revealing the participant's thoughts, ideas and opinions more thoroughly. Additionally, non-verbal communication also can be observed and used in analytical work, which would not be possible with anonymous questionnaires and similar data collection methods. Thus, the semi-structured research interview is an appropriate data collection method for this thesis.

However, some disadvantages of the research interview are that the method is time-consuming and vulnerable to interviewer bias and interviewee fatigue (Cohen et al., 2007, p. 349). The interviewer's personal attributes, such as ethnicity, gender, appearance etc. also may affect the participants unexpectedly, and different participants may perceive nonverbal communication from the interviewer differently (Nardi, 2014, p. 74). Furthermore, open-ended questions, and subsequent follow-up questions, can make it difficult to organise and standardise data, particularly with open and semi-structured interviews (Kvale et al., 2015, p. 35). Steps taken in this respect are described in more detail below.

Furthermore, children can be influenced easily through leading questions, the artificial interview situation and the interviewer (Kvale et al., 2015, p. 175). For example, the constructed situation of an interview may be perceived as more natural if the child is placed in a known environment. However, considering that the interviews were conducted digitally due to COVID-19 regulations, most of the children were situated in their own homes during the interviews. Possible effects from interviewing children digitally, to our knowledge, remain unknown.

3.1.2 Interview structure

Research interviews can have various degrees of structure, which must match the purpose of the research. If the object is to gather data that can be generalised and compared across participants, the interview should have a tighter form than if the aim is to uncover unique, personal and individual information (Cohen et al., 2007, p. 354). The purpose of the interviews in this project was to uncover participating pupils' own experiences, attitudes and opinions on digital technology in education, but simultaneously, the results ideally should be comparable to unmask patterns and trends. The DigiGen group chose the semi-structured interview form to accomplish this, in addition to other data collection methods for other parts of the project.

An advantage of the semi-structured interview is that even though the data collection is systematic, the interview situation still can be experienced as dialogue-based and flexible (Cohen et al., 2007, p. 353), enabling follow-up questions while still having a structured format. Other disadvantages can be that important and relevant themes may be overlooked, or that a dialogue-based and flexible interview can lead to divergent and, thus, less-comparable, responses. Consequently, it is neither a fully free conversation, nor is it a way to create uniform and easily comparable data sets.

To enable extraction of comparable data, all participating countries used the same interview guides, adapted and translated to their own language and school system. To prevent overlooking important topics, the interviews were mainly conducted with two interviewers. The main interviewer kept the dialogue going, while the second interviewer kept an eye on the interview guide to keep track of which topics were covered. If the main interviewer overlooked some topics, the second interviewer could intervene and ask follow-up questions to keep the interview on track. Due to scheduling issues, some interviews were conducted with only one interviewer.

3.1.3 Recruitment and selection

When discussing the importance of hearing the pupils' voice in the background of this thesis (Section 1.1), an important aspect presented in (Flutter, 2007) is stressed: When

investigating pupils' opinions and ideas, it is frequently the most well-adjusted and resourceful pupils who are heard. This might be the case in this study, but the DigiGen research group has endeavoured to recruit a diverse group of pupils. The sampling criteria used by the DigiGen project included children transitioning from primary to secondary schools, comprising participants varying in gender, socioeconomic background and cultural background and from both rural and urban areas. To ensure random and unbiased selection of participants, selection was based on randomly drawing candidates from a list of potential participants. The candidates then were asked whether they wished to participate in the study.

The Norwegian participants include 11 pupils from different schools in the eastern part of Norway. Most of the pupils were from Oslo or the surrounding suburbs, but a few were from smaller towns. The pupils mostly were from public schools, and they all had 1:1 access to digital devices used for learning purposes at school, such as Chromebooks, iPads or laptops. The schools usually had committed to one of these types of devices.

The pupils were interviewed twice during the year they turned 13 years old, first in the spring, at the end of seventh grade, and second in late autumn at the beginning of eighth grade. Some of the pupils changed schools between the seventh and eighth grade whilst others remained at the same school. This is due to some Norwegian schools offering grades 1-10, while others were divided into two schools: grades 1–7 (primary school) and 8–10 (lower secondary school).

One of the pupils moved abroad after seventh grade. This pupil's experiences were not included in the responses for eighth grade because the classroom setting reportedly was different from the Norwegian classroom setting. However, the pupil's reflections on the seventh grade experience and use of digital tools in Norway were included.

3.1.4 Data collection

The Norwegian DigiGen research group collected the data using an adaptation of semi-structured interview guide that the German DigiGen group developed. Two interview

guides were developed; one for the seventh grade interviews (found in **Feil! Fant ikke referansekilden.**) and one for the eighth grade interviews (found in **Feil! Fant ikke referansekilden.**). The Norwegian DigiGen group translated and adapted the interview guide to the Norwegian context, and children of the same age as the participant group pilot-tested the guide, which was then adjusted. The interviews were conducted using video conference tools, typically involving the pupil and two researchers. Occasionally, only one researcher was present. The interviews were video-recorded and stored on a secure server for use during data analysis, together with the interview transcriptions. The storage of sensitive data is further elaborated on in Sub-section 3.3.6.

The interviews were conducted through Zoom, which allows for video and sound recording. When transcribing and interpreting the data this was beneficial as non-verbal cues could be observed even though we were not present during the interviews.

Cohen et al. (2007, p. 349) referred to Laing (1967, p. 66), asserting that 'the interview is not either exclusively subjective or objective, but intersubjective'. Kvale et al. (2015, p. 22) explained that knowledge is constructed through dialogue and interaction between the interviewer and the participant, and their points of view. In this case, we were not part of the interviews nor the creation of the interview guides, and as such were not part of the knowledge construction that occurred during the interviews. However, we have been involved heavily in the process of transcribing the interviews and, thus, have grown very familiar with the collected data.

3.2 Data analysis

Qualitative data always need to be interpreted with 'a reflexive, reactive interaction between the researcher and the decontextualised data that are already interpretations of a social encounter' (Cohen et al., 2007, p. 368). The data from the interviews must be viewed as a combination of what the interviewer and the participant say, what they mean and the choices the transcriber makes during transcription (Hammersley, 2010).

During data analysis, a balance must be established between maintaining the whole picture that the data paint and fragmenting the data into manageable statements (Cohen et al., 2007, p. 368). Through sorting and categorising data, the larger picture might be lost, but it is necessary to break qualitative data sets into smaller pieces to extract meaning and construct knowledge from them.

In this section, the procedures and considerations with the transcriptions will be outlined before an account of the coding process is provided, including information on how NVivo was used and which categories were analysed.

3.2.1 Transcription

In this context, the transcript is the translation from audio and video recordings into a written text format. Kvale et al. (2015, p. 212) asserted that 'there is no true, objective translation from oral to written form'. In the transition between video recordings and transcribed text, data loss must be expected (Cohen et al., 2007, pp. 365-367). Details such as body language and intonation can be difficult to describe in text; therefore, it is important to take into consideration that a transcription of an interview is data that already have been interpreted by the person transcribing it. The researchers must be clear on what level of detail is necessary in the transcription, such as tone of voice, intonation, emphasis, pauses, interruptions, speed of speech etc. (Cohen et al., 2007, pp. 367-368). The level of detail required inevitably will vary depending on the purpose of the research (Hammersley, 2010). It also might change within the same project, depending on what is discovered during the analytical process.

A group of research assistants, including us, transcribed the seventh and eighth grade interviews conducted during the DigiGen project. There was a shared transcription key for transcribing some non-verbal interactions (laughing, pauses, interrupted speech, etc.), but no guidelines were provided on the level of detail to adhere to during transcription. Considering that several research assistants were involved in the transcription process, there may be variance in the level of detail in the transcriptions, or different students may have emphasised different factors in the process. To counteract this, we discussed the

level of detail required for this thesis thoroughly and decided that we would omit most of the body language unless it seemed very relevant, but that we would include pauses, stutters and filler words. We transcribed most of the interviews, which is beneficial not only in strengthening our intimacy with the data, but also in maintaining transcription consistency. The transcription process was time-consuming, particularly because we wanted to be precise so that meaning would not be lost in the transition from oral to written form. To ensure validity, we used the original video recording in addition to the transcriptions when working with transcriptions that we had not made ourselves.

The transcriptions generally were not written in an oral form, which grants ease of reading, but meaning might be 'lost in translation' through loss of intonation, body language and other artifacts. To reduce the possible negative impact of varying degrees of detail in the transcripts, original video recordings were used actively alongside the transcriptions during the coding process, particularly when we were unsure of the meaning or intonation of a statement. The transcription key can be examined more closely in Appendix C.

Transcriptions were performed using f4transcript, a transcription software that connects the transcribed text to time-stamped segments of the source material, making it easy for researchers to go back to original recordings to study salient phrases found in the transcriptions more closely.

Both the recordings and transcriptions were written in Norwegian, but the examples cited in the results and discussion chapter (Chapter 4) were translated into English. With the context of the data and video material, we feel confident that the translations from one language to another adequately represent the original statements.

3.2.2 Coding data using NVivo

The data analysis was completed using several steps to increase the transparency, validity, reliability and overall quality in the data collected. The interview transcripts were coded using NVivo, which is a computer-assisted qualitative data analysis software

(CAQDAS) that aids the researcher in the analysis process. NVivo provides flexibility and saves time during the data analysis process (Zamawe, 2015). However, it is important to keep in mind that CAQDASs do not analyse the data for you, but merely help structure the data and help visualise emerging patterns (Zamawe, 2015).

Initially, the data analysis was conducted both individually and together, though mostly individually, as we do not live in the same city. However, to avoid discrepancies in the coding process and our understanding of the various categories, the first data analysis was completed in the presence of both authors, Hege and Eirin.

A test was performed to determine whether we agreed on what the different categories entailed, and to ensure that both of us would transcribe the data similarly. The test involved coding the same transcript individually before comparing the coded statements to verify that they were similar. After completing the test, it was found that we coded nearly identically, with a few deviations: The same quotes were coded into the same categories, but Hege frequently coded in bigger chunks, whereas Eirin coded in shorter sequences. Altogether, the content turned out to be the same, so we continued to code individually. Hege, who transcribed most of the seventh grade interviews, also coded the seventh grade transcripts. Eirin coded the eighth grade transcripts, which she had transcribed. When coding transcripts that we had not transcribed ourselves, we used the original video recordings as a supplement to better understand the context of the pupils' statements, as mentioned previously in sub-section 3.2.1.

Considering that our research questions only involved a few of the questions in the interview guides used for data collection, initial sorting was performed to highlight the information pertinent to our thesis. The transcripts were coded roughly into the main TPACK categories for teachers' digital competence (technological, pedagogical and content knowledge), as well as pupils' attitudes towards ICTs in school and their assessment of their own ICT skills.

When the initial coding was completed, we reviewed the statements that we had assigned to the various categories and discussed any emerging trends, patterns or particularities. This led us to discover new aspects, and we refined our research questions and coding categories, and coded the data again. This time, Eirin coded the interviews she had not transcribed, and Hege did the same so that both were involved in the coding of all the transcripts, which increased our overall familiarity with the data set. The interview video recordings were used alongside the written transcript when meaning was unclear or when neither of us had written the transcript. This gave us a solid familiarity with all the interview content, as well as ensuring additional control of the transcription.

The categories used for the second coding process were based on statements we gleamed during the original sorting and were as follows:

Main category	Sub-category
Teachers have different digital skill levels	Difference between teachers (for the eighth grade pupils, difference between seventh and eighth grade teachers was an individual coding node)
Teachers' technological pedagogy knowledge	Digital class management
Teachers' technological content knowledge	The teachers use digital technology in subjects
Teachers' technological knowledge	The teachers are good
	The teachers can solve technical issues
	The pupils must help the teacher
	The pupils are better than the teacher
	Technology makes schoolwork easier

Pupils' attitudes towards technology in learning	Other advantages with technology in schools
	Any disadvantages with technology in schools
	Technology makes schoolwork more motivating.
Miscellaneous	

Table 1. The categories used for the second round of coding in NVivo

After the second coding round, the data were sorted into individual tables for each pupil and structured using the coding categories provided in Table 1. This made it possible to compare the pupils' statements in seventh and eighth grades to determine whether their views had evolved. The coded quotes in NVivo, as well as the table comparing statements from seventh and eighth grade, were used when structuring the results and discussion of this thesis.

3.3 Ethics

Ethical considerations always must be included and considered in any research project (Cohen et al., 2007, p. 318; Kvale et al., 2015, p. 102). In this section, both our and DigiGen's ethical considerations regarding this data and research are presented.

Kvale et al. (2015, pp. 102-109) presented four areas that should be taken into consideration when dealing with ethics in research projects: confidentiality; informed consent; consequences; and the researchers' role. These four areas will be described and elaborated on further in relation to the method used in the thesis.

Due to the vulnerable nature of children, the DigiGen research group had an increased ethical responsibility to protect the privacy and well-being of the participants during this project. This responsibility also extended to us and our handling of the data. The DigiGen research group has received several deliverables with ethical requirements from the EU concerning topics and ethical considerations such as consent, assent, exchange of data,

research on vulnerable subjects and incidental findings. These ethical requirements are critical to protecting participants' integrity when conducting research on vulnerable groups. We have been given access to these deliverables and have in that way been able to learn more about the ethical considerations taken when conducting research that uses children as subjects. These considerations also are presented in its own section: 3.3.5.

Ethical considerations have been made to provide for the safety of the participants' data. In the Norwegian part of the project, the Norwegian Centre for Research Data (NSD) approved the prospects of data achievement, management and protection in the study. The data were stored and analysed in an enclosed server with limited and secure access. More information on the storing of sensitive data is presented at the end of this section.

3.3.1 Confidentiality

Confidentiality involves the matter of how the researchers will treat data and personal information. As a part of a larger risk assessment for the DigiGen project, a risk and vulnerability analysis was performed (see Appendix D).

Kaiser (2012), as cited by Kvale et al. (2015, p. 106), noted the importance of an agreement between participants and researchers on what the collected data can be used for. In the DigiGen project, this agreement was reached through informed consent, which is elaborated on in Sub-section 3.3.2 below.

In interviews in which the participants can be recognised facially, it is never possible to ensure full anonymity (Cohen et al., 2007, p. 64); therefore, the participants depend on the researchers to maintain confidentiality and not publish anything that makes it possible to connect the gathered data with personal identifying information. This is the case for the participants in this study due to the video recordings made, i.e., those who view the recordings could recognise the pupils facially. If direct quotations might be published in public reports, this should be declared in advance (Kvale et al., 2015, p. 106), as was the case for the participants in this project.

Confidentiality is a critical issue to keep in mind during the transcription process, as no identifying information should be included. Kvale et al. (2015, p. 213) express the need to protect not only respondents' confidentiality, but also those whom respondents mention during the interviews. During the interviews used in this study, the pupils were asked to assess their teachers' digital competence, which potentially could harm the reputations of the teachers in question. To ensure confidentiality for both the participants and those mentioned during the interviews, all names of people, schools and towns mentioned were changed during transcription.

3.3.2 Informed consent and assent

Informed consent is an important ethical principle in all research involving human subjects (Cohen et al., 2007, p. 52) and is a natural ethical implication to assess when using research interviews as methods (Kvale et al., 2015, p. 104). To ensure informed consent, study participants should be given information on the study's aim, including an explanation of how the study will be conducted. Furthermore, the participants should be informed on potential positive and negative outcomes from participating in the study, as well as who may have access to their responses, how their given data will be used and for how long the data will be stored (Kvale et al., 2015, pp. 104-105). Finally, participants should be informed and understand that they can withdraw their consent to participate in the study at any time, as well as refuse to answer any specific questions for any reason.

Considering that the pupils participating in this project were under the age of 16, which is the legal age of consent in Norway, the children's guardians had to provide informed consent (forms found in Appendix E). However, due to the participatory design central to the DigiGen project, and based on a strong belief in the children's right to assent and to be heard, efforts were made to obtain informed assent from the all the children as well, regardless of the children's age. Guardians are also informed through their consent forms that their approval does not oblige the child to participate.

In order to warrant confidentiality, the children were ensured that their parents would not be given access to the data set, but in some cases, the parents were present during the

interviews, and some even interjected with their own comments. This may have contributed to the participants feeling more secure in the interview setting, but it also may have limited their ability to speak freely. This raises some ethical questions as to whether the guardians should be able to access their child's responses, whether the children participated voluntarily and whether the pupils understood what they were contributing and why. Therefore, it was a priority for the DigiGen research group to present the information in a form that was accessible to the pupils in a language that they could understand.

The participant information and assent form for the participants (Appendix E) and the consent form for the guardians (Appendix F) provides information on the purpose of the study, the storage of data and what the research and data obtained will be used for.

The importance of the participants' rights to withdraw consent at any time also was stressed. The participants were informed orally during the interview that they could refrain from answering any questions without explanation, in addition to including information on consent withdrawal in the written information sheet they received when consenting to the interview. The information and assent form provided for the participating children can be found in Appendix F.

3.3.3 Positive and negative outcomes of participating in a study

The ethical considerations regarding positive and negative outcomes of participating in a study involve considerations on what consequences the participation may elicit for the participant, as well as for the group that the participant represents (Kvale et al., 2015, p. 107).

Considering that the interview situation may provoke unexpected reactions from the participant, such ethical considerations should be deliberated (Kvale et al., 2015, p. 107). In terms of asking potentially delicate questions, the researcher must be aware of the participants' reactions. This includes being alert to both what is being expressed through spoken language, as well as facial expressions or body language that may reveal

participants experiencing discomfort. The researcher always must consider whether it is ethical to continue the interview, particularly in cases when the participant expresses emotional distress (Kvale et al., 2015, p. 107). The DigiGen group did not anticipate any physical, social, economic, psychological or legal harms to befall the participants in this project. However, they have deliberated thoroughly on the potential for acquiring incidental findings. Some questions potentially could be distressing for the pupils to answer, such as questions on whether they had undesirable experiences online. As the research revolves around children, the potential for the participants finding questions uncomfortable was assessed and carefully monitored meticulously throughout the interviews.

Statements elicited from such questions were not used in this thesis, but it is possible that the pupils could find it awkward, embarrassing or uncomfortable to express negative aspects of themselves, their teachers or their fellow pupils when asked about their teachers' skills, or the challenges with using ICTs in the classroom. Some of the questions regarding their own experiences with technical difficulties or issues potentially could be difficult to answer, particularly if the participants had destroyed or sabotaged equipment at school. Respondents could perceive questions regarding their teachers' ICT skills as sensitive, as they might not want to critique their teachers. Using both the vocal and non-verbal cues from the video recordings has been helpful in better interpreting the pupils' feelings.

3.3.4 The role of the researcher

Kvale et al. (2015, p. 108) noted the necessity for researcher independence and research transparency. The research also needs to be neutral and unbiased, i.e., the researcher must be aware of any self-bias, as well as sponsors and participants' role.

The researcher's role is particularly important in research interviews (Kvale et al., 2015, p. 108). The interviewer is the tool for collecting data and should be familiar with questions of value, ethical guidelines and ethical theories that may influence choices

made during the interview. In this case, the interviewers were experienced researchers accustomed to treating respondents with respect and sensitivity.

Although we did not participate in the interviews, we still took a hands-on approach to this research project, as we were involved heavily in the transcription process as research assistants.

3.3.5 Vulnerable subjects

This thesis is based on data collected from children ages 12–13 years old. When using children as informants for a research project, several ethical issues must be addressed and considered throughout the research project.

DigiGen has conducted thorough ethical deliberations during this project's development based on requirements from the EU, who funded the project. Considering that the project involves research on children, particular attention was paid to deliberations regarding the use of vulnerable subjects as data sources.

Considering that children are viewed as vulnerable subjects, they have extra protection under the ethical guidelines and regulations for research. Depending on the child's age and the nature of the research, it might be necessary to secure consent from both the guardians and the participating children. The DigiGen group collected informed consent from both the guardians and assent from the children for the interviews in this project. Efforts were made to ensure that the information given was comprehensible and presented in a language that the children could understand. This is in line with the Ethical Research Involving Children (ERIC) report compendium, in which it is stressed that 'children must be provided with information appropriate to their age, competencies, context and evolving capacities' (Graham et al., 2013, p. 57).

Adults who interview children must be aware of what authority the situation may give the interviewer. According to Kvale et al. (2015, p. 175), familiarity between the interviewer and the child may affect the child's replies; consequently, the data may not reflect the child's reality, thoughts or experiences. Kvale et al. (2015, p. 175) also

addressed the increased importance of not asking leading questions when interviewing children, as they may be influenced more easily into replying in favour of the leading question. The importance of asking age-appropriate questions also is relevant to ensure that questions are simple and easy to understand.

One of the biggest ethical challenges that adults interviewing children face is the skewed power balance, a factor of which the interviewer must remain aware. The interviewer must therefore be wary of any signs, verbal or non-verbal, that the child might give that they have withdrawn consent, or that the setting is making them unnecessarily uncomfortable. It is crucial that the researchers uphold the child's right to withdraw consent, ensure that the children are not harmed during or by the research and that the child is benefitting from their involvement with the research, either as an individual or on a group level (Graham et al., 2013, pp. 23, 56). In the information form provided to the participants (Appendix F), they are notified on how they can withdraw from the study at any time by either contacting the researchers directly, or by telling their guardians to help them withdraw.

The interview guides developed for these interviews was, as noted in Sub-section 3.1.4, pilot-tested by children in the same age group and adjusted in an effort to make the questions both open-ended and age-appropriate. The interviewers were experienced researchers, most of whom had previous experience with interviewing children.

3.3.6 Storing sensitive data

The audio and video recordings of the interviews, the transcribed material and consent forms are stored on Tjenester for Sensitiv Data (TSD [Services for Sensitive Data]), a secure server in accordance with GDPR standards. Only authorised personnel are granted access to this secure server after signing a confidentiality agreement. The access lasts for a limited period, and two-factor authentication is required for logins, thereby increasing the security. The data will be stored for five years, a detail about which the participants have been informed. They also were informed that they can withdraw from the study at any time, in which case, all data regarding that participant will be deleted.

3.4 Validity and reliability

The research interview as a method requires accurate and representative presentation of findings to ensure high scientific quality. Control and validation of results should be facilitated, and procedures and methods that form the basis of the conclusions must be transparent (Kvale et al., 2015, p. 108). In the following sub-sections, validity and reliability will be accounted for.

3.4.1 Validity

When assessing a project's validity, potential sources of error should be investigated. The researcher must assess themselves, their methods and their findings, and evaluate whether their methods are suitable for investigating the matter at hand (Kvale et al., 2015, pp. 275-279). This assessment should be continuous throughout the research process (Kvale et al., 2015, p. 277). This thesis contains three principal areas in which errors may have occurred: data collection; transcription; and analysis.

When assessing potential errors occurring during data collection, it is natural to start with an assessment of the data collection method itself. The semi-structured research interview still seems to be a suitable method for extracting pupils' views and opinions on ICTs in school. Other methods that could be considered to investigate this matter include quantitative questionnaires, as they might provide a broader data set. However, they would not provide the flexibility and opportunity to ask follow-up questions, as the semi-structured interview does. Focus groups also could be considered, as they might let the children inspire each other to provide more information. However, focus groups also could lead to the pupils speaking less freely, as they might be embarrassed speaking about such matters in front of their peers.

It is possible that data collected from participants may be untrue or imprecise, which is something the researcher must consider both during the interviews and later during data processing and analysis (Kvale et al., 2015, p. 281). It is also possible that the interviewer's personality or technique may have influenced the participants' responses (Kvale et al., 2015, pp. 276, 282). In this study, it is likely that the respondents would keep some details

to themselves if they were embarrassed by them or scared of any consequences if they answered truthfully, as mentioned in Sub-section 3.3.3. It always must be considered that the participants might not be painting a full picture.

Eder and Fingerson (2002), as cited by Kvale et al. (2015, p. 175), pointed out that children as respondents might associate the interviewer with a teacher and might try to answer the questions 'correctly'. In the DigiGen project, interviewers made it clear that there were no correct answers, and that they were interested only in the respondents' views and opinions, the respondents still might have tried to answer the questions based on what they thought the interviewers wanted to hear. The participants were interviewed twice, which may have allowed for building trust and familiarity between the participants and the interviewers. However, some participants met new interviewers during their second interview, so this effect might have been diminished. Nonetheless, the project and the questions were familiar to the participants, and some questions were asked during both interviews, so the pupils still had some familiarity with the setting during their second interviews. The presence of the respondents' guardians during some of the interviews also might have influenced the answers provided. These are all considerations that must be kept in mind during data analysis.

As mentioned in Section 3.2, on data analysis, transcription must be viewed as an analytical stage, considering that a certain amount of interpretation occurs when a rich data form (video) is transferred into text. Possible sources of error might be that the transcriber mishears words, or that transcribers' choices vary on what to include, how to write dialect and sociolect words, which pauses to include, which body language to emphasise etc. The research assistants transcribing the interviews used a simple transcription key (see Appendix C), but no further training or clarification was provided. This led to varying degrees of precision and attention to detail across the transcriptions, which could lead to meaning being lost. In this thesis, the transcriptions were analysed alongside the original source materials to counteract this effect. Salient statements were investigated carefully in the video recordings for the purpose of including non-verbal

communication when interpreting statements. Furthermore, we transcribed most of the interviews, and we reviewed those that we did not transcribe to ensure that no significant loss of meaning or nuances had occurred.

During analysis, the most important source of error was the researchers' own attitudes and opinions. It is crucial for the results' validity and reliability that the researcher is aware of this issue. Although the researchers' views inevitably will determine how the data are analysed, it is vital to ensure that the researchers' biases do not colour the analysis too much, and that the researchers are aware of these biases. In the work with this thesis, the best calibration has been towards each other as co-researchers, but it is possible that some of the data have been misinterpreted due to biases or desires of which we have been unaware. Thus, the results of this thesis under no circumstances should be viewed as the absolute truth, but rather the truth as we perceived it.

Many steps were taken to ensure quality of coding and analysis of the data. These steps are described in detail in Sub-section 3.2.2, on data coding, but mainly comprised ensuring that the coding was performed consistently, striving for close familiarity with the data material and checking both transcripts and coding twice.

3.4.2 Reliability

The reliability of the data and analysis is dependent on whether other researchers can elicit the same data when asking the same questions. Therefore, the transparency of the interview guides, data collection and data analysis are of particular interest to increase reliability. Through the description of the data collection and analysis in Section 3.1 and 3.2, the aim is to provide for transparency of the research methods and strive for increased reliability.

Whilst interviewing the pupils, the researchers used an interview guide, which has been evaluated and translated for use in five different countries. The Norwegian interview guides for both the seventh and eighth grade interviews can be found in **Feil! Fant ikke referansekilden.** and **Feil! Fant ikke referansekilden.**.

The interview guides, as mentioned earlier, provide a structure for the interview, in addition to allowing the interview to be flexible if the situation allows it. An interview guide is a good tool for increasing reliability during interviews, as it ensures that topics and principal questions will be asked. Thus, although different interviewers conducted the interviews, the main questions remained the same – even across the various participating countries – thereby eliciting comparable data.

3.4.3 Generalizability

Considering that the research method is qualitative and the number of participants is low, the prospect of generalisation is neither possible, nor an aim. It is also known that the schools of the participating pupils are equipped differently and, thus, might have different priorities. However, there may be opportunities to observe links amongst the data collected and previous research on the topic, and the themes and topics revealed and discussed in this thesis may serve as an indication of what might be found if one were to delve further into the pupils' perspectives on ICTs in school. In this way, the findings may contribute to the overall research field of the children's perspectives on digital technology in learning.

3.5 Our cooperation

In this section, we describe the reasons why we decided to cooperate writing the masters' thesis together and give a general presentation of our collaborative process. Considering that we have taken several classes together during this master's programme, we have received many opportunities to work together on smaller assignments. We have found that we have similar goals and motivations and that our talents and strengths complement each other. Most importantly, we like working together, and we figured that this was a good starting point for a collaborative master's thesis.

Our writing process has been highly collaborative, with both of us actively involved in every part of the data treatment and writing process. In collaborative learning, the learners work together, synchronously and communally (Stahl et al., 2006). Our collaboration has been facilitated through the use of computers, thereby making it

computer-supported collaborative learning (CSCL). CSCL combines sociocultural learning theory with opportunities brought by computer technology and learning software, focusing on the co-creation of an artefact or knowledge among a dyad or small group (Stahl et al., 2006).

In collaborative writing, the participants can use their own qualities and abilities to compensate for each other's weaknesses (Kimmerle et al., 2017, p. 197). Our familiarity with each other's strengths and weaknesses facilitated an excellent and balanced division of labour.

Considering that we were both unfamiliar with transcription, coding and data analysis, we did this simultaneously, but individually. During the writing process, Eirin's primary occupation has been to search for literature and write notes used by Hege to write cohesive texts. This was done while constantly conferring with each other to ensure that nothing was misunderstood or lost in translation. We both have been sharing thoughts and perspectives during the discussions, and have used both video chats, the commenting feature and colour-coded text to communicate with each other. Using colour-coded texts allowed us both to share our immediate thoughts and suggestions, which became a way to discuss paragraphs and content asynchronously before the thoughts and ideas were knitted together to form the cohesive text that you are now reading.

An open line of digital communication has been of particular importance to us, as we live in different cities and, therefore, have had limited opportunities to write in the same physical space. To facilitate collaboration and communication, we employed several digital platforms for both communication and operation, including Teams, Word, Facebook Messenger, Snapchat, Endnote and Zoom. We also benefited from two writing weekends during which we met up and worked together in person to ensure that we agreed on analytical aspects.

According to Stahl et al. (2006, p. 3), one of the key factors in collaboration is synchronicity. We alternated between working asynchronously and synchronously in our collaborative process, as we found that this gave us a good balance between collaboration and independent work. To ensure that we agreed on the content and the way forward, we made frequent video calls to each other in addition to a continuous line of communication through the various communication tools mentioned earlier.

In cases in which disagreements occurred during data interpretation, these conflicts became a possibility to ensure that we had interpreted the data correctly. In one case, we disagreed on the meaning of a pupil's statement, leading to us studying this statement in particular detail, using both the transcript and the video recording, and leading to a fruitful debate on how to interpret this statement. If we had not been writing this thesis together, such discussions would not have occurred. This increased attention and alertness to accuracy, as well as the opportunity to control and verify our own interpretations with each other, have been useful both to our development as researchers and to the validity of this thesis.

Several formal requirements are linked to co-writing a thesis at OsloMet. A co-writing contract is created with three prerequisites for the collaboration: All participants must contribute to the concept, as well as data collection, analysis and interpretation of data. All students must contribute to the written material, and all must approve the version submitted for assessment. Both students have been involved in the entire process of creating this work; thus, we have fulfilled this contract.

Despite being located in two different cities, we have been involved equally in all aspects of the thesis, but in different ways. When writing, pondering and deliberating, it has been beneficial to use each other as discussion partners. Based on previous experiences of writing essays and coursework together, as well as our open and honest communication, we were aware of our strengths and weaknesses, as well as our different competence levels and preferences. To sum up, the collaboration has been highly beneficial to our work process, and thus the validity of the thesis.

4 Results and discussion

In this chapter, we will present and discuss the results from our analysis. The chapter is divided into two main sections.

The first section presents and discusses the results from RQ1: How do pupils perceive their teachers' digital competence? The results will be discussed in relation to the TPACK framework, with an emphasis on the pupils' perceptions. In the second section, the results from RQ2 will be presented and discussed: Which challenges and opportunities do pupils perceive using technology while learning?

4.1 RQ1: How do pupils perceive their teachers' digital competence?

This section presents and discusses results connected to the first research question: How do pupils perceive their teachers' digital competence? First, the pupils' perceptions of the differences in skill levels between teachers is addressed, then a discussion on the pupils' awareness of how their teachers manage the digital learning environment in light of TPACK is presented, before pupils' views on teachers' technology knowledge are deliberated using the TPACK category for technological knowledge. The section ends with a brief summary of the findings and discussions relevant to the first research question.

4.1.1 Pupils perceive differences between teachers' digital competence

Six of the pupils stated during their seventh-grade interviews that their teachers have different technical skill levels. In the eighth grade, Pupils 3, 9 and 17 all perceived their eighth-grade teachers as being better at using technology than their seventh-grade teachers. Pupil 9 (8th) says when describing the differences between the seventh and eighth grade teachers: 'Uhm.. The best at subjects… Uh, that's actually all of them. But they [the eighth-grade teachers] are absolutely better at technology than the teachers we had at primary school.' The pupils' ability to perceive differences in ICT skill levels among their teachers is in line with the findings from Lindberg et al. (2017) presented in Sub-section 1.2.2. Below, we will focus on which differences the pupils perceived and

emphasised, and what they think were the reasons for these differences.

When it comes to *how* the teachers differ, Pupil 19(7th) said that teachers who are more competent than others 'do things much quicker, are better at things and know more'. Pupil 4(7th) said that the difference lies in the teachers' ability to help the pupils with software: 'When they're helping us get into various apps or something, some of them don't know what to do. And some of them are really good at helping'.

Interestingly, the pupils emphasised different aspects of technical skills, stating that the teachers who are better than others are faster, know more or are more efficient at helping the pupils access their digital learning tools. These views can be linked to the efficiency discussed in Fransson et al. (2018, pp. 2166, 2171), as presented in Sub-section 1.2.2 on Teachers' digital competence above. They found that students view efficiency as good use of ICT, much like the pupils in our project.

As to *why* the teachers' skills differ, the pupils have ideas about that as well. Pupil 9(8th) theorised over why the eighth-grade teachers seem more skilled than the seventh-grade teachers:

> Pupil 9(8th): I think maybe it is because they've been doing it for a bit longer because I think they might have been doing, maybe they've been doing it a bit longer before than the teachers we had at primary school, who might just have started using it.
>
> Interviewer: Yes, so they seem a bit more experienced?
>
> Pupil 9(8th): Yes, they have a bit more experience.

This pupil's views seem to align with Krumsvik et al. (2016, p. 219) in that the teachers' experience levels might be predictive of their ICT skill levels. Pupil 19(8th) seemed to support this view. When asked whether any of their teachers are really good at using technology, the pupil replied, 'Yes, some of them have computers as a hobby almost, so

they know a bit more than the others', implying that more experience with using computers results in higher ICT skill levels.

Krumsvik et al. (2016) also found age to be an impacting factor, as did Pupil 12(7th):

> Pupil 12(7th): Some of the older teachers don't know it that well, but some know it better, it's…
>
> Interviewer: So you think it's dependent on age? That the older teachers are less competent than the younger?
>
> Pupil 12(7th): Maybe a little, because they have had more access to it, perhaps?

Here, the pupil seemed to imply that younger teachers have been more exposed to ICTs compared to the older ones and, thus, are more familiar with them. Pupil 17(7th) seemed to think it has something to do with how popular the teachers are because more popular teachers would be more accustomed to communicating digitally with more people simultaneously. This idea is more difficult to corroborate in the literature, but it seems that this pupil was trying to analyse the difference in skills through the filter of their own experiences. A possible source of this idea could be that their more popular peers use social media more frequently, or are more visible to the pupil and, therefore, seem more competent and experienced than other pupils. Interestingly, these views also can be linked to the findings of Krumsvik et al. (2016) that level of experience with technical tools can be a predictive factor for teachers' ICT skill levels.

The pupils' thoughts on why their teachers differ in ICT skills are remarkably close to what is found in the literature. They emphasised different aspects and reasoning for the differences and view age, experience and popularity as possible factors impacting the teachers' ICT skill levels.

Some of the pupils described differences in how their teachers use technology in the classroom. Pupil 6(7th) said that the main difference between teachers is how they use

technology: 'I think they are good, all of them, but they have different understandings of technology, but they learn from each other when they take part in each other's lessons'. Here, Pupil 6 also described how teachers learn from each other by participating in professional learning communities, which is a remarkably astute observation.

Pupil 19(8th) said that a difference exists in the teaching methods between seventh and eighth grade teachers and elaborates that they in eighth grade learn how to make digital presentations and other documents. Pupil 14(7th) pointed out that the teachers differ when it comes to the quantity of the technology used during lessons, and elaborates on their thoughts on why this is the case:

> Pupil 14 (7th): I think the reason our main teacher lets us use the iPad more is that he can manage the class better than our English teacher. When we have her [the English teacher], more than half the class plays games on their iPads.

When asked in the eighth-grade interview about their seventh grade teachers, Pupil 14 still remembered their English teacher, and how they did not make use of the iPads much during their lessons. This pupil has thoughts on how classroom management impacts the use of digital tools. This will be elaborated on further in the next Sub-section.

4.1.2 Pupils' perception of their teachers' technological pedagogical knowledge

In the TPACK framework, *technological pedagogical competence* is defined as knowing how teaching and teaching tools change in the digital learning landscape, as well as using digital administration and communication tools (Mishra & Koehler, 2006). As mentioned in the theory chapter above (see chapter 0), a technology-rich classroom influences both teachers and pupils, and how teaching and learning are approached (Giæver et al., 2014). Therefore, teaching in a technology-rich classroom requires an awareness of how the technology influences the pedagogy. Most of the pupils in this study cited examples of the teachers using digital communication tools; they sometimes communicated with their teachers through digital surfaces, particularly while doing distance learning during the

COVID-19 lockdown. However, the data also revealed that the pupils had an awareness of their teachers' ability to maintain an orderly technology-rich classroom.

One of the challenges with a technology-rich classroom, as Giæver et al. (2014) noted, is digital devices' potential disruptiveness. In our study, the pupils expressed an awareness of their classmates doing things online other than what they were supposed to, as well as their teachers' response to this, or lack thereof. Three of the seventh-grade pupils mentioned instances during which classmates played games or watched videos during class. Pupil 14(7th) said that the classroom becomes chaotic when many of their classmates play games or watch videos, and indicated that their teachers struggled to manage the classroom in these situations: 'They often just say that, 'stop' and then nothing happens, and then they sort of have to do a bit more', further suggesting that 'the easiest way would be to say, or sort of threaten them, that they will have to take a written warning home'.

Written warnings for disobeying rules seem to be a common theme that the pupils emphasised. Pupil 17(7th) admitted to playing games in class, even though they are not allowed to. During the eighth-grade interview, the same pupil spoke about how the teacher manages these situations: 'Well, some teachers reproach you first. Like, you get a yellow card. And then you … you get another shot, and if you blow that one, you get a written warning'. Amongst the other pupils during the eighth grade interviews, Pupil 3 also mentioned getting written warnings when using their digital devices for games or videos in class.

These are examples of how the teachers attempt to enforce rules and routines related to technology, which, according to Giæver et al. (2014), are important in establishing a fruitful digital learning environment and assuming control of the digital classroom. Pupil 14(7th), as quoted in Sub-section 4.1.1, said that their English teacher uses technology less than their other teachers, and that this is due to her lack of control over the digital devices in the classroom. This was very perceptive and possibly points to a self-reinforcing wariness of digital tools in the teacher. As presented in the literature review, a link exists

between frequency of ICT use and teachers' belief that ICT is supporting their teaching (Blau & Shamir-Inbal, 2017). Furthermore, positive experiences with use of ICTs in teaching increases the teachers' self-efficacy, which is important for integrating ICTs into teaching practice (Siddiq & Scherer, 2016). If the English teacher in question does not have much experience with using ICTs in her teaching and has negative experiences when she tries implementing them, she might feel that digital technology does not support her teaching, and her self-efficacy in ICTs might be lowered.

To prevent losing control of the pupils' activities on their digital devices, it is important to establish classroom routines for the devices. Pupil 9(8th) described how their lessons start:

> Pupil 9(8th): And then they talk a bit of what we're doing that day, and, like, tell us messages and such. And then they say, well, you can bring out your computers, and then they tell us what to open and what to work with.

This indicates a set of well-established classroom routines in which the teacher is in control of when the pupils bring out their computers, in line with Giæver et al. (2014).

The pupils stated that they get distracted when their classmates use their digital devices for forbidden activities in class, such as watching videos or playing games, sometimes resulting in chaotic learning environments. The pupils pointed to the teachers' tools to handle these events, mentioning oral warnings and sending written notes home as the principal measures taken. They noted that some teachers are better at managing technology-rich classrooms than others, and that the teachers that struggle with maintaining order might use technology less in their teaching. Thus, from pupils' perspective, part of their teachers' digital competence involves classroom management, which goes beyond the teachers' use of digital technology and towards the pedagogical perspective.

4.1.3 Pupils' views on the teachers' technology knowledge

In the TPACK framework, *technology knowledge* is defined as practical, technical and specific skill knowledge connected to various technologies, both transparent (such as books and pencils) and new (such as the Internet and computers) (Mishra & Koehler, 2006). In this thesis, we will discuss only the pupils' experience with their teachers' technology knowledge in connection with *digital technology*, as this is what the interviewers specified to the interviewees.

The pupils were asked directly during the interviews about who can help them with technical issues and whether they think their teachers are good with 'the technology' – where digital technology is implied. The answers to these questions are the main source of data for this sub-section. In this sub-section, the pupils' opinions on whether their teachers are good at using technology in school are discussed, followed by a presentation and discussion of the pupils' perceptions of whether their teachers are better at using technology than they are, including a discussion of implications from teachers asking pupils for technical help. However, the pupils' views on their teachers' practical technological knowledge are addressed first, expanding on how well the teachers can deal with any technical issues that pupils experience.

Dealing with technical issues – practical technological knowledge

When asked whom they can ask for help with technical issues, the seventh-grade pupils largely thought of their parents and their teachers first. In the eighth grade, the pupils tend to include their classmates as possible helpers when faced with technical difficulties. However, when directly asked, the pupils often explained that they asked the teacher first, then their classmates:

> Interviewer: … Yes, so does that mean that if you have any technical issues, you don't ask the teachers in class?
>
> Pupil 20 (8th): Usually, I do that first, yes, but if they don't reply, I kind of usually ask my classmates.

Two of the seventh grade pupils mentioned specific cases where they received help from their teachers. Pupil 19(7th) got a virus on their school computer and said they 'gave the computer to my teacher, and we managed to delete it', implying they worked together with the teacher to solve the problem.

However, two of the seventh grade pupils did not mention the teachers as potential technological helpers. One of them, Pupil 14(7th), said they usually solved the problems themselves '… because the teachers don't always know the answer either'. Most of the pupils mentioned, sometimes after being prompted, that they have IT professionals to help with more severe technical issues. Pupil 19(8th) stated that 'if we ask the teacher, we end up going to [the IT professional] almost every time anyways'. All the pupils seem to think that this technological helper is a dedicated IT technician. It is not known whether this is true or not, but it is common for Norwegian schools to have designated teachers who have time allotted on their schedules to take care of the technological equipment at the schools. It is possible that the IT people that the pupils mentioned are in fact such teachers tasked with IT maintenance. These 'ICT teachers' can be teachers with a particular interest in ICT and often participate in developing the school's ICT strategy and guide their peers in the use of ICT, in addition to maintaining digital equipment (Øgrim et al., 2014, p. 198).

One pupil said they experienced some technical issues with which they do not get assistance at school. Pupil 3(8th) spoke about problems with software in which they receive grades and feedback: 'So … and since the teachers are quite new too, I kind of don't get any help from the teachers either'. This statement is ambiguous, as it is unclear whether the pupil means the teachers are inexperienced in general, or whether the software is new to the school and, consequently, new to the teachers as well. Either way, the pupil indicated that the teachers did not manage to help them with this app because they had not used it before and did not know how to use it.

In cases in which the teachers did not know how to use crucial school apps, time should be set aside for them to learn new software and technology, preferably before

implementing them in the classroom. Time has been emphasised as an important factor for implementing technology in classrooms in several studies (Scully et al., 2021; Spiteri & Chang Rundgren, 2017), and (Bacher, 2019) emphasised targeted teacher training to help teachers become more technologically competent. Fransson et al. (2018, p. 2165) found that the teachers' ability to handle technological issues is important for the pupils. The pupils in their studies indicated that a lack of technological confidence in their teachers resulted in time being wasted, less learning and a reduction in the pupils' confidence in their teachers. The latter part in particular also, to some extent, can be found in this data set, exemplified by Pupils 14(7th) and 19(8th) above, who both seem to lack confidence in their teachers being able to help them with technical issues.

The pupils in the study experienced cases in which their teachers were able to help them with technical issues, and cases in which their teachers' technological skills were inadequate. They noted that they can ask their teachers for help with technical difficulties they cannot fix themselves, but apparently, they do not necessarily have faith in the teachers' ability to help them. However, they do seem to have aforementioned possible IT helpers for any technical issues with which teachers cannot help them. In that respect, the pupils seem to feel like their tech support needs are being met at school, except for Pupil 3(8th), who could not seem to find anyone to help them with their new school organisation app.

The pupils generally think that their teachers are good enough

When it comes to assessing their teachers' use of technology in teaching, most of the pupils stated that their teachers have adequate technological skills. Five of the seventh-grade pupils stated that their teachers are good at using technology. Pupil 20(7th) phrased it this way: 'They're doing pretty good. Like, they understand things, how to use the things we have at our school, projector, to show things they have on their computer. They have a good understanding of today's technology'. Two of the seventh-grade pupils, Pupils 14 and 4, stated that the teachers are good enough. Pupil 14(7th) stated 'They're

not particularly good, but they are, like, good enough, to show us stuff', indicating adequateness. Pupil 9(7th) said that none of their teachers are great at using technology.

When interviewed half a year later, in eighth grade, eight of the pupils said they think their teachers are good at using technology. Pupil 3 experienced fewer issues with IT compared with seventh grade due to a higher number of ICT-competent teachers: 'There are a lot fewer IT issues now, because we have more teachers who know IT in school. In primary school, there were only two that could help us, but now there are more'. This indicates that the pupil answers with a practical understanding of the question, leaning towards understanding the teacher as tech support.

Some of the pupils provided examples of what makes a teacher good at technology: they understand and use technology in their lessons; they know keyboard shortcuts; they can display things on digital boards; and they can help with technical difficulties. From the pupils' perspective, a teacher's technological 'goodness' depends on how the teacher uses and understands technology in teaching. When viewing these findings in light of the TPACK framework, the pupils mainly connect a teacher being good at technology with practical and technical skills knowledge. They do not mention other aspects of technology in learning, such as technological pedagogical knowledge, technological content knowledge or technological pedagogical and content knowledge. Given that the interview questions asked about technological skills directly, and the unlikeliness of the pupils reflecting on the pedagogical deliberations of their teachers, this is not very surprising. However, these findings are slightly different from the findings of Fransson et al. (2018, p. 2166) discussed in Sub-section 1.2.2 above. They found that pupils' statements were not limited to remarks on technology knowledge, but included the TPACK terms pedagogical knowledge and pedagogical content knowledge.

Pupils found that their teachers have sufficient technological skills for teaching with technology, but they related their teachers' goodness to practical and technological skills, instead of reflecting on content or pedagogical knowledge. In the following section, the pupils' experiences with teachers asking them for help are examined.

Teachers sometimes ask pupils for help

Six of the seventh-grade pupils said their teachers sometimes asked them for help, mentioning technical difficulties with hardware in the classroom, such as speakers or projectors. Four of them mentioned the same phenomenon during the eighth grade interviews. Blikstad-Balas and Klette (2020, p. 64) also found in their study that teachers sometimes needed pupils to help them with connecting to projectors or speakers in the classroom. Contrary to the pupils that (Fransson et al., 2018, p. 2165) studied, the pupils in this project did not describe technical issues as time-consuming, and that it was, therefore, inconvenient for the pupils to aid the teachers. As discussed in Sub-section 1.2.2 above on Teachers' digital competence, Fransson et al. (2018, p. 2165) also found that a lack of technological skill or self-efficacy among teachers could result in the pupils' confidence in them weakening. However, asking pupils for help is not necessarily a wholly bad thing. As presented in Section 2.2, Giæver et al. (2014, p. 175) pointed out that, if handled correctly by the teacher, these events could provide an opportunity to teach the pupils how to use ICT.

Offering the pupils the opportunity to assist with technological issues also might function as a motivational factor:

> Pupil 19(7th): It doesn't happen often, but it sometimes happens that our teacher asks how to do this again, and such.
>
> Interviewer: And how does it feel that you can help the teacher sometimes?
>
> Pupil 19 (7th): It's a bit fun to teach the teachers.

The experience of contributing with valuable skills in the classroom potentially could contribute to the pupil's digital self-efficacy. Helping the teacher use technology correctly does not require any reading, writing or math skills and can be an opportunity to let pupils who usually do not feel like they can contribute to the learning community shine, thereby elevating their status. Another possible benefit could be that pupils who are

overly active, i.e., the 'wanderers', could have a legitimate reason to get up and move around to help the teacher.

Asking for help also may teach the pupils that it is OK not to know everything, even for adults. Used correctly, asking pupils for help might help build a learning environment in which being wrong is viewed as a good thing, as it provides learning opportunities.

To sum up, some pupils have noted experience helping their teachers with technical issues, such as assisting with projectors or audio. These events could be viewed as negative, as the pupils might lose confidence in the teachers' technical skills, but they also might serve as opportunities to teach the pupils technical skills or provide an arena in which pupils might feel accomplishment. In some cases, the pupils noted that they thought they were better at technology than the teachers. These pupils' statements will be examined further in the following paragraphs.

Pupils believe they are better at using technology than their teachers

Three pupils in the seventh grade and one in the eighth grade declared that they think pupils generally are better with technology than their teachers. Blikstad-Balas and Klette (2020) found the opposite – that many of the eighth-grade pupils in Norway found it challenging to use school-related ICT tools, such as navigating in LMS and saving files on their computers, while their teachers were competent users in educational settings. This discrepancy could mean several things, including that the pupils in this project could be objectively wrong, the project's population could differ from the population of Blikstad-Balas and Klette's study, or the pupils or researchers' criteria for being good at technology might differ.

An example of the latter could be this seventh-grader's view that a teacher must be better than their pupils to qualify as being good at digital technology:

> Interviewer: You said that only one teacher is good. What does it mean to be good at using technology? How …

> Pupil 9(7th): (interrupting) That he's better than the pupils (laughs). That he's better than, well, that he makes an impression on me. Like, 'Wow, he knows this'. And the other teachers also make an impression on me, but that's not 'Wow, they know this', but that they DON'T (emphasises) know this.

This pupil was clear that teachers have varying degrees of technological competence, as discussed in Sub-section 4.1.1. They also seemed to think that very few teachers are better than their pupils at using technology, and their tone and emphasis indicated that they do not think very highly of teachers who demonstrate poor technological skills.

Pupil 3(7th) has a nuanced view on their teachers' technological competence:

> Pupil 3 (7th): They are relatively worse, you can say. But we understand things a bit faster than they, with tasks and digital problems. But when it comes to very advanced things, they do better than us because we are quite young, and they still have more experience than us.

This pupil seems to think that pupils are better at learning new things in technology, whilst teachers are more experienced and can better understand more advanced structures or concepts. The pupil also mentions the aspect of age and experience as a variable potentially influencing their teachers' technological competence, similar to what was discussed in Sub-section 4.1.1.

4.1.4 Summary of RQ1

This section attempted to answer the following question: How do pupils perceive their teachers' digital competence? The pupils' perspectives on their teachers' digital competence are important to uncover, as they might differ from other groups' views.

In this project, it was found that the pupils do, indeed, have opinions and views on their teachers' digital competence. Although this study was not large enough to extrapolate

generalised data, the pupils interviewed have emphasised various aspects of their teachers' digital competence. Our findings can be corroborated with current literature, particularly regarding the teachers' technical knowledge, as this is what was specifically asked about during the interviews.

From the pupils' perspective, teachers who are good at using technology in school can help with technical issues efficiently, manage a technology-rich classroom and they can use computer shortcuts. The pupils perceived differences amongst their teachers and were able to differentiate between these teachers based on their technical skill levels. They mainly emphasised age and experience as factors they believe might be affecting the teachers' ICT skills, which is in line with what is found in the literature. Furthermore, they noted differences between teachers in eighth grade and seventh grade.

Generally, the pupils found that their teachers are 'good enough' at using technology in school, but they mainly related this to purely practical and technological skills, rather than other aspects of the TPACK model, such as content or pedagogical knowledge.

The pupils were aware of the disruptive effects that digital devices might have on the learning environment, and of the teachers' endeavours to maintain order in technology-rich classrooms. Verbal corrections and sending written notes home seem to be the main measures taken. The pupils also noted that some teachers are more confident with managing classrooms while using technology in teaching and theorised that some teachers refrain from using technology in their classes because they easily lose control of the learning environment when digital devices are added.

The pupils said they asked their teachers for help with technical issues, and that they generally lacked confidence that their teachers can help them with technical problems. Most of the pupils mentioned that they can get help from IT workers in the school, and in that respect, seemed to feel like they can get help with technical issues in school. Some pupils experienced teachers asking them for help with technical issues, mainly with connecting to hardware. This could lead to the pupils' losing confidence in their teachers'

technological knowledge, but also could provide opportunities for the pupils to learn about using ICT.

Some pupils seemed to think that pupils generally are better at technology than their teachers, particularly when it comes to adapting to new problems or programs, but one pupil emphasises that the teachers still are more experienced, making them better able to work with advanced technology.

Using the TPACK framework for analysis has elicited some challenges, as the pupils mainly focused on purely technical knowledge when they assessed their teachers' competence, apart from a few hints of awareness of their teachers' technological pedagogical knowledge. This might be because the pupils were asked directly about their teachers' technical knowledge, but were not prompted further on the other knowledge categories. Furthermore, it is possible that the pupils have not reflected on their teachers' pedagogical or didactical deliberations, and that these knowledge categories were less visible to the pupils.

This indicates that the TPACK framework might not be a perfect fit when assessing pupils' views on the teachers' competence teaching with technology, and that a modified framework focusing on pupils' views might be required for potential further research on this topic.

4.2 RQ2: Which possibilities and challenges do pupils perceive using digital technology while learning?

Whereas the previous section examined the pupils' views on their teachers' use of technology, this section focuses on the pupils' views on digital tools in learning. If we want to affect how pupils learn, we should know about their perspectives and values (Nordahl, 2010, p. 14). It is important to gain knowledge about what the pupils themselves experience as positive effects from using digital tools in school. It reflects what the pupils think is important and is founded in their experiences and ideas.

The pupils interviewed have various views on, and experiences with, using digital tools in learning. In this chapter, the pupils' views on digital tools in learning will be presented in regard to Research Question 2: Which possibilities and challenges do pupils perceive using digital technology while learning?

In the first section, the pupils' views on how technology can make schoolwork easier are discussed, including their ideas on how technology can aid both the pupils and teachers. After that, the challenges that pupils presented are examined and divided into two sections: technical and practical challenges, and content or pedagogy-related challenges, followed by a presentation of data concerning to what extent did pupils find that technology made learning more motivating. Finally a summary of the findings connected to Research Question 2 is provided.

4.2.1 Pupils say technology makes schoolwork easier – for pupils *and* teachers

In line with the findings of Mulet et al. (2019) presented in Sub-section 1.2.4 - Use of digital tools in learning, we also found that the pupils mainly expressed positive attitudes towards technology in learning. Most of the pupils, both in seventh and eighth grades, expressed in various ways that technology makes schoolwork easier. They mentioned benefits such as quicker writing; easier text editing, reading and access to information; organisation of homework and assignments into digital learning platforms; making it easier for teachers to provide feedback on pupils' work; improved communication between pupils and teachers; and having everything in one place (the digital device), rather than using different textbooks and notebooks.

These findings are similar to those of Dahlström (2019, pp. 1574-1575, 1578), as presented in Sub-section 1.2.3, who found that Swedish pupils noted equivalent benefits in regard to writing with technology: They found it easier and quicker to write and edit texts, and that writing on computers increased readability for both pupils and teachers.

Another aspect of technology in schools that the pupils mentioned frequently in the present study is that technology offers more variety when it comes to ways to learn. Pupil

12(7th) expressed it this way: 'Maybe because, yes, it's a bit more ways to learn it, perhaps? Than one book, for instance, there are more ways you can learn it, and see what … yes'. This statement can be associated with Lindberg et al. (2017), presented in Sub-section 1.2.3, who found that pupils state that the use of ICTs in education adds a wide variety of methods to teaching and learning.

Some pupils were asked about learning with video during the seventh-grade interviews. They described the use of videos in teaching as useful for learning at their own pace and having the subject matter described or presented in different ways. Pupil 4(7th) stated that it is 'really nice when we can have videos. The teachers can't always describe things. Then it's nice to be able to see it yourself'. Pupil 14 (7th) stated that using videos in learning enables them to learn at their own pace, and that they can go back and watch the videos again if they need repetition:

> Interviewer: Do you think it's easier to remember when you've seen it in a video, than when you listen to your teacher in the classroom?
>
> Pupil 14(7th): Maybe, because if there's something I didn't get, I can just rewind.
>
> Interviewer: Right. And you can't do that in the classroom?
>
> Pupil 14(7th): No. Or, I can ask him if he can say it again, but then I'd … not ruin, but it can be a bit troublesome.

This pupil indicated that the videos also benefit the teacher, who will not need to repeat themselves as often. Furthermore, videos may serve as an aid for pupils who struggle with asking questions or taking up time in the classroom, as they do not want to be viewed as troublesome.

Interestingly, several pupils in addition to Pupil 14(7th) mentioned ways in which technology may assist the teachers: Pupil 17(7th) stated that 'if we didn't have the PC, we

would raise our hands much more, but when we have the PC, we can search. Then we work way faster, and the teacher can help those that are actually really stuck'. This is also similar with Dahlström (2019, p. 1576), whose study revealed that some pupils thought that digital technology could replace some of the spelling assistance that the teacher usually provides. This indicates that the pupils are aware of the teacher's role and tasks, and in which ways technology can replace teacher assistance or facilitate new teaching practices.

Five of the seventh graders and four of the eighth graders mentioned finding information as a benefit from using technology in learning, like Pupil 13(7th): 'It [the computer] helps me with sort of finding information. Yes, mostly with information. Maybe a bit about writing?' The pupils mentioned using search engines or encyclopaedias to find information, and that this also can help free up time for the teacher, as they did not need to ask them for information. They also found it quicker to search the Internet for information, rather than searching through a book.

When asked how technology aided their learning, Pupil 13(8th) seemingly found it difficult to answer, stating 'It's not really any technology, it's mostly the teachers', indicating that they found teachers more important to their learning than the use of technology. Although flattering, this statement might be a consequence of the question's phrasing and an indication that they have not been given the opportunity to reflect on what helps them in their learning process, or that they may not have the language or concepts to describe it. It is also possible that the use of digital technology in learning already has become transparent or internalised for this pupil, and the question makes as much sense to them as asking them how a blackboard or a pencil aids their learning.

This also could be the case with Pupil 20(7th), who had a very instrumental view on the use of technology in learning. They did not view computers as all that important, apart from the word-counting feature:

> Interviewer: So, you don't think it would matter if the computers were collected, and you had to write everything down when the teacher …
>
> Pupil 20(7th): (interrupting) Not really, except when we have one of those … that we must write something, and we have to write a specific number of words. It would probably be a bit silly to count the words one by one.

To sum up, the pupils noted several beneficial effects from using technology in learning: Technology makes it easier for the pupils to write, edit text and find information, rendering pupils more independent and requiring less assistance from the teacher. According to the pupils, this leads to the teacher being free to spend their time helping pupils who need more help. Furthermore, technology in learning provides a wider variety of teaching methods and perspectives. Some pupils pointed out that it is beneficial when the teacher supports their lessons with videos that might offer different explanatory models than the teacher could offer, and that pupils can watch them again if needed.

4.2.2 Technical and practical challenges with the use of digital tools in school

The pupils also were asked about challenges using digital tools in school. Some of them mentioned challenges related to technical and practical issues, which will be discussed below.

The issue of technological challenges when using ICT for learning activities is the topic of several articles (Egeberg & Wølner, 2011; Mulet et al., 2019) involving issues such as challenges with internet connections, lagging, computer crashes, power supply problems etc. Pupils 20, 3 and 4 (seventh grade) also mentioned such challenges, including losing their internet connection, computer crashes or simply forgetting to charge the computer. The pupils found such technological challenges vexing, as Pupil 20(7th) noted:

> Pupil 20(7th): It's not exactly something that has crashed or anything; it's sort of when things aren't working and, like, it's, the Internet is gone, but then it says I still have internet.
>
> Interviewer: Yes.
>
> Pupil 20(7th): Then, then, like, I get, like, a bit frustrated that things aren't working.

This pupil expressed the same sentiment when asked again in eighth grade and elaborated on why they get frustrated: 'Uhm, because I sort of, things aren't working. And I want to make things work, and when it doesn't, I get cross because, like, I want to make it work'. It is clearly frustrating to the pupil when the technological infrastructure does not work as expected. The issue is out of the pupil's control, but the desire to make it work remains.

Mulet et al. (2019, p. 645) described how technical challenges are hindrances that result in 'loss of time and (interrupted) learning'. Thus, Pupil 20 is not the only one with this frustration. In fact, the pupils frequently cited slow or unreliable internet access as a nuisance:

> Pupil 8(7th): Sometimes, if there is no internet, I wonder why it's not there. The Internet at school is bad.
>
> Interviewer 2: Right.
>
> Interviewer: How do you notice that?
>
> Pupil 8(7th): That it's really slow, and yeah… That it doesn't work and, or that it works, but really, really slowly.

This might indicate that the schools' digital infrastructure development has not been able to keep up with the increasing use of technology and the Internet in classrooms. In schools using Chromebooks, the local network is of particular importance because

Chromebooks need an internet connection for the pupils to be able to use it. Infrastructure for power connection is not necessarily present either, particularly in older school buildings, resulting in classrooms being filled with extension cords and charging cables. Pupil 4(7th) noted that they wish charging had been easier, but is not entirely sure how:

> Pupil 4(7th): Maybe something about charging. Because it's a bit annoying because sometimes people forget and then they have a dead iPad, and then they can't do what we're supposed to. Maybe … that would have been easier. But I can't really think of how that could have been.

Pupil 14(7th) comments on how it may be more challenging to forget a digital device than other school supplies: 'Maybe if you forget it, it's a bit harder than if you forget a pencil … or paper or a book'. All the pupils asked during the interviews stated that they were allowed to bring their digital devices home, for instance to do homework. This dependency on pupils remembering to bring their digital devices to school is likely to be an increasing problem. Some of the eighth graders explained that they only used digital schoolbooks after the implementation of a new curriculum in Norway, Kunnskapsløftet 2020, that started the year before they were interviewed. The implementation of this new curriculum has led to existing schoolbooks being outdated. The government granted some funds to the municipalities to buy new learning materials after the implementation of the new curriculum, in addition to increased funds to stimulate purchases of digital learning materials (Kunnskapsdepartementet, 2020). As presented in Sub-section 1.2.4, many of the school owners have only purchased digital learning materials, and updated textbooks are scarce.

Many Norwegian schools use digital learning materials created by the publishing companies, in which all the learning activities can be found online through the digital devices. Such activities could be reading and writing answers to multimodal texts, video or voice recordings, or solving math problems, etc.

This development means that the digital devices to a large extent are the main teaching materials in themselves. No simple replacements for being online can be used when the learning activities take place on digital platforms. If the pupils do not have access, it is difficult to follow along with lessons, and as Pupil 14(7th) pointed out, pupils cannot necessarily simply borrow a new computer, a new headset or other digital equipment, like they could get a new notebook, borrow a pencil or share a textbook. When everything is digital, it limits the options for learning activities. When the teachers only have digital learning resources readily available, it is likely that they depend more on the use of digital devices in their teaching, and the issues connected to pupils forgetting or losing their digital devices will increase.

The pupils get annoyed when the technology is not doing what it is supposed to do. The pupils cited slow or unstable internet connections and the increased importance of remembering to bring the digital device to school as learning becomes increasingly dependent on internet access.

4.2.3 Content- or pedagogy-related challenges with the use of digital tools in school

Some pupils mentioned issues connected to content or pedagogy when using digital tools in school, such as apps not offering varied tasks, the possibility of being exposed to false information online and the multiple distractions available on the digital devices.

One pupil commented on the never-ending flow of unmotivating and boring tasks in math class:

> Pupil 9(7th): I think maybe I think it's boring when you sit there and have so little variety. And that the new tasks just keep coming. And it's not motivating since you never get done. More tasks just keep coming. And then, well, nothing new happens. You just sit there getting more and more tasks, and they are quite similar as well.

The pupil did not comment on which app or learning tool they are referring to, but several adaptive math programs might fit the description. This case contrasts with the

findings of Lindberg et al. (2017), as presented in Sub-section 1.2.3, that pupils viewed the use of ICTs in education as providing more variety in teaching and learning, a finding also echoed by other pupils in the present study, as discussed in Sub-section 4.2.1 above. However, in a later article, the same group of researchers explained that teachers who are less adept at using ICTs in school have a more limited repertoire of teaching methods and that their teaching is monotonous (Fransson et al., 2018). Thus, Pupil 9(7th)'s experiences might be tied to their teachers' ICT skills, or possible lack thereof.

Pupils 13 and 2 (seventh grade) commented on finding and using false information as a challenge in using the Internet in school. Pupil 13(7th) had a somewhat ominous viewpoint: 'That if you find the wrong facts, then, and use them … things can go quite wrong'. Some of the pupils explained how they have been taught how to evaluate information by comparing it with other sources and testing the credibility of the source:

> Pupil 9(7th): That you consider – OK, fine, how many sources say this and how many sources say that? What – in which way is it constructed? Does it look like a secure webpage? And stuff. That, we learn some of that.

This is one of the downsides when using the Internet to find information – erroneous information needs to be sorted out. If the pupils use false information in their school essays, they can end up with errors in their knowledge base. Furthermore, for the pupils to engage in democracy on fair terms, it is crucial that they learn how to evaluate information they are subjected to – both through the Internet and by people who wish to influence them. This should be taught in schools as part of preparing the pupils for full societal participation and is part of the Norwegian curriculum (Utdanningsdirektoratet, 2017, pp. 3-4).

Some pupils emphasised digital distractions as a challenge with technology-rich classrooms, as discussed in Sub-section 4.1.2. Pupil 17(7th) speaks of themselves playing games in class:

> Interviewer: What do you play in school, then?
>
> Pupil 17(7th): Well, it varies. We're not allowed to do it, so we must watch it a bit, but yeah. We play mostly Minecraft Education Mode. That's what we [illegible] mostly.

Later in the interview, this pupil elaborated on why they start playing games in class, stating that 'we play maybe mostly because we are bored in class'. For some pupils, the world of opportunities that digital tools and the Internet offer might be an easy way out of this boredom. Unfortunately, these distractions are not merely detrimental to the pupils who are misusing their digital tools, as they also negatively impact the learning outcomes of the pupils sitting nearby, or other pupils who are disturbed by the activity.

Most of the pupils do not speak of themselves playing games or watching videos in class, but some speak of getting annoyed and distracted when other pupils do it. Pupil 9(8th) speaks of it as fellow pupils abusing or misusing their digital devices 'to play games and such that takes, that distracts, that could distract other pupils'. This finding corresponds to those of Sana et al. (2013) and Tindell and Bohlander (2012), as demonstrated in Sub-section 1.2.4, concerning the use of digital tools in learning. The pupil spoke further about sitting next to someone who spent most of the time in class playing games on their computer, stating that 'I got really disturbed by that'. The pupil later excused their computer game-playing neighbour by noting that this pupil was new both to the class and the country, did not speak the language and did not know the rules, but that understanding the context did not make the game playing any less distracting to them.

This demonstrates that the teachers' management of technology-rich classrooms also is important for the pupils who are not misbehaving, as they get distracted by their fellow students playing games, watching videos or using their digital devices for other things they are not supposed to do during class.

The pupils are aware of some pedagogical and content-related issues concerning technology in schools, such as being subjected to false information on the Internet;

needing to do monotonous, boring math tasks; and navigating the many potential distractions offered by the Internet. Furthermore, the pupils admit to being distracted when other pupils use their digital devices for things unrelated to class, which underlines the importance of a well-managed technology-rich classroom, as discussed in detail in Sub-section 4.1.2 on the teachers' technological pedagogical knowledge.

4.2.4 Motivation and digital tools

The pupils have different perspectives on whether they find learning with ICT more motivating than learning without ICT.

Six of the seventh graders stated that schoolwork was more motivating when using technology. When asked again in the eighth grade, five of the same children still found technology to be motivating. They said apps and games make learning more fun, and that it is easier and quicker to find information and write on a digital device, rather than write or read in a book, as Pupil 6(8th) noted: '(…) And it's also motivating to not have to ask the teacher every second and actually find something myself'. The pupils seemed to find it motivating in itself that technology makes learning activities easier. This also corresponds to the science of motivation discussed in Section 2.3 on pupils' motivation. The Internet can be a source of information when the pupils are motivated to practice help-seeking behaviour, and unlike getting help from the teacher, the Internet rarely requires that pupils wait their turn. Furthermore, learning with technology through a digitally competent teacher often offers a more varied approach to learning, as discussed in Sub-sections 1.2.2 and 4.2.1. Motivation also is connected to pupils' interests and achievements, and using digital devices in learning might appeal to pupils who already are interested in computing, or feel confident using it, thereby increasing their motivation.

When juxtaposing Pupil 8's answers from the seventh and eighth grade interview, an interesting observation can be made: Pupil 8 went from finding the use of the Internet in learning a 'more fun way to learn' in the seventh grade, to simply answering 'I don't know' when asked how using the Internet influences their motivation in the eighth grade.

This could be a testament to the elusiveness of children's opinions in interviews, or a result of the pupil being tired during the interview and, therefore, not reflecting on the question. These considerations are described in more detail in Sub-section 3.4.1, concerning validity. It also could mean that the pupil has not reflected much on how using the Internet and technology in schoolwork affects their learning, or that they do not have the proper concepts or language to discuss this. The latter possibility seems to be the case with Pupil 14(7th), who seems uncertain on how to relate to the term 'motivation':

> Interviewer: Yes. Do you get more motivated to do some work by using the Internet, than going to textbooks or something like that?
>
> Pupil 14(7th): I much prefer to write on the iPad, I absolutely do. But I don't know if that … motivation? If that helps for…?

Three other eighth-grade pupils' views are in line with those of Pupil 8, noting that they do not know whether the Internet affects their motivation, or that it does not matter to them. Pupil 13(7th) does not think it affects their own motivation, but is open to the possibility that it might affect others:

> Interviewer: (…) Can you say something about how the Internet affects your motivation to do schoolwork? Do you become more motivated by using the Internet?
>
> Pupil 13(7th): It doesn't really matter to me. But for others, it might.
>
> Interviewer: It's equally fun if you use the schoolbook if it's a good book? As using the Internet?
>
> Pupil 13(7th): Yes, it depends a bit on what we're doing too.

Pupil 12(8th), like Pupil 13(7th), also felt that motivation can depend on the activity at hand, stating, 'It varies a bit, though. Sometimes it can be more fun to use the Internet, and other times it can be not as fun'.

Only one of the pupils stated clearly that they do not think using the Internet and digital tools while learning makes them more motivated to learn. Pupil 3(8th) stated that '(…) I wouldn't precisely say its motivating, but it's easier than to write by hand, but I don't get more motivated'. Furthermore, the case with the never-ending math tasks described by Pupil 9(7th) in Sub-section 4.2.3 speaks of a specific activity that did not leave the pupil feeling particularly inspired.

To sum up, the pupils in this study have different perspectives on how digital tools influence their motivation. Some of the factors mentioned that affected the pupils' motivation in a positive way are that apps and games make learning more fun, and that it is easier and quicker to find information and write on digital devices compared with writing by hand or finding information in a physical book. Furthermore, some pupils had found that the digital tools and the opportunities they offered can make them more independent of their teacher. However, as one pupil claimed, the motivation may be activity dependent. Four of the eight graders answered that they did not know whether using technology while learning affected their motivation.

4.2.5 Summary of RQ2

In this chapter, we endeavoured to shed light on Research Question 2: 'Which opportunities and challenges do pupils perceive using digital technology while learning?' The pupils were asked directly about which benefits and challenges they perceived from using digital technology while learning, and whether using the Internet affected their motivation.

The pupils mentioned several positive effects from using technology in school, focusing on everything technology has made easier: writing; editing text; finding information; organising tasks; communicating with the teacher etc. The pupils found that using video lectures and searching for information on the Internet made them more independent in their learning, which, according to them, frees up the teacher to aid pupils who need more specialised help. Furthermore, technology enables more variety in learning

activities, approaches to the subject and explanation models, making learning more interesting and easier.

The pupils also noted some challenges with technology, such as annoyance when the technology infrastructure was not good enough, exemplified by issues with the internet connections and charging their digital devices. This is a problem that needs a solution because teaching in Norwegian schools is increasingly dependent on digital learning materials and internet access. They also were concerned that exposure to false information on the Internet could occur, but some pupils noted that they had been taught strategies to assess information critically. Some spoke of repetitive, unending and boring tasks, possibly referring to adaptive learning programs, as a negative side of technology in schools. Some pupils also noted that they get distracted by fellow pupils who use their digital devices to watch videos or play games in class.

The pupils who found that using digital technology in their learning experienced positive effects on their motivation mostly emphasised the same benefits as mentioned before: Digital devices make learning activities quicker and easier. Some said it is more fun to learn with apps or games. Some pupils also found the aforementioned independence granted by the digital devices to be motivating.

5 Conclusion

As Norway has one of the world's highest levels of ICT integration in education, it is interesting to investigate Norwegian pupils' views on the digital tools they use and are subjected to in their lives as pupils. After two years of abnormal conditions due to the COVID-19 pandemic and under a newly implemented curriculum, all the pupils investigated in this thesis had a 1:1 ratio of digital tools-to-pupils in their schools, just as the 2018 PISA report predicted.

In this thesis, we attempted to paint a picture of the pupils' perspectives on two aspects of ICTs in learning: Their teachers' technological skills and the pupils' views on the digital tools themselves. We found it necessary to raise the pupils' voice and opinions on this subject, as we found very limited literature on the topic. The pupils' experiences and encounters with digital tools in school are unique to them and offer valuable insights into the digital school day of a small group of pupils in transition between Norwegian primary and secondary school.

In this final chapter, we will emphasise the value of adding the pupils' perspectives to school research; summarise our findings and discussion in relation to the two research questions; attempt to assess the suitability of the TPACK framework; contemplate the study's limitations, implications and our contributions to the field of research; and recommend areas for future research.

5.1 The importance of the pupils' perspective

As we found so few studies that examined the pupils' perspectives on this topic, we found it compelling to elucidate this aspect to gain insight into Norwegian pupils' perspectives on digital tools and their teachers' digital competence. As teachers and researchers, we found it important to investigate what the pupils experienced when we subjected them to digital tools in learning, and what they think about us as professionals and our digital competence. It is important to figure out what our competence means to the pupils, how it affects them, what impressions they are left with and whether it matters

to them whether they have a teacher with good digital competence to know how to help them and create good learning situations with varied tasks.

Their voice should be heard by teacher educators who can ensure that what the pupils find important is taken into consideration when educating the next generation of teachers.

Some of the pupils provided examples of what makes a teacher good at technology, such as teachers being able to help with technological issues effectively, managing the digital classroom and being efficient and knowing how to use the technology. These findings are particularly interesting, as they give an impression of what the pupils are concerned with, and which aspects of the teachers' competence are visible to them.

Finally, pupils have a remarkable ability to see beyond themselves at such a young age, and they can perceive how digital technology can give their teachers more time to help pupils, but also that the technology makes them more independent. In this way, the technology not only makes the pupils' schoolwork easier, but also – from the pupils' point of view – improves learning opportunities for their fellow pupils, as well as their teachers' teaching capacity.

5.2 RQ1: How do pupils perceive their teachers' digital competence?

From the pupils' perspective, their teachers are good enough at using technology in school. They mainly focused on the technological aspects of their teachers' digital competence, possibly due to how the questions were phrased, or because the teachers' technological knowledge was more visible to the pupil. Some pupils thought that they were better at learning new things than the teachers, but some also noted that the teachers might have a deeper understanding of more advanced technology.

The pupils found that their teachers, to some extent, can help them with technology and solve technological issues, but some pupils described how they frequently required assistance from IT personnel to solve problems. Sometimes the pupils even assisted their teachers with technical issues, but this is, from the teachers' perspective, also an

opportunity for pedagogy, in which the pupils can be taught how to use technology, the pupils who need it can have their status elevated or the teacher can demonstrate, by example, that you do not need to know everything. Based on the literature on the pupils' perspective on the matter, some pupils perceived teachers' problems with technology as a waste of time, or that they could lead to the pupils losing confidence in their teachers' skills, but this was not something that pupils in this thesis directly addressed.

Using data from before and after transitioning from seventh to eighth grades increased the depth of our thesis. Most of the pupils changed schools during this transition, and the change was relatively fresh in their minds during the second interviews. Thus, we were granted insights into the perceived differences between teachers in primary and secondary school. In both seventh and eighth grades, the pupils noticed differences in the teachers' technological skills and their use of digital tools. In eighth grade, they also compared their current teachers with their primary school teachers. Some common factors brought up were that teachers who were better than others were quicker, knew more and were more efficient when using the technology. The pupils also theorised over why the teachers have different skill levels, mentioning age and experience as likely factors, perfectly aligning with existing literature.

Several of the pupils discussed the occurrence of digital disruptions in the classroom, and how their teachers managed these situations. The pupils sometimes found technology-rich classrooms chaotic and observed that it can be difficult for teachers to manage a classroom so rife with potential distractions. They noted that their teachers had limited tools for sanctioning pupils. As demonstrated in the discussion, simply removing the digital devices is not necessarily an option either, as many of the schools have not acquired physical learning materials adapted to the new curriculum and, thus, now rely on digital learning materials. To amend this situation, teachers should receive more training to further develop and better their ability to manage technology-rich classrooms.

To sum up the findings on how pupils perceived their teachers' digital competence, the pupils cited varying experiences and views on this topic. Moreover, they generally

viewed their teachers' digital competence as good enough, but that their teachers have different technological skills and experiences. In some cases, the pupils found that they needed to help their teachers solve technical issues, and sometimes the teachers could help pupils resolve their own technical issues only to a limited extent. They experienced how digital devices in their classrooms can act as a source of disruption, and that their teachers have varying degrees of control over the digitalised classroom.

5.3 RQ2: Which possibilities and challenges do pupils perceive using digital technology while learning?

The pupils pointed out several possibilities and challenges using digital technology while learning. They found the effects to be mostly positive, as they discovered that technology makes learning easier, offers more variation, simplifies organisation of the schoolwork and is more fun. Technology enables them to learn more independently, as the teacher can let them use video lectures or search for information on the Internet, rather than wait for help from their teacher.

The pupils commented on some challenges related to lesson content when learning with technology, such as the occasional lack of variation when using digital tools, and that some tools give repetitive and never-ending tasks. Another content-related challenge that the pupils cited was that the Internet is rife with false information, which might lead them to be misinformed. This demonstrates that some pupils are aware of the need to evaluate information critically, but they also might feel a bit insecure about this and want more training to feel confident negotiating this vast boscage of information.

Infrastructure often was cited as a frustrating technical challenge that applied not only to teachers not being able to connect to hardware or the Internet, but also to pupils who frequently experienced slow internet service. As more schools use digital learning materials to a larger extent, a fast and stable internet connection becomes crucial. This is particularly important in the schools that utilise digital devices that depend on an internet

connection to function, such as the very popular Chromebook. Some pupils also expressed frustration with difficulties with the power supply for their digital devices.

The pupils mainly were positive about using digital technology in learning, and experienced it as a tool simplifying learning, easier to use than analogue counterparts, offering variation and providing more fun. However, they also cited challenges related to finding false information, lack of variation and poor infrastructure – particularly regarding slow internet connections. As Norwegian schools become increasingly digital, it is vital that the infrastructure follows suit in order to make it easier for teachers and pupils alike.

5.4 The suitability of the TPACK framework

As expected, the knowledge categories in the TPACK framework enabled us to categorise the pupils' statements based on which area of the teachers' digital competence they were noticing and commenting on. This was beneficial to our analysis, as we already had predefined concepts and categories with which to analyse our data. However, as the framework was not designed to capture pupils' perspectives on teachers' digital competence, some limitations emerged.

The questions asked in relation to the teachers' digital competence were, to a large extent, centred on technological competence. Consequently, the answers that the pupils provided mostly focused on practical and technical skills and issues. This made it difficult to sort pupils' views into the knowledge categories presented within the TPACK framework like we planned, as the pupils did not volunteer information on their teachers' pedagogy or content knowledge. It is possible that other questions could have contributed to other perspectives relevant for the categories in the framework, such as questions specifically designed to examine the different knowledge categories.

Even though the questions did not invite reflections on pedagogy, some glimpses of the pupils' perceptions on pedagogical competence when dealing with technology in classrooms were uncovered, particularly concerning the potential for distractions when

adding digital technology to the classroom, as well as the teachers' methods for dealing with such disruptions. The pupils made astute observations on their teachers' ability to maintain order in technology-rich classrooms, as well as how the technology could help teachers organise lessons and assessments. These observations could have been difficult to spot if we had not founded our analysis in the TPACK framework.

Still, the data analysed were not clear enough to place the pupils' responses in the framework, apart from the responses given on the questions about their teachers' technical skills and some observations on pedagogy. Three other frameworks also were considered, as described in Chapter 2:

Theory and frameworks for analysis, but neither of them would have suited the responses in the study either. This made us think that it is possible that we need something we do not have to structure and describe the pupils' perspectives on their teachers' digital competence in a framework. Although some of the pupils studied in this thesis occasionally indicated that they had thoughts on pedagogy and content, it became apparent that these are concepts children might not have the linguistic ability to explain or reflect upon. Furthermore, these knowledge categories might be less visible to the pupils. This should be considered when designing further research on the topic. If an adapted framework were to be designed, TPACK could be a good point at which to start. However, such a framework should consider the concepts of teaching that are visible and relevant to the pupils, as well as their motivation and interests.

To sum up, we have learned that a framework designed to assess teachers' digital competence from an adult perspective is not a perfect fit when describing teachers' digital competence through the eyes of children. However, questions designed specifically for using the TPACK framework could lead to different and more apt results.

5.5 Limitations

In new or different settings, several choices could have been made to change the outcome of this thesis. To research the pupils' perspectives on their teachers' digital competence in more depth, and within structure of the TPACK framework, we could have developed an interview guide with more targeted questions. This could have provided better and more in-depth insights, and more opportunities for the pupils to reflect on various aspects of their teachers' digital competence beyond purely technical aspects.

It could have been interesting to compare the answers from seventh and eighth grade to a larger extent to determine whether and how the pupils' views might change during this transition. However, the semi-structured form and slight variations in the interview guide did not make all the questions relevant to this thesis directly comparable, although this was attempted when the opportunity presented itself.

Something that could have changed the outcome of the thesis drastically is if a different framework had been chosen. We could have spent more time searching for appropriate frameworks or evaluating the possibilities within the frameworks in more depth. In other words, it is possible that another framework could have been a better match, which would have altered the structure of the analysis and possibly our biases and subliminal expectations.

Other data collection methods could have provided different types of answers. A questionnaire could have provided quantitative data that could have been used to develop a more in-depth interview guide on this topic.

Our access to this rich data set has been both a blessing and a curse, as we constantly have had to debate what to include and what to exclude, i.e., what is relevant and what is not. The relevance might even have shifted during the process, forcing us to engage in a continuous dialogue between ourselves, our supervisors and the data. In these interview transcripts lie a million different outcomes, and several aspects that we have not had the time to investigate further. This thesis is in no way a full picture of either the research question or the data set, and therein lies one of the greatest possible weaknesses – the possibility that we missed something crucial.

5.6 Implications

Through this thesis, we endeavoured to increase awareness of the importance of the pupils' perspectives in school research, specifically in relation to digital technology. As a teacher and educational researcher, it is important to be aware of pupils' attitudes, wishes and vexations, so as not to deem the pupils as passive recipients of knowledge, but rather as critical and reflective individuals with their own thoughts, opinions and experiences.

The pupils seem to think that the teachers are good enough, but it is still important to ensure that the teachers are competent in the digital tools they are using, so the pupils can be supported when they are learning how to manage the digital landscape. The pupils appreciated that the technology simplifies learning, and that the increased independence

that comes with digital learning frees up time for the teacher to help them with deeper issues.

5.7 Areas for further research

This thesis raised more questions than it answered. First and foremost, the aforementioned lack of a framework for structuring pupils' views on their teachers' digital competence could be a particularly interesting field of study. Developing such a framework could be beneficial for future research on the topic.

The pupils' perspective provides valuable insights into what the pupils view as important. More research in this field would be pertinent. In this respect, the DigiGen project's focus on elevating pupils' voice in international research truly is inspiring.

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Appendix A Interview guide: Grade 7

Mars 2021

Bruksanvisning:

Intervjuguiden (er ment å fungere som et rammeverk som intervjueren skal referere til under intervjuet. Den fungerer derfor som en veiledning for intervjueren, selv om den ikke er hugget i stein. Intervjuguiden lister opp en rekke temaer og tilsvarende spørsmål som anses som viktige for å utforske hovedforskningsspørsmålet. Hvordan og hvilke spørsmål som faktisk diskuteres, avhenger av gangen i intervjuet, som er nøye instruert av intervjueren, men som samtidig gir rom for at intervjuobjektet uttrykker seg fritt.

- Du trenger ikke å holde deg til rekkefølgen

- Du må følge resonnementet til barna og de unge gjennom intervjuet og bygge videre på svarene barna / ungdommen gir.

- Still grundige spørsmål (foreslå valgfrie spørsmål i kolonne tre og fire). Husk å alltid prøve å oppmuntre barn og unge til å fortelle deg mer og å gi deg beskrivende eksempler (individuell oppfølging / inngående spørsmål, der det er aktuelt)

Ekstraordinære tider krever ekstraordinære tiltak:

Det er ikke mulig å forutsi hvordan COVID-19-pandemien vil utvikle seg og hvordan skolehverdagen vil bli påvirket ytterligere.

Siden vi er inne i en ekstraordinær situasjon, må vi gjøre ekstraordinære tiltak i WP5s forskning om 'digital teknologi i utdanning' og tilpasse vår intervjuguide så langt som mulig:

- Intervjuguiden, som uansett skal forstås fleksibelt, må håndteres enda mer sensitivt av intervjueren.
- Få informasjon på forhånd om hvordan skolen er organisert på det tidspunktet intervjuet skal finne sted (f.eks. Hybrid undervisning, fjernundervisning, undervisningen i klassen).
- spør barn og unge om den aktuelle skolesituasjonen i begynnelsen av intervjuet (og sjekk med informasjon samlet inn på forhånd). Den videre forløpet av samtalen dannes på dette grunnlaget.
- I seksjon 'C' (blå seksjon) gir intervjuguiden støtte for å stille spesifikke inngående spørsmål på bakgrunn av 'fjernundervisning'. I dette tilfellet kan du vurdere de spesielle inngående spørsmålene markert med rødt (fjerde kolonne). For skole organisert som (fysisk) tilstedeværelse, bør de svarte inngående spørsmålene vurderes.
- Bortsett fra det, formuleres spørsmålene så åpent som mulig for å fungere som veiledende, uavhengig av hvordan skolen for tiden er organisert og det skal gis rom for at forskeren kan være fleksibel i å reagere på barnets svar, og stille oppfølgingsspørsmål-

Mål for WP5

A	Introduksjon	Objektiv

A-00	**Oppvarming** **(Småprat innledningsvis for å skape god stemning)**	

A-01	*Hei Hva heter du? Hvordan har du det?* *Takk for at du er villig til å bli intervjuet. Mitt navn er____ og jeg er fra OsloMet. Sammen med åtte europeiske land gjennomfører vi et forskningsprosjekt om den digitale generasjonen og deres syn på fremtiden. Vi prøver å lære av barn og unge (som deg) hvordan dere føler at dere er forberedt på livet i et digitalt samfunn . I dag - som du allerede vet - er jeg her for å lære av deg og for å forstå hvordan du tror du er forberedt på fremtiden i et digitalt samfunn . Temaet vårt for intervjuet vil være digital teknologi og dens rolle i læring og skolehverdagen. Men det ville være flott om du først kunne presentere deg selv.* *[På dette punktet lar vi først barna snakke om seg selv før vi begynner med de innledende spørsmålene. Disse spørsmålene er valgfrie. De hjelper bare med å introdusere samtalen og skape avslappet atmosfære.]*		Introduksjon
A-02	Hvor gammel er du?		Introduksjon
A-03	Hvilken klasse går du i?		Introduksjon

A-04	Kan du fortelle meg noe om hva slags fritidsaktiviteter du har?		Introduksjon
A-05	Har du allerede en ide om hva du vil bli en dag (yrke / drømmejobb)?	Oppfølgings**spørsmål:** Kan du nevne arbeidsområdet eller interesseområdet du vil se deg selv i fremtiden? Hvilket yrke har du i tankene?	Introduksjon
A-06	Fortell oss hvordan skoledagen din ser ut for øyeblikket?	Oppfølgings**spørsmål:** **Hvor lenge har du hatt undervisning delvis på nettet eller bare hjemmeskole eller er du tilbake på skolen?** Hva synes du om det?	Introduksjon
B	**Introduksjon til digitale verktøy**		
B-01	Som allerede sagt vil vi fokusere på temaet digital teknologi og enheter i forbindelse med skole og læring. Når vi snakker om digital teknologi og enheter, kan dette referere til forskjellige ting som: smarttelefoner, stasjonære datamaskiner, bærbare eller bærbare datamaskiner, (netbook-	Oppfølgings**spørsmål:** Beskriv en typisk dag med digital teknologi? [**henvis til barnas beskrivelser**, og hvis det er rom for det, be om spesifikke eksempler på hvordan og hvilke digitale verktøy brukes (hva barn og unge gjør på nett eller på mobiltelefonene), favorittaktiviteter osv.]	Introduksjon

	datamaskiner) eller nettbrett. Er du kjent med noen av disse tingene, eller bruker du noen av disse regelmessig?			
B-02	Hva er det siste du gjorde på nettet i dag før dette intervjuet startet?	[Bare et oppvarmingsspørsmål å stille inn]		Introduksjon
C	**Bruk av digital teknologi i utdanning og relevans for barn og ungdoms bakgrunn**			**WP5-1**
C-01	Når du tenker på skolehverdagen din, hva slags digitale enheter kommer du til å tenke på? OBS!: Avhengig av om barnet er i en fjernundervisningsfase, kan du stille spesifikke inngående spørsmål.	**Oppfølgingsspørsmål:** Hva slags digitale enheter har du på skolen? Kan du fortelle oss om de digitale enhetene du har tilgang til utenfor skolen og som du bruker til skolerelaterte formål?	**Dybdespørsmål:** Hva slags digitale enheter har du hjemme til skolearbeid?	WP5-1.1
C-02	Når du tenker på skoledagen din, hva slags programmer / apper tenker du på? **OBS!:** Avhengig av om barnet er i en	**Oppfølgingsspørsmål:** Hva slags programmer / apper har du på skolen? Kan du fortelle oss om programmene / appene du har	**Dybdespørsmål:** Hva slags programmer / apper har du hjemme til skolearbeid?	

	fjernundervisningsfase, kan du stille **dybde spørsmål**.	tilgang til utenfor skolen for skolerelaterte formål?		
	Merk følgende: Takk for innsikten om hvilke enheter og hvilke programmer / apper du bruker i og til skolearbeid Vil vi bruke begrepet "digital teknologi" i fortsettelsen for å referere til alle disse enhetene og alle slags programmer / apper vi har snakket om.			
C-03	Beskriv hvordan du bruker digital teknologi i skolehverdagen din. **OBS!:** Avhengig av om barnet er i en fjernundervisningsfase, kan du stille spesifikke inngående spørsmål.	**Oppfølgingsspørsmål:** Hva slags digital teknologi bruker du **på skolen**? Hvordan bruker du dem? Til hva? Hvilken bruker du oftere og hvilke mindre? _____ Hva slags digital teknologi bruker du utenfor skolen til skolearbeid? Hvordan bruker du den? Til hva? Hvilken bruker du oftere og hvilke mindre?	**Dybdespørsmål:** Hva slags digital teknologi bruker du hjemme for skolearbeid? Hvordan bruker du den? Til hva? Hvilken bruker du oftere og hvilke mindre?	WP5-1.2

C-04	Kan du beskrive hvordan bruken av digital teknologi hjelper deg mest i skolehverdagen?	**Oppfølgingsspørsmål:** Beskriv hvordan bruken av digital teknologi hjelper deg **på skolen**? Kan du gi et eksempel på hvordan digital teknologi hjelper deg på skolen? _____ Beskriv hvordan bruken av digital teknologi hjelper deg til skolerelaterte formål **utenfor skolen**? Kan du gi et eksempel på hvordan digital teknologi hjelper deg med skolearbeid når du er utenfor skolen?	**Dybdespørsmål:** Beskriv hvordan bruken av digital teknologi hjelper deg med skolearbeid når du er hjemme? Kan du gi et eksempel på hvordan digital teknologi hjelper deg med skolearbeid når du er hjemme?	WP5-1.2

C-05	Når du står fast – ikke kommer deg videre med skolearbeid, hvem hjelper deg?	**Oppfølgingsspørsmål:** (Avhengig av nåværende situasjon, spør hvem støtter eleven hjemme/på skolen)**:** Kan du gi et eksempel? Hvordan støtter/hjelper de deg med tekniske ting? Hvordan støtter/hjelper de deg med lekser? (learning issues) Hvordan støtter/hjelper de deg med fagene? (subject issues content related?)	WP5-1.2

D	**Identifiser relevansen av overgangsfaser i utdanningen**			**WP5-2**
D-01	Har du hatt noen problemer med å bruke digital teknologi til skolearbeid? (dette spørsmålet har vi endret noe fra den engelske versjonen for å skille mellom C03, C04 og D01)	**Oppfølgingsspørsmål:** Kan du gi et eksempel? Hva føler du om det? Kan du beskrive noen av de problemene eller utfordringene du har hatt? problematiske erfaringer eller utfordringer med å bruke digital teknologi til læringsformål? _____ Kan du forestille deg at andre barn har problemer eller utfordringer med å bruke digital teknologi til skolearbeid? Kan du gi et eksempel? Kan du forestille deg hvordan andre barn har det?		WP5-2.1
D-02	Kan du fortelle meg på om du snakker med klassekamerater og lærere om utfordringer ved å bruke digital teknologi?	**Oppfølgingsspørsmål:** Hvilke farer / risikoer knyttet til bruk av digital teknologi har du snakket med lærerne og klassekameratene dine om? [Hvis mulig, referer til barnets negative erfaringer og eksempler. Hvis barnas fortellinger indikerer det, kan vi gjerne fortsette med aspekter av digital dømmekraft] Om noen måneder vil du starte i ungdomsskolen. Kan du beskrive hvordan du forestiller deg at det blir ?		WP5-2.1

D-03	Fortell meg, hva du liker ved å bruke digital teknologi til skolerelaterte formål, og hvorfor?	**Oppfølgingsspørsmål:** Kan du beskrive i hvilket fag du spesielt liker å bruke digital teknologi? Hvorfor? *[Kanskje ikke bare bruk i klassen, men også på skolen generelt (samarbeid/kommunikasjon med lærere og klassekamerater osv., også for vurdering, hjemmeoppgaver)]*	WP5-2.2
D-04	Fortell meg, hva du ikke liker (liker minst) ved å bruke digital teknologi til skolerelaterte formål?	**Oppfølgingsspørsmål:** Kan du forklare hvorfor?	WP5-2.2
D-05	Hva slags digital teknologi anser du som typisk for barneskolen du går på?	**Oppfølgingsspørsmål:** Om noen måneder vil du starte på ungdomsskolen Kan du forestille deg hva av digital teknologi som vanligvis brukes der?	WP5-2.2
E	**Evaluering av læreres syn av barn og unge**		
E-01	Kan du fortelle meg hvordan lærerne dine er forskjellige når det gjelder bruken av digital teknologi?	**Oppfølgingsspørsmål:** Fortell meg mer om hvorfor du har dette inntrykket? Kan du gi et eksempel? _____ Tror du lærerne dine liker å bruke digital teknologi til undervisning og læring? (er det forskjeller mellom ulike faglærere)? Hvorfor tror du det? Hvorfor ikke? Kan du gi et eksempel?	WP5-3.1

E-02	Er lærerne flinke til å bruke digital teknologi?	**Oppfølgingsspørsmål:** Fortell meg litt mer hvorfor du mener det? Kan du gi et eksempel?	WP5-3.1
E-03	Kan du beskrive hvordan lærerne dine støtter læringen din når dere bruker digital teknologi?	**Oppfølgingsspørsmål:** Kan du gi et eksempel? Støtter de deg når du opplever tekniske problemer? Hvordan støtter de deg når du har problemer med å forstå ting (både læringsprosess og faginnhold)?	WP5-3.1
F	**Forstå problemer med langsiktige effekter**		
F-01	Hvordan bruker du internett når du skal lære noe?	**Oppfølgingsspørsmål:** Kan du gi et eksempel? Hvordan hjelper bruk av internett deg å lære? Kan du lære noe fra / gjennom bruk av internett?	WP5-4.1
F-02	Kan du forklare hvordan internett påvirker motivasjonen din til å gjøre skolerelaterte aktiviteter?	**Oppfølgingsspørsmål:** [*Be om nødvendig om spesifikke eksempler på motivasjon for å lære enda mer, få bedre karakterer, fullføre oppgaver, nå læringsmål*] Kan du uttrykke dette i poeng? 1 = ikke mye; 10 = veldig mye Hvorfor? Kan du forklare valget ditt? Så, fortell meg, hva må endres for at du skal rangere det høyere?	WP5-4.1
G	**Forstå barn og unge menneskers synspunkter og deres innvirkning**		WP5-5

G-01	I begynnelsen av samtalen din fortalte du meg at en dag vil du bli _____ / gjøre noe med_____. På hvilken måte tror du at bruk av digital teknologi vil være viktig for deg å nå målet ditt?	**Oppfølgingsspørsmål:** Hvorfor er digital teknologi viktig eller hvorfor ikke? Hva er det avhengig av? [*Gjør om mulig en konkret referanse til ønsket yrke, slik at barnet bedre kan forestille seg det du følger opp samtalen*.]	WP5-5.1
G-02	Hvordan føler du at skolen hjelper deg med å lære ting om digital teknologi som vil være nyttig for deg senere, kanskje til og med i drømmejobben din?	**Oppfølgingsspørsmål:** Hva synes du om din egen bruk av digital teknologi? Fortell meg, hvordan vil du rangere hvor **flink** du er i å bruke digital teknologi? Relatert til dette, kan du fortelle meg om ting du vil lære mer om bruk av digital teknologi? Kan du gi et eksempel?	WP5-5.2
H	**COVID-19 relaterte spørsmål**		
H-01	De siste månedene har COVID-19-pandemien hatt sterk innflytelse på utdanning/læring i skolene. Når du tenker på det siste året ditt på skolen, hva er de første ordene du kommer på når du blir bedt	**Oppfølgingsspørsmål:** Hva gjorde det så kjedelig / stressende / utfordrende / spennende / fruktbart? Kan du beskrive hvordan fjern- / hybrid undervisning ble organisert / fungerte for deg?	COVID-19 Add-On

	om å beskrive det, og hvordan du følte det?		
H-02	Kan du beskrive hvordan COVID-19 har endret bruken av digital teknologi for skolegang?	**Oppfølgingsspørsmål:** Hva føler du om det?	COVID-19 Add-On
I	**Spørsmål om ønsker // Åpent spørsmål / Avsluttende ord**		
I-01	Om noen måneder vil du starte på en ny skole / ungdomsskolen Hva forventer du?		Transition
I-02	Hvis du kunne komme med tre ønsker knyttet til digital teknologi i skolen - hva ville de være?		Closing
I-03	Nå er jeg ferdig med spørsmålene mine. Vil du legge til noe, eller er det noe du vil legge til?		Closing

I-04	Tusen takk for det flotte intervjuet. De siste spørsmålene er noen bakgrunnsspørsmål. **Nå vil jeg avslutte opptaket.**		Closing
J	**Spørsmål til barn og unges bakgrunn** **OBS: For å unngå å registrere personlige data på bånd, kan innspillingen stoppes her og informasjonen dokumentert på dokumentasjonsarkene som er gitt for dette formålet.**		
J-01	I hvilket land ble du født?	Fødselsland barn:	Bakgrunn
J-02	Ble foreldrene dine født i samme land som deg? Hvis ikke: I hvilket land ble foreldrene dine født?	Mor (foresatt 1): Far (foresatt 2):	Bakgrunn
J-03	Hvilket språk snakker du mesteparten av tiden hjemme?		Bakgrunn
J-04	Hvilket språk eller språk snakker du med vennene dine?		Bakgrunn

J-05	Kan du gjette hvor mange bøker du har hjemme?	Merk: Intervjuer viser bokhyllene (se figur vedlagt) OBS: Be i tillegg om digitale alternativer (som digitale bøker).	Bakgrunn
J-06	Jobber foreldrene dine eller foresatte i en lønnet stilling?	Merk: Intervjuer sorterer yrkene i henhold til HISEI-kodingen (Hvis informasjonen fra barna og de unge ikke er klar, spør om nødvendig) Mor (foresatte 1): Far (foresatte 2):	Bakgrunn
	Tusen takk for dette supre intervjuet. For det neste intervjuet ser vi hverandre igjen til høsten, og vi gleder oss veldig til å høre om hvordan du har det på ungdomsskolen		

Indikator for kulturell kapital

For å få informasjon om barnas kulturelle bakgrunn, vil vi bruke indikatoren for bøker hjemme. Vi vil foreslå å integrere spørsmålet i intervjuet - da det alltid har fungert bra i studier som TIMSS, PIRLS og PISA - for å kunne vurderes internasjonalt.

Vi har endret spørsmålet til en mer detaljert formulering og også tatt med en tilsvarende illustrasjon (nedenfor).

Figur: bokhyller

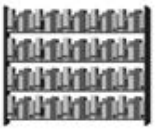
About how many books are there in your home? (Do not count magazines, newspapers, or your school books.)

*Fill **one** circle only.*

None or very few (0–10 books) -- ○ This shows 10 books

Enough to fill one shelf (11–25 books) -- ○ This shows 25 books

Enough to fill one bookcase (26–100 books) -- ○ This shows 100 books



Enough to fill two bookcases (101–200 books) -- ○ This shows 200 books

Enough to fill three or more bookcases (more than 200) -- ○ This shows more than 200 books

(IEA, 2015)

Appendix B Interview guide: Grade 8

November 2021

Bruksanvisning:

Intervjuguiden (er ment å fungere som et rammeverk som intervjueren skal referere til under intervjuet. Den fungerer derfor som en veiledning for intervjueren, selv om den ikke er hugget i stein. Intervjuguiden lister opp en rekke temaer og tilsvarende spørsmål som anses som viktige for å utforske hovedforskningsspørsmålet. Hvordan og hvilke spørsmål som faktisk diskuteres, avhenger av gangen i intervjuet, som er nøye instruert av intervjueren, men som samtidig gir rom for at intervjuobjektet uttrykker seg fritt.

- Du trenger ikke å holde deg til rekkefølgen

- Du må følge resonnementet til barna og de unge gjennom intervjuet og bygge videre på svarene barna / ungdommen gir.

- Still grundige spørsmål (foreslå valgfrie spørsmål i kolonne tre og fire). Husk å alltid prøve å oppmuntre barn og unge til å fortelle deg mer og å gi deg beskrivende eksempler (individuell oppfølging / inngående spørsmål, der det er aktuelt)

Instructions:

The guideline developed jointly by DigiGen researchers in advance is intended to serve as a **framework** to which the interviewer should refer to during the interview. It therefore serves as a **guide for the interviewer**, though it is not set in stone. The guideline lists a number of topics and corresponding questions considered important in order to explore the main research question. How and which questions are actually discussed depends on the individual course of the interview, which

is carefully directed by the interviewer but at the same leaves **room for the interviewee** to express him-/herself freely.

- You don't have to stick to the order, be prepared and **flexible.**

- You need to follow the lead of the children and young people through the interview and build on the answers of the children/young people.

- Please ask in-depth questions (suggested optional questions in column three and four). Keep in mind to always try to encourage the children and young people to tell you more and to give and descriptive examples (individual follow-up/ in depth questions, where appropriate)

Notes on the *after transition* focus:

As agreed, the *before* and *after transition* guides are basically structured in the same way to **ensure comparability** for us and also to **serve as a structure for our narrative reports**. However, follow the lead of the participant and please **pay close attention to the in-depth questions** and **take several opportunities to ask if there have been any changes since the last interview** you've had with that participant (before transition).

Ekstraordinære tider krever ekstraordinære tiltak:

Det er ikke mulig å forutsi hvordan COVID-19-pandemien vil utvikle seg og hvordan skolehverdagen vil bli påvirket ytterligere.

Siden vi er inne i en ekstraordinær situasjon, må vi gjøre ekstraordinære tiltak i WP5s forskning om 'digital teknologi i utdanning' og tilpasse vår intervjuguide så langt som mulig:

- Intervjuguiden, som uansett skal forstås fleksibelt, må håndteres enda mer sensitivt av intervjueren.
- Få informasjon på forhånd om hvordan skolen er organisert på det tidspunktet intervjuet skal finne sted (f.eks. Hybrid undervisning, fjernundervisning, undervisningen i klassen).
- spør barn og unge om den aktuelle skolesituasjonen i begynnelsen av intervjuet (og sjekk med informasjon samlet inn på forhånd). Den videre forløpet av samtalen dannes på dette grunnlaget.
- I seksjon 'C' (blå seksjon) gir intervjuguiden støtte for å stille spesifikke inngående spørsmål på bakgrunn av 'fjernundervisning'. I dette tilfellet kan du vurdere de spesielle inngående spørsmålene markert med rødt (fjerde kolonne). For skole organisert som (fysisk) tilstedeværelse, bør de svarte inngående spørsmålene vurderes.
- Bortsett fra det, formuleres spørsmålene så åpent som mulig for å fungere som veiledende, uavhengig av hvordan skolen for tiden er organisert og det skal gis rom for at forskeren kan være fleksibel i å reagere på barnets svar, og stille oppfølgingsspørsmål-

Extraordinary times call for extraordinary measures:

It is not possible to predict how the COVID-19 pandemic will develop and how school life will be further impacted. As this is an extraordinary situation, we have to take extraordinary measures in WP5's research on 'ICT in education' and adapt our interview guidelines as far as possible:

- The guideline, which is to be understood **flexibly**, must be handled even more sensitively by the interviewing researcher.
- Get information in advance about how school is organised at that time in that place (e.g. hybrid formats, distance learning, in class teaching).
- Ask children and young people about the current school situation at the beginning of the interview (and check with information gathered beforehand). The further course of the conversation is formed on this basis.
- In section 'C' (blue section), the guideline offers support to ask specific in-depth questions against the backdrop of 'distance learning'. In this case, please consider the special in-depth questions highlighted in red (fourth column). For school organised as (physical) presence, the black in-depth questions should be considered.
- Apart from that, questions are phrased as openly as possible in order to serve as a guide, irrespective of how school is currently organised and leaving room for the researcher to be flexible in reacting to the child and asking follow-up questions to go along with the child's responses.

Objectives of WP5

1. Research use of ICT in education and understand children and young people's backgrounds' relevance

1.1 Assess how ICT is used in different settings in before and after transition

1.2 Establish an understanding of which children and young people's with which socioeconomic characteristics and cultural backgrounds profit, and which educational settings have the potential to support children and young people of vulnerable groups (e.g. children and young people's background)

2. Identify the relevance of transition phases in education

2.1 Identify what children and young people in different transition phases consider as threats (risks) in terms of their own ICT use and how the schools can address these threats

2.2 Identify what children and young people consider as the main potential of ICT use in different transition phases and how their school contributes to that

3. Evaluating teachers' views by children and young people's

3.1 To give children and young people the opportunity to evaluate their teachers' and schools' views and their capacity and readiness to support the younger generation in preparing them adequately for the digital age.

4. Understand long-term effect issues

4.1 Understand the long-term effects of the availability of the Internet on cognitive skills.

5. Comprehend children and young people's views and their views' impact

5.1 Comprehend how children and young people at different ages rate and assess the value of their education as a part of preparing for adult life, and for developing their own way of living and working in the digital age

5.2 Examine whether there are differences in the way children and young people from different backgrounds assess their education and the extent to which the latter influences their perspectives
6. Explore the impact of the COVID-19 pandemic 6.1 Understand how COVID-19 has an impact on teaching and learning with ICT 6.2 Understand how far COVID-19 impacts attitudes towards ICT in teaching and learning.

A	Introduction	Objective

A-00	**WARM UP – ICE BREAKING SECTION** **(First informal exchange to create a friendly atmosphere and taking up starting situation)**	
A-01	**Hvis det har vært en overgang mtp skolebytte [If there has been a transition in form of a school change]:** Hei, hyggelig å se deg igjen, Hvordan går det Takk for at du ville stille opp til intervju igjen, det er flere måneder siden vi snakket sammen. Jeg gleder meg til å høre om hvor godt du føler at du er forberedt for det digitale samfunnet. *Vi prøver å lære av barn og unge for å forstå hvordan du tror du er forberedt på fremtiden i et digitalt samfunn. Det er viktig å lære hvor godt de nye lærerne og den nye skole forbereder deg for fremtiden og å finne ut hva slags forskjeller det er fra før og etter overgangen til nye skole. Før vi setter i gang,* ***kan du fortelle litt om hvordan du synes det er på den nye skolen din?*** **If there has been a transition in form of a school change:** Hei, hyggelig å se deg igjen. Hvordan går det med deg? Takk for at du takket ja til å bli intervjuet igjen. Vi (eller noen av mine kolleger) snakket sammen for flere måneder siden. Jeg er veldig glad for at vi møtes igjen i dag for å snakke om hvor godt forberedt du føler deg å delta i et digitalt samfunn. Jeg er veldig spent på å høre hvordan det går på den nye skolen og hva slags forskjeller du har oppdaget med tanke på digital teknologi sammenlignet med sist vi snakket. Før vi starter, vil jeg gjerne vite helt generelt hvordan du har det på den nye skolen din? **If there has been a transition of class, but not in form of a school change:**	Introduction

	Hi. How are you? Thank you for agreeing to be interviewed again. We talked several months ago. I am very happy that we are meeting again today to talk about how well prepared you feel for life in the digital age. You are now attending a new class and you probably have new teachers as well. So, I am happy to about changes you experienced, but first of all about how you feel. *[At this point, we first let the children talk about their experiences and impressions before we start with the introductory questions. The introductory questions are optional questions. They only help to introduce the conversation and create a relaxed atmosphere.]*		
A-02	Hvordan liker du den nye klassen/skolen?		Introduction
A-03	Hva er annerledes nå (sammenlignet med skolen du gikk på i fjor)?		Introduction
A-04	Hvilke(t) er favoritt fag(ene) ditt/dine?		Introduction
A-05	Forrige gang snakket vi om planer for fremtiden, som for eksempel om du har en ide om hva slags jobb du kan tenke seg. Har du fortsatt	Hva slags type arbeid eller interesse har du og ser for deg å drive med i fremtiden? (Hvilke jobb/profesjon tenker du på?)	Introduction

	samme ideer eller har du nye tanker?			
A-06	Kan du beskrive en typisk dag på skolen?			Introduction
B	**Introduction ICT** [Just a warm up question to tune in - **an icebreaker**]			
B-01	Som allerede sagt vil vi fokusere på temaet digital teknologi og enheter i forbindelse med skole og læring. Når vi snakker om digital teknologi og enheter, kan dette referere til forskellige ting som: smarttelefoner, stasjonære datamaskiner, bærbare eller bærbare datamaskiner, (netbook-datamaskiner) eller nettbrett.			Introduction
B-02	Hva er det siste du gjorde på nettet i dag før dette intervjuet startet?			Introduction
C	**Use of ICT in education and children and young people's backgrounds' relevance**			**WP5-1**
C-01	Når du tenker på skolehverdagen din, hva slags digitale enheter tenker du på? OBS!: Avhengig av om barnet er i en fjernundervisningsfase, kan du stille spesifikke	**Oppfølgingsspørsmål:** Hva slags digital teknologi har du <u>på skolen</u>? Kan du fortelle oss hvilke teknologi du har tilgang til <u>utenfor skolen</u> som du bruker for skolerelaterte ting?	Specific in-depth question: What kind of digital devices do you have at home for school?	WP5-1.1

	oppfølgings eller dypdespørsmål.	Could you tell us about the digital devices you have **outside** school for school-related purposes?		
C-02	Når du tenker på skoledagen din, hva slags programmer / apper tenker du på? **OBS!:** Avhengig av om barnet er i en fjernundervisningsfase, kan du stille **dybde spørsmål**.	**Oppfølgingsspørsmål:** Hvilken programmer/apper har du tilgang til på skolen? Kan du fortelle oss hvilken programmer/apper du har utenfor skolen til skolerelaterte formål? Merker du forskjeller på (undervisningstimene) nå sammenlignet med barneskolen	Specific in-depth question: What kind of programs/apps do you have at home for school?	
	Takk for innsikten om hvilke enheter og hvilke programmer / apper du bruker i og til skolearbeid Vil vi bruke begrepet “digital teknologi” i fortsettelsen for å referere til alle disse enhetene og alle slags programmer / apper vi har snakket om.			

C-03	Kan du beskrive en typisk skolehverdag hvor du bruker digital teknologi? **OBS!:** Avhengig av om barnet er i en fjernundervisningsfase, kan du stille spesifikke inngående spørsmål.	**Oppfølgingsspørsmål:** Hva slags teknologi har du **på skolen** Hvordan bruker du den og til hva? Hva bruker du oftest/sjeldnest? Kan du beskrive en time når du jobbet med digital teknologi på skolen? Er dette noe av det samme som du gjorde på barneskolen? Hva slags teknologi har du **utenfor skolen** til skolerelaterte ting? Hvordan bruker du den og til hva? Hva bruker du oftest/sjeldnest? Kan du beskrive en time når du jobbet med digital teknologi på skolen? Er dette noe av det samme som du gjorde på barneskolen?	Specific in-depth questions: What kind of digital technology do you use at home for school? How are you using it? What for? Which do you use more often and which less?	WP5-1.2

C-04	Kan du beskrive teknologien som hjelper deg mest på skolen?	**Oppfølgingsspørsmål:** Kan du beskrive hvordan teknologien hjelper deg på skolen? Kan du gi eksempel på hvordan teknologien hjelper deg **på skolen?** Kan du beskrive hvordan teknologien hjelper deg med skolerelaterte gjøremål **utenfor skolen**? Kan du gi eksempel på hvordan teknologien hjelper deg med skolerelaterte gjøremål **utenfor skolen?**	Specific in-depth questions: Please describe how the use of digital technology helps you at home for school? Can you give an example of how you benefit from the use of digital technology at home for school?	WP5-1.2
C-05	Når du står fast – ikke kommer deg videre med digital teknologi, hvem hjelper deg?	**Oppfølgingsspørsmål:** (Depending on the current situation, ask who helps/supports at home/at school)**:** Kan du gi eksempel? Hvordan blir du hjulpet mtp tekniske problemer, læringsrelaterte og faglige temaer?		WP5-1.2

D	**Identifiser relevansen av overgangsfaser i utdanningen** **Identify the relevance of transition phases in education**		**WP5-2**
D-01	Hvordan håndterer du å bruke digital teknologi til skolearbeid?	**Oppfølgingsspørsmål:** Kan du gi eksempel? Hvor enkelt er det for deg å bruke digital teknologi som du ikke kjenner fra før eller har ikke brukt før? Opplever du at du løser utfordringer som oppstår når du bruker teknologien? Liker du å utforske og bruke nye digitale verktøy eller applikasjoner? Kan du fortelle meg hvis dette har endret seg siden vi snakket siste gang? Tror du andre barn/ungdommer har problemer eller utfordringer å bruke digital teknologi i læringsarbeid (til støtte for læring)? Kan du gi eksempler? Kan du tenke deg hvordan det føles for dem?	WP5-2.1
D-02	Fortell meg, hva du liker ved å bruke digital teknologi til skolerelaterte formål, og hvorfor?	**Oppfølgingsspørsmål:** Kan du beskrive i hvilken fag du spesielt liker å bruke digital teknologi? Har dette endret seg siden vi snakket siste gang? Kan du forklare hvordan og hvorfor?	WP5-2.2

		[ikke bare i undervisningen i klassen, men på skolen generelt for eks. i kommunikasjon med lærer eller til vurdering eller hjemmelekser]	
D-03	Fortell meg, hva du ikke liker (liker minst) ved å bruke digital teknologi til skolerelaterte formål?	**Oppfølgingsspørsmål:** Kan du forklare hvorfor?	WP5-2.2
D-04	Kan du si noe om hvordan du snakker om utfordringer av å bruke digital teknologi med lærere og (medelever/klassen)?	**Oppfølgingsspørsmål:** Hvilken farer/uheldige episoder relatert til bruk av teknologi har du tatt opp med lærer eller klassekammerater? [hvis mulig, referer til barnets negative opplevelser og eksempler] [hvis mulig kan intervjuer følge opp med digital dømmekraft aspekter]	WP5-2.1
D-05	Lærer dere om personvern på skolen - for eks hvordan å beskytte din informasjon, GPS lokasjon, cookies, å lage gode passord, kunnskap om identitetstyveri osv.?		

D-06	Vurderer du hva du bør tenke over når du vil legge ut et bilde eller video av dine venner på nett?	Spør du alltid om tillatelse (hvorfor/hvorfor ikke)? Diskuterer du publisering av bilder med lærerne dine (for eksempel om hva du kan publisere og hvor)	
D-07	Lærer dere eller diskuterer dere (hvordan man skal oppføre seg) på nett på skolen? Og med hvem - klassen, skolevenner, lærere, sosiallærer, helsesøster?	**Oppfølgingsspørsmål:** Har du eller dine medelever opplevd ubehagelig nettbasert aktivitet (trakassering på nett, digital mobbing)? Hvis du eller klassekameratene ville oppleve trakassering eller digital mobbing, hva ville du ha gjort, hvem ville du ha spurt om hjelp?	
D-08	Betyr ordet "opphavsrett" noe til deg?	Når du finner informasjon på nett for skoleoppgaver, er det noe spesielt du tenker på, mtp opphavsrett (eller creative commons) før du deler ressursene med klassekameratene/lærer?	
D-09	Diskuterer dere kildekritikk på skolen? Hvordan vet du om informasjon som du finner på nettet er sann eller usann (sånn type fake news)?		
D-10	Hvis du tenker på skoledagene på barneskolen før du gikk over til	Kan du beskrive forskjellen Hva tenker du om det?	WP5-3.2

	ungdomsskolen, kan du fortelle om bruk av digital teknologi er den samme på den nye skolen?	Kunne teknologi gjort overgangen til ungdomsskolen bedre på noen som helst måte? *[Hvis ja, spør hvilke teknologi ble brukt og til hva. Kanskje du kan få eksempel også]*	

E	**Evaluering av læreres syn av barn og unge** **Evaluating teachers' views by children and young people**		
E-01	Hvordan bruker dine lærere digital teknologi?	**Oppfølgingsspørsmål:** Fortell meg mer om hvorfor du har dette inntrykket? Fortell meg litt mer om hvorfor du sier dette: legger du merke til at lærerne bruker teknologien annerledes enn lærerne på barneskolen? Kan du gi eksempel på dette? _____ Tror du lærerne dine liker å bruke digital teknologi til undervisning og læring? (er det forskjeller mellom ulike faglærere)? Hvorfor tror du det? Hvorfor ikke? Kan du gi et eksempel?	WP5-3.1
E-02	Er det noe forskjell i hvordan lærerne i år bruker digital teknologi kontra lærerne på skolen du gikk på i fjor?		WP5-4.1
E-03	Er lærerne flinke til å bruke digital teknologi?	**Oppfølgingsspørsmål:** Fortell meg litt mer hvorfor du mener det? Kan du gi et eksempel?	WP5-3.1

E-04	Kan du beskrive hvordan lærerne dine støtter læringen din når dere bruker digital teknologi?	**Oppfølgingsspørsmål:** Kan du gi et eksempel? Støtter de deg når du opplever tekniske problemer? Hvordan støtter de deg når du har problemer med å forstå ting (både læringsprosess og faginnhold)? Har dette endret seg noe fra sammenlignet med når du gikk på barneskolen?	WP5-3.1
F	**Forstå problemer med langsiktige effekter** **Understand long-term effect issues**		
F-01	Hvordan bruker du internett når du skal lære noe?	**Oppfølgingsspørsmål:** Kan du gi et eksempel? Hvordan hjelper bruk av internett deg å lære? Kan du lære noe fra / gjennom bruk av internett?	WP5-4.1
F-02	Kan du forklare hvordan internett påvirker motivasjonen din til å gjøre skolerelaterte aktiviteter?	**Oppfølgingsspørsmål:** [*Be om nødvendig om spesifikke eksempler på motivasjon for å lære enda mer, få bedre karakterer, fullføre oppgaver, nå læringsmål*] Kan du uttrykke dette i poeng? 1 = ikke mye; 10 = veldig mye Hvorfor? Kan du forklare valget ditt?	WP5-4.1

		Så, fortell meg, hva må endres for at du skal rangere det høyere?	

G	**Forstå barn og unge menneskers synspunkter og deres innvirkning** **Comprehend children and young people's views and their views' impact**		WP5-5
	Hva tenker du om viktigheten av digital teknologi i hverdagen (i livet ditt)?		
G-01	I begynnelsen av samtalen din fortalte du meg at en dag vil du bli _____ / gjøre noe med_____. På hvilken måte tror du at bruk av digital teknologi vil være viktig for deg å nå målet ditt?	**Oppfølgingsspørsmål:** Hvorfor er digital teknologi viktig eller hvorfor ikke? Hva er det avhengig av? [*Gjør om mulig en konkret referanse til ønsket yrke, slik at barnet bedre kan forestille seg det du følger opp samtalen*.]	
G-02	Hvordan føler du at skolen hjelper deg med å lære ting om digital teknologi som vil være nyttig for deg senere, kanskje til og med i drømmejobben din?	**Oppfølgingsspørsmål:** Er det forskjeller på erfaringene dine på dette sammenlignet med i fjor? Hva synes du om din egen bruk av digital teknologi? Fortell meg, hvordan vil du rangere hvor **flink** du er i å bruke digital teknologi? Relatert til dette, kan du fortelle meg om ting du vil lære mer om bruk av digital teknologi? Kan du gi et eksempel?	WP5-5.2

H	COVID-19 related questions		
H-01	Nå har du hatt erfaringer med ulike måter av/for å lære/bli undervist - som på nett eller blandet (hjemme og på skolen). Hvis du kunne velge, hva liker du best? By now you have had experiences with different modes of teaching and learning, like online classes during distance learning, hybrid classes or in person. If you could choose, what would your favourite mode look like?		
H-02	Forrige gang vi snakket sammen spurte vi om covid 19 og hvordan den har påvirket eller endret skolen/læring. Opplever du at fortsatt endringer på skolen på grunn av COVID-19?	**Oppfølgingsspørsmål:** Hva gjorde det så kjedelig / stressende / utfordrende / spennende / fruktbart? Kan du beskrive hvordan fjern- / hybrid undervisning ble organisert / fungerte for deg? Er det forskjeller på hvordan dette fungerer nå sammenlignet med når du gikk på barneskolen?	COVID-19 Add-On

H-03	Kan du beskrive i hvilken grad covid 19 har endret bruken av digital teknologi på skolen/til læring?	**Oppfølgingsspørsmål:** Hva tenker du om dette?	COVID-19 Add-On

I	Question about wishes//Open question/Closing words	
I-01	Hvis du ønske deg tre ting relatert til digital teknologi på skolen, hva ville det ha vært?	Closing
I-02	Jeg har ikke flere spørsmål. Er du noe du vil legge til?	Closing
I-03	Tusen takk for at du ville delta på intervjuet igjen :)	Closing

Appendix C Transcription key

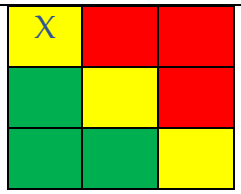
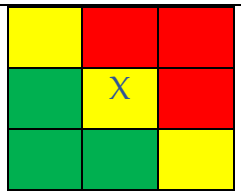
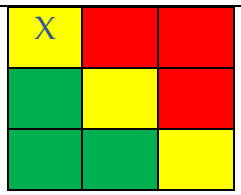
###comment
I: (Interviewer name)
B: (Interviewer)
Research project: DIGIGEN
Navn på video: (Name of videofile)
Lengde: (File length)
Dato for videofil: (Date of videofile)
Dato for transkribering: (Date of transcription)
end###

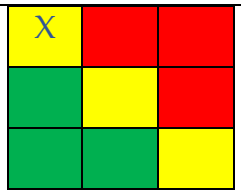
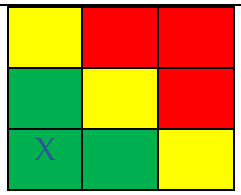
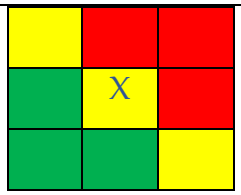
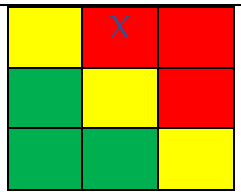
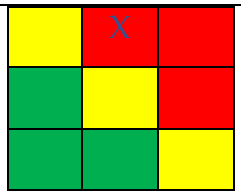
Symbol:	**Meaning:**
#	Unintelligible (cannot understand)
“word	Transcribed words are uncertain
Wor-	Cut of word
…	Pause (not timed)
@	Laugh
Capital	Capitalise for beginning of a new discourse/sentence
<VOX>	Voice of another
<MISC>	Various notations for manner of speeking(excited..)
LINE	One new line for each unit (discourse/sentence)
#Halla	Real name
-Eskil	Name change to preserve anonymity
I:	interviewer
B:	person answering the questions.

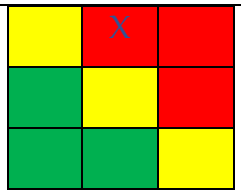
Appendix D Risk and vulnerability analysis

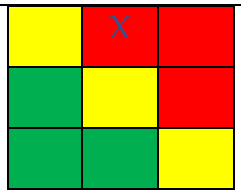
Risk and vulnerability analysis for research projects		
Institution: Oslo Metropolitan University (OsloMet)	**Faculty/Department: Faculty of Education and International Studies**	
Research project: The impact of technological transformations on the Digital Generation (DigiGen)	**Telephone/email: +4745431420 / hallab@oslomet.no**	
Risk Owner/contact person: Halla B. Holmarsdottir		
What risk is assessed: Ethics risks related to GDPR regulations (i.e. data collection, data protection, data processing, etc.)		
Reviewed by: Nina Hestnes **Date:** 27/02/2020	**Section:** Research administration	**Telephone/email:** +4767237076 / ninahe@oslomet.no

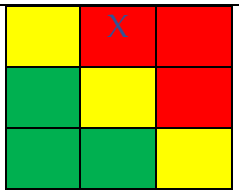
Conditions (risk incident) considered	**Risk element** Tick off	**Risk level (L,M,H)** Probability (horisontal) Consequence (vertical) Put one cross as relevent	**Action needed (Yes/no)**	**Description of measures to reduce risk**

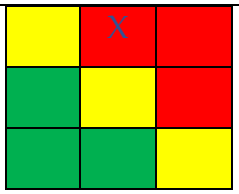
1	Dictaphone is lost on the way back to the office after an interview allowing unauthorized persons access to the information or loss of data.	_X_Confidentiality _X_Intergirty _X_Availabiltiy		Yes	Use the TSD encrypted Dictaphone available on a mobile app. This data is then directly linked up to the TSD server after the interview.
2	Researchers forget encryption password	_X_Confidentiality _X_Intergirty __Availabiltiy		Yes	Consider whether two people should know password. Or the need for an institutional password base and good routines
3	Unwanted disclosure of data	_X_Confidentiality _X_Intergirty __Availabiltiy		Yes	The ethics sub-committee will take appropriate action and professional misconduct will result in withdrawal from the project.

4	Loss or theft of mobile devices.	_X_Confidentiality _X_Intergirty X__Availabiltiy		Yes	Any data collected on mobile devices will immediately be uploaded to the TSD server.
5	Inability for researchers to carry out their assigned tasks.	__Confidentiality __Intergirty X__Availabiltiy		No	
6	Difficulty in recruiting informants for data collection	__Confidentiality __Intergirty X__Availabiltiy		Yes	Go through information and recruitment channels carefully
7	Unintentional changes of raw data (modification)	__Confidentiality X__Intergirty __Availabiltiy		Yes	Raw data in separate folders and work only on copies
8	Data inadvertently stored in a 'cloud'	X__Confidentiality X__Intergirty __Availabiltiy		Yes	Save data on TSD2.0; have good procedures for processing data; go through the routines with the team regularly

9	No sound recordings from interviews	__Confidentiality __Intergirty X__Availabiltiy		Yes	Should teams use two recording devices. Check equipment before the start of the interview

10	Unauthorized persons can recognize information in the file as it is not sufficiently anonymised.	_X_Confidentiality X__Intergirty __Availabiltiy		Yes	Background data of participants collected will include age and gender. The participants will be informed that the signed informed consent will at no time be stored together with the collected data to ensure anonymity. Each participant will receive a code number. Only the person in charge of the study will have a list with names and codes to allow participants to withdraw the data at any point in time during the study. These lists will be in hard copy, (as malware cannot read), and stored in a locked filing cabinet for all

					members of the consortium. These are routine procedures for privacy and data protection.
11	Screencasting of the Minecraft game could include chat logs with other players who have not provided consent.	X_Confidentiality X__Intergirty __Availabiltiy		Yes	Only observe and include screen casting of Minecraft when children build on their own and not directly on servers that are online.

12	Participants using the My View app. capture photos or scenarios of others who have not given consent.	X_Confidentiality X__Intergirty __Availabiltiy		Yes	We will have to provide clear instructions to only capture themselves/their own data. Have screening mechanisms in place by the data controllers that include filtering of data input, deleting material that breaches other individuals' privacy, e.g. photos of friends/classmates etc.

Appendix E Participant Information and Consent Form provided for parents or guardians

Participant Information for Parents/Guardians

Research Project: *'ICT in education'*

Dear Parents/Guardians,

Your child is being invited to take part in the abovementioned research project. Its main purpose is to develop knowledge about how children and young people use and are affected by the technological transformations. The project will be focussing on their education as a main part of their everyday life. In this letter we will give you detailed information about the purpose of the project and what your child's participation would involve. This also means that we would like to inform you about the processing of your child's personal data within the scope of the project, as well as requirements resulting from participating. We ask you to read the document carefully. If your child is interested in taking part in the project and you have agreed to this, we ask you to give your consent to your child's participation in the project 'ICT in education' by signing at the end of document.

Purpose of the project

The technological transformations of our time have profound impacts on the daily lives of children and young people who are consequently called the 'digital generation'. However, it is assumed that the digital revolution is not perceived positively by all children and young people. The project, "The Impact of Technological Transformations on the Digital Generation (DigiGen)", funded by the European Commission, aims to develop an understanding of how and why some children and young people benefit from the use of ICT while others seem to be rather negatively affected. ICT is the abbreviation for **I**nformation and **C**ommunication **T**echnology and refers to all different kinds of digital devices that allow interaction in the digital world we live in. This includes devices such as computers, laptops, tablets, or cell phones, and especially the (wireless) Internet. The use of digital technologies and how children and young people are influenced by them is researched in different sub-projects within the overall project. These sub-projects focus on four different areas of children's everyday life, that are important to understand the effects of technological changes: family, leisure, education, and civic participation. Focussing on education, the aim of the sub-project 'ICT in education' is to generate

knowledge about how the technological transformations of our time influence the everyday school life of children and young people with regard to educational equity. The main research question driving our project is therefore the following:

'How do young children regard their education in terms of preparing them for future life in the digital age?'

With our research project 'ICT in education', we will look at children's and young people's ICT experiences in schools focussing on transitions into a new formal educational phase. Particular attention will be paid to the potential benefits and risks related to ICT use in education. This project aims to offer new insights and knowledge not only about the use and impact of ICT, but also about how children rate and assess the value of their education as a part of preparing for future life. This knowledge provides the basis for inventing new ways to contribute to the development of effective ICT-related policies and practices in education. Moreover, it will contribute to the development of teacher education addressing the need for teacher candidates to be aware of the challenges children and young people face in relation to ICT. Teachers must be prepared adequately to be able to provide children and young people with the best possible education in terms of ICT which are vital to their future in a digital world.

Why is your child being asked to participate?

We would like to ask your permission to allow your child to take part in the project and contribute to a better understanding of ICT in education and its effect on children and young people.

To get in contact with children and their parents, we contacted different institutions. Since this project is focussing on children and young people in transition phases, your child's [insert form of institution, youth organization] has selected your child to be invited to participate, as she or he is attending [the last year of primary education before transitioning to secondary education/the first year after transitioning into secondary education].

Moreover, the diversity of children with regard to their different individual backgrounds and characteristics is of fundamental importance for our research. We have asked the institution to support us in disseminating this information. In case you are interested, please contact [Prof. Dr. Birgit Eickelmann, adapt for each country].

What does participation involve for you?

If you choose to allow your child to take part in the project, his will involve she or he giving two interviews on the topic of ICT in education. These will take approx. 30 minutes each. The conversations include questions about the use of digital devices **in** school and **for** school. Your child's answers will be recorded electronically. As a parent/guardian you may request to see the interview guide etc. in advance.

The research will be conducted in spring/summer 2021 and autumn/winter 2021. Participants will be interviewed twice, before and after the transition to secondary school. A researcher of the [Paderborn University] will contact you and your child to make an appointment for a first personal interview with your child. The interview will take around 30 minutes and will be audio-recorded. The recording is necessary for the analysis but will not be published or shared with anybody outside the research team. To get insights and understand children's perspectives, their challenges, and wishes we would like to talk to your child about the use of ICT *in* and *for* school. During the interview, your child will be asked to provide information on the following topics:

- her or his person and family (year of birth, gender, the country of the child's and the parents' origin, the language predominantly spoken at home, the occupation of the parents, the highest level of school or educational degree of the parents)
- experiences and opinions on ICT in school
- their teachers' and schools' views and their capacity and readiness to support the younger generation in preparing adequately for the digital age
- wishes that your child has regarding ICT in education

Since we are focussing on the transition phase and aim to identify its relevance in education, there will be a second interview session after the transition. This means you and your child will be contacted a second time a few weeks after your child entered secondary education. The topics we will talk about in the second interview are essentially the same as in the first one, except that we will also talk about changes in comparison to primary education.

Participation is voluntary

The participation of your child in the project is voluntary and requires your written consent. If you and your child choose that she or he will participate, your consent is needed to collect and process your child's data. You declare this by filling out the attached declaration of consent. Your consent will enable your child to participate in the research project but will not oblige her or him to do so. All information about your child will be made anonymous. Your child may, for example, omit individual questions that she or he cannot or simply does not want to answer, or even stop the conversation altogether. You and your child can withdraw your consent at any time without giving a reason. There will be no negative consequences for your child if either one of you chooses not to participate or later decides to withdraw. We will then stop processing your child's data immediately after receipt of your message. Please note, however, that the admissibility of data processing in accordance with Article 6 paragraph 1 letter a) GDPR remains unaffected by this until the time of receipt of your withdrawal and all previously acquired and anonymised data may continue to be processed by us by cleaning up the personal reference. As a sign of appreciation, we would like to ask your child to sign a consent form as well.

What are the risks and benefits of a participation?

We don't anticipate any physical, social, economic, psychological, or legal harms regarding this project. Children and young people can benefit from the discussion with our researchers and reflect on their own use of ICT. If you are interested, we can share short reports on the project results with you.

Your personal privacy – how will we store and use your personal data?

Please find the **data policy statement** with further information in the appendix!

The processing of your child's data concerns the personal data as described above (gender, age, country of the child's and the parents' origin, the language predominantly spoken at home, the occupation of the parents, the highest level of school or educational degree of the parents), which will be particularly protected (GDPR, Art. 5,6 and Art. 9 (2) lit a).

The information and data collected will only be used for scientific purposes named in this information letter. The data will be pseudonymised immediately after collection by replacing your child's name with another characteristic. A clear assignment of the data to your child's person is therefore only possible for someone who has access to the

assignment of the pseudonyms. Restricted access to the assignment of pseudonyms is ensured by encrypting and securely storing data at the [Insert name of your institution/university] server inaccessible to third parties. In publications all names and other information that could lead to the identification of your child will be removed or replaced by pseudonyms if necessary. All audio recordings will be encrypted and securely stored for a duration of max. five years after the projects ends. Your personal data will be processed confidentially and in accordance with the General Data Protection Regulation (GDPR).

Your rights

If you choose to give permission for your child to participate, you and your child can withdraw from the project at any time without any negative repercussions. In terms of data protection, while it is possible for you to be identified in the collected data (only prior to the projects end which is approximately in autumn 2022), you have the right to, e.g.:

- Access your child's personal data (audio recording)
- Request that the personal data be deleted

The Institutional Ethics Committee at the [Paderborn University] approved this research as in line with national and European legislation as well as the University's policies for data protection and welfare of participants.

Who is responsible for the research project? [Adapt for each country]

Paderborn University conducts the study in Germany. The project leader is Prof. Dr. Birgit Eickelmann and you can ask for more information and details:

Telephone: [to be completed]

e-mail: digigen@upb.de

All the information given in this letter will also be explained and given by the researcher who will contact you. You will also have the opportunity to ask any questions you may have.

Your child will also receive a short version of the information sheet and we will also explain the project and participation in person. Your child can also refuse to participate at any time.

For a general overview of the project you can visit the project website www.digigen.eu.

Thank you for considering participating in our research

Kind regards,

Prof. Dr. Birgit Eickelmann

Project Leader, Institute for Educational Science at Paderborn University

[Adapted for each country]

Project Leader

(Researcher/supervisor)

Parental Consent

Research Project: 'ICT in education'

I confirm that I have received and understood the information about the research project: 'ICT in education'. I was provided with clear and detailed information about the aims, significance, and scope of the project, as well as requirements resulting from participating.

I have received and taken note of the information sheet on the processing of my personal data in accordance with Art. 13,14 GDPR in connection with the production and use of photo, video and/or audio recordings. I have been given the opportunity to ask questions about the study and my participation. All my questions have been answered sufficiently and in a comprehensive manner. I am aware I can raise questions at any time.

☐ I agree for **my child** to participate in the project 'ICT in education'
Name of the child*: _____

I also agree to the following data processing as part of my child's participation in the project:

☐ for **my child** to participate in a personal interview and my child's data being collected, audio recorded to be analysed in this research project (maintaining the best possible hygiene service)
Name of the child*: _____

☐ for **my child** to participate in an interview conducted using a video conference tool and to my child's data being collected, audio recorded to be analysed in this research project
Name of the child*: _____

I reserve the right to end my or my child's voluntary participation at any time without this being to my disadvantage. If I want to withdraw from the study – in part or completely –, I can do so at any time by contacting [name of contact person], either in writing or verbally.

I have received a copy of this information for participants and declaration of consent. The original remains with the study coordinator.

_____	_____
Signature of participant	Date
_____	_____
Signature of study coordinator	Date

*Name of the child is only used to check your consent and is never linked with any interview or focus group data at any time.

Appendix: Information on the Processing of your Personal Data within the Framework of the Research Project 'ICT in education' in Accordance with Art. 13 GDPR

This data privacy policy describes the processing of your personal data in the context of the research project 'ICT in education'. In this way, [insert your university] fulfils its information obligations in accordance with Art. 13 of the EU General Data Protection Regulation (hereinafter: GDPR). With regard to the terms used in the following, e.g. "personal data", "processing", "person responsible" etc., reference is made to the definitions in Art. 4 of the GDPR.

1. Names and Contact Details

Within the scope of the research project 'ICT in education', a public corporation with legal capacity is responsible for the processing of your personal data.

1.1 Name and Contact Details of the Controller

Paderborn University

Warburger Str. 100

33098 Paderborn

Tel.: +49-5251-60-5261

Web: https://www.uni-paderborn.de

1.2 Management and Contact Person of the project at [Adapt for each country]

Tel.:
E-mail:
Web:

1.3 Contact Details of the Data Protection Officer [Adapt for each country]

You can contact the official data protection officer of Paderborn University by post at the address of the person in charge given above or as follows:

E-mail:

Tel.:

Web:

2. Processing of your Personal Data, Purposes and Legal Basis of Processing

Within the scope of the research project 'ICT in education', Paderborn University processes the following of your personal data for the following purposes and legal bases:

2.1 Interview data:

Collection of personal data (participant's background) as part of the interview about ICT in education:

- First name, last name, gender, age
- Special categories of personal data that is especially sensitive according to article 9 (GDPR):
    - the country of the child's and the parents' origin
    - the language predominantly spoken at home
    - the occupation of the parents/guardians
    - the highest level of school or educational degree of the parents

2.2 Pseudonymous analysis and anonymous publication:

- In accordance with the GDPR, special security measures, including pseudonymisation und encryption, ensure that technical and organizational measures guarantee the protection of personal data at any time.

2.3 Purpose:

- Your/Your child's personal data are processed for scientific research purposes in the scope of the research project 'ICT in education' which is part of the project 'The Impact of Technological Transformations on the Digital Generation (DigiGen)', funded by the European Commission. It's aims is to develop an understanding of how and why some children and young people benefit from the use of ICT while others seem to be rather negatively affected.

- Within this sub-project work package five (WP5) 'ICT in education' the use of digital technologies and how children and young people are influenced by them is researched. It is the aim to generate knowledge about how the technological transformations of our time influence the everyday school life of children and young people with regard to educational equity. The main research question driving our project is as follows: 'How do young children regard their education in terms of preparing them for future life in the digital age?'
- This knowledge provides the basis for inventing new ways to contribute to the development of effective ICT-related policies and practices in education. Moreover, it will contribute to the development of teacher education

The legal basis for data processing is your consent (Arti. 6 (1) lit. a, Art. 9 (2) lit.a). You can withdraw your consent – in parts or completely – at any time. Withdrawal of consent does not affect the legality of data processing carried out previously.

6. Recipient of your Personal Data

Since the research is funded by the European Commission, participating countries share the responsibility for data processing. This is carried out under the joint responsibility of other responsible parties, this is done on the basis of an agreement on joint data processing responsibility in accordance with Art. 26 GDPR. Only departments and researchers of this project have access to the encrypted data.

7. Transmission of your Personal Data Outside of the EU

In principle, no personal data is transferred to countries outside the European Economic Area and associated countries (no "third country transfer"). Should this be necessary, we will inform you separately.

8. Duration of Storage of your Personal Data

Your/your child's personal data, which we process within the scope of the research project 'ICT in education', will be deleted as soon as they are no longer required for the purposes for which they were collected, i.e. five years after the end of the project. However, since processing of your personal data is based on your consent, your data will only be stored until you withdraw your consent, unless there is another legal basis for the processing (Art. 17 (1) lit. b GDPR).

9. Rights of Data Subjects

As a data subject, you/your child can assert the rights granted to you by the GDPR at any time; these are

- the right to be informed whether and which of your data are being processed in accordance with Art. 15 GDPR;
- the right to demand corrections or completion of data concerning you in accordance with Art. 16 GDPR;
- the right to have data concerning you/your child deleted in accordance with Art. 17 GDPR
- the right to demand a restriction on the processing of data in accordance with Art. 18 GDPR;
- the right to have data concerning you/your child transferred in accordance with Art. 20 GDPR

10. The right to Withdraw to the Processing of your Personal Data

Any consent that may have been granted can be withdrawn in whole or in part at any time without having to justify the revocation. The withdrawal does not affect the lawfulness of the processing carried out on the basis of consent up to the point of revocation (Art. 7 (3) GDPR). As a result, we may no longer continue to process data based on this consent in the future. If you wish to withdraw your consent in whole or in part, simply send an e-mail to *[insert your e-mail].*

11. Right of Appeal

In addition to the rights mentioned above, you have the right to file a complaint with the supervisory authority for data protection (Art. 77 GDPR) if you believe that the processing of your personal data has violated this regulation; for example, with the supervisory authority responsible for the university's data protection [insert contact details for each country]

12. Automated Decision Making / Profile Building

There is no automated decision-making or profiling pursuant to Art. 22 GDPR.

13. Validity of the Data Privacy Statement

We reserve the right to amend this privacy policy to adapt it to changes in relevant laws or regulations or to better meet your needs. This data privacy statement is valid in the version last published by Paderborn University. Therefore, please note the current version number of the Privacy Policy.

Appendix F Information Sheet Children and Young People

Information Sheet Children and Young People

Funded by the Horizon 2020 Framework Programme of the European Union

PADERBORN UNIVERSITY

DigiGen

Information Sheet Children and Young People

Who are we?

- We are a team of researchers at Paderborn University.
- We study the digital generation and their views on their future.
- We work together with eight countries in this European research project.

What is our study about?

- We want to identify why and how some children and young people (like you) in school benefit from digital technologies use
- We want to actively involve **you** and other children in this project, because you are the experts.

What does the study involve?

- If you decide to join our study you will be asked some questions about the use of digital technologies in and outside of school.
- With this one of us will have an easy conversation with you.
- Everything you say is important to us, so there are no wrong answers.
- The whole conversation will take about 20-30 minutes.
- As we cannot remember all your answers we have to record the conversation. But the recording will be used safely and will not be passed on.

What will we do with the answers to our questions?

- All the questions we ask will be kept safe and secure with us.
- The only time we would tell someone about it is if we were worried about your safety.

Do I have to take part?

- No, it is up to you. Speak with your parent and/or a person you trust about taking part in this study.
- Please let your parents know if you do want or do not want to take part in the study and they will tell us about it. Also, below there is a form to sign.
- Even if you decide to take part, you can of course stop at any time.

Put a tick by the answer you want:

☐ Yes, I want to take part in the study.

☐ No, I do not want to take part in the study.

Your name: _____

Date: _____

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Eickelmann, Drossel, Casamassima & Port