

Miriam Størseth Lillebo
Julie Adele Solum-Sjaavaag

Learning from COVID-19 emergency remote teaching

A case study to compare pupil and teacher
experiences

Master's thesis in Master of Science in Informatics

Supervisor: Monica Divitini

Co-supervisor: Madeleine Lorås

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Faculty of Information Technology and Electrical Engineering
Department of Computer Science

Abstract

On the 12th of March 2020, the Norwegian government decided to close all schools as a consequence of the COVID-19 pandemic. The school closures led to major disruptions in education systems, as schools were forced to find temporary solutions for teaching and learning to happen remotely. The temporary solution was referred to as emergency remote teaching (ERT). The situation created an opportunity that could be taken advantage of, as lessons learned from the sudden transition to ERT could influence the digitalization process and future use of ICT in education.

The objective of this research was dualistic: (1) compare pupils' and teachers' experiences with emergency remote teaching to give both perspectives an active role in the process of learning from it and to reveal potential differences. And (2) investigate how experiences from ERT can influence the ongoing digitalization process in Norwegian schools.

The research was conducted as a case study focusing on a selected Norwegian upper secondary school. The school was studied in depth using several data generation methods, collecting qualitative and quantitative data from pupils and teachers. Questionnaires aimed at both teachers and pupils were conducted, which made it easy to compare their experiences towards different aspects of teaching and learning during ERT. Further, focus group interviews and interviews were utilized to capture additional qualitative data from pupils and teachers related to how ICT was adopted, their experiences, and their thoughts regarding findings from the questionnaires. The interviews additionally obtained information about how experiences from ERT can influence the digitalization process. The SAMR model was used to evaluate the results concerning the adoption of ICT, while results connected to experiences were evaluated through the CIPP model. The evaluations led to a mapping of how ICT was adopted and an overview of how ERT was experienced during the school closures. The mapping and overview were further used to conduct a comparison of pupils' and teachers' perspectives.

Results from the comparison of pupils' and teachers' perspectives indicate different experiences with ERT. The digitalization strategy states that pupils and teachers should collaborate in choosing teaching aids, which demonstrates that these differences in experiences should be addressed in the future to make ICT an integrated part of teaching and learning. An investigation of how pupils and teachers perceive that ERT experiences can influence the future adoption of ICT showed that they had been exposed to digital activities and tools they found useful and wanted to use more. Another finding was that pupils and teachers encountered challenges with ERT during the school closures, which was related to them not having sufficient training in the use of ICT. The lessons learned from ERT were mainly connected to the software and teachers' competence. By addressing these lessons learned, one can perhaps mitigate challenges with the digitalization process in Norwegian schools. This research study was conducted through a case study, which means that the results apply to one particular case. The results can still contribute to a better understanding of how pupils and teachers in Norwegian upper secondary schools have experienced the ERT situation differently and how this can influence the ongoing digitalization process.

Sammendrag

Den norske regjeringen besluttet den 12. mars 2020 å stenge alle skoler på grunn av COVID-19-pandemien. Skolestengingene førte til store forstyrrelser i de norske utdanningssystemene, da skolene ble tvunget til å finne midlertidige løsninger for fjernundervisning. Dette ble referert til som ”*emergency remote teaching*” (ERT). Situasjonen skapte dog en mulighet til å lære fra den plutselige overgangen til ERT, noe som kan påvirke digitaliseringsprosessen og fremtidig bruk av IKT i utdanning.

Målet med denne forskningen var todelt: (1) sammenligne elevenes og lærernes erfaringer med fjernundervisning for å gi begge perspektivene en aktiv rolle i prosessen med å lære av det og for å avsløre potensielle forskjeller. Og (2) undersøke hvordan erfaringer fra ERT kan påvirke den pågående digitaliseringsprosessen i norske skoler.

Forskningen ble gjennomført som en case-studie, der man fokuserte på en spesifikk norsk videregående skole. Skolen ble undersøkt i dybden ved hjelp av flere datagenereringsmetoder, som samlet både kvalitative og kvantitative data fra elever og lærere. Spørreundersøkelser ble rettet mot både lærere og elever for å gjøre det enkelt å sammenligne deres erfaringer med ulike aspekter ved undervisningen under pandemien. Videre ble fokusgruppeintervjuer og intervjuer brukt for å samle mer kvalitative data fra elever og lærere om hvordan IKT ble brukt, deres erfaringer og deres tanker knyttet til funn fra spørreundersøkelsene. Intervjuene samlet også informasjon om hvordan erfaringer fra fjernundervisningen kunne påvirke digitaliseringsprosessen. SAMR-modellen ble brukt til å evaluere resultatene knyttet til IKT-bruk, mens resultatene som vedrørte erfaringer ble evaluert ved hjelp av CIPP-modellen. Evalueringene resulterte i en kartlegging av hvordan IKT ble brukt, samt en oversikt over hvordan lærere og elever opplevde skolestengingene. Kartleggingen og oversikten ble videre brukt til å gjennomføre en sammenligning av oppfatningene til lærere og elever.

Resultatene fra sammenligningen av oppfatninger indikerte at lærere og elever hadde opplevd fjernundervisningen forskjellig. Digitaliseringsstrategien sier at elever og lærere bør samarbeide når de skal velge hjelpemidler til undervisningen, noe som indikerer at disse forskjellige erfaringene bør bli adressert i fremtiden for å sørge for at IKT blir en integrert del av undervisningen. En undersøkelse av hvordan lærere og elever tror at ERT-erfaringene kan påvirke digitaliseringsprosessen viste at de hadde brukt digitale aktiviteter og verktøy som de synes var nyttige og som de ønsker å bruke mer. Et annet funn var at elever og lærere opplevde utfordringer med ERT under skolestengingene, som ofte var knyttet til at de ikke hadde tilstrekkelig opplæring i bruken av IKT. Det man har lært av fjernundervisningen er knyttet til programvare og lærerens kompetanse. Ved å ta tak i det lærere og elever har erfart under skolesteningene, kan man kanskje dempe utfordringer i digitaliseringsprosessen i norske skoler. Denne forskningsstudien ble gjennomført gjennom en case-studie, noe som betyr at resultatene gjelder en bestemt case. Resultatene kan likevel bidra til en bedre forståelse av hvordan elever og lærere i norske videregående skoler har opplevd ERT-situasjonen forskjellig, og hvordan dette kan påvirke den pågående digitaliseringsprosessen.

Preface

This submission is our master's thesis, which was written for the Department of Computer Science, at the Norwegian University of Science and Technology. It concludes a two-year Master's degree programme in Informatics with a specialization in Interaction Design, Game and Learning Technology.

We would first like to thank our supervisors Monica Divitini and Madeleine Lorås. They have provided invaluable guidance and motivation throughout the process of this research. They helped us stay on track and pushed us forward when we needed it. We are grateful for their extensive feedback and expertise, which gave us an insight and understanding of the world of research.

We would also like to thank the pupils and teachers who were involved in this study. We know that this pandemic period has been demanding for them, so we appreciate that they took the time to participate. Also, we would like to express our gratitude to the head of the department at the school, which helped us organize everything.

Lastly, we want to thank our families for all the proofreading, patience, and support during this process.

Trondheim, June 2021

Abbreviations

ERT - Emergency Remote Teaching

ICT - Information and communication technology

IDI - Department of Computer Science

IT - Information technology

LMS - Learning management system

NTNU - The Norwegian University of Science and Technology

RQ - Research question

SD - Standard Deviation

Vg1 - 1st year of upper secondary school

Vg2 - 2nd year of upper secondary school

Vg3 - 3rd year of upper secondary school

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Chapter 1

Introduction

1.1 Motivation

The Ministry of Education and Research in Norway has developed a digitalization strategy aimed at primary and secondary education and training. It focuses on the need for a future-oriented education, where digital skills and pedagogical use of information and communication technology (ICT) are to become more central parts of education (Kunnskapsdepartementet, 2017). The strategy further states that ICT should become a necessary and natural part of future teaching and learning. The digitalization process in Norwegian schools was planned to happen between the years 2017-2021 but was in March 2020 affected by the COVID-19 pandemic. The pandemic forced national school closures, which led to major disruptions in Norwegian education systems. This situation consequently forced the identification and implementation of temporary solutions for teaching. The temporary solution was, in turn, defined as emergency remote teaching (ERT), with the main objective of providing temporary access to education in a way that was quick to set up (Hodges et al., 2020). The pandemic further showed itself to be a long-lasting situation with continuous changes and switching between ERT and traditional teaching.

The pandemic situation has been described as "an unforeseen shift in education that has never been seen before" (Petrie et al., 2020 in Bubb and Jones, 2020), which led to the motivation for initiating a research study addressing it. The main focus was on learning from ERT by investigating pupils' and teachers' views of the approaches taken to maintain teaching and learning during the pandemic. Reimers and Schleicher (2020) argues that one should look at good practices nationally and internationally to become knowledgeable about what works. Although ERT differentiates significantly from using ICT in the traditional teaching situation and planned online teaching, one should still take advantage of the opportunity to learn from ERT experiences by listening to pupils and teachers about what worked and not. It was essential to include and compare both perspectives because it provided an opportunity for both pupils and teachers to gain an active role in the process of learning from ERT. The lessons learned from comparing the two perspectives can, in turn, affect future use of ICT. The lessons learned, discussed in light of the digitalization strategy of the Norwegian government, could further provide insight in how this crisis can affect the use of ICT in the ongoing digitalization process in Norwegian schools. This thesis, therefore, focuses on the experiences of pupils and teachers towards the adoption of ICT during ERT, in addition to how they perceive the situation will influence the digitalization process.

1.2 Research Context

This research was conducted as a master's thesis at the Department of Computer Science at the Norwegian University of Science and Technology (NTNU). Two students from Master of Science in Informatics with the specialization "Interaction Design, Game and Learning Technology" conducted the research and were the authors of this report. The research was supervised by Professor Monica Divitini and Ph.D. candidate Madeleine Lorås, who guided the researchers throughout the whole project.

1.3 Research Questions

The first main research question of the study included an exploration of whether pupils and teachers in Norwegian upper secondary schools have different experiences with the adoption of ICT and ERT during the school closures. This question was considered extensive and was divided into two sub-questions that would provide grounds to conduct a comparison of pupils' and teachers' experiences of the ICT adoption and ERT. The first sub-question aimed to obtain a mapping of how Norwegian upper secondary schools adopted ICT to maintain the teaching and learning during school closures. Exploring how pupils and teachers experienced ERT during the school closures was further chosen as the second sub-question, as this was crucial to be able to compare the two group's experiences. The second main research question focused on how the lessons learned from ERT could influence the ongoing digitalization process in Norwegian schools.

- RQ1:** What are the differences between how Norwegian upper secondary school pupils and teachers experienced the adoption of ICT during emergency remote teaching due to the COVID-19 school closures?
- RQ1.1:** How did Norwegian upper secondary schools adopt ICT to maintain the teaching and learning during the school closures?
- RQ1.2:** How did pupils and teachers experience the emergency remote teaching during the school closures?
- RQ2:** What can be learned from the emergency remote teaching that can influence the ongoing digitalization process in Norwegian schools?

1.4 Research Methods

A case study was conducted to answer the research questions. The research was focused on a selected Norwegian upper secondary school which was studied in depth. Several data generation methods (questionnaire, focus group, interview) were used to develop a thorough understanding of the case and increase the validity of the study. The main reason for using all three data generation methods was to obtain a *data triangulation* for RQ1. The combination of methods could, in turn, show a significant pattern even if it was not possible to find significance in each method alone (Miesing, 1991). Another main focus of the data generation methods was to investigate the research problem in a way that made it possible to compare pupils' and teachers' perspectives. Table 1.1 provides an overview of how the research questions were answered through data generation, analysis, and evaluation.

| RQ | Answered by |
|-------|--|
| RQ1.1 | Analyzing quantitative and qualitative data gathered from both pupils and teachers from questionnaires, focus groups, and interviews. The results were further evaluated through the SAMR model. |
| RQ1.2 | Analyzing quantitative and qualitative data gathered from both pupils and teachers from questionnaires, focus groups, and interviews. The results were further evaluated through the CIPP model. |
| RQ1 | The two sub-research questions provided a solid foundation for comparing the experiences of pupils and teachers towards the adoption of ICT and ERT during the school closures. The results from RQ1.1 and RQ1.2 were analyzed and compared to search for potential differences. |
| RQ2 | Analyzing quantitative and qualitative data gathered from both pupils and teachers from questionnaires, focus groups, and interviews. |

Table 1.1: Research Questions & how they were answered

1.5 Summary of Results

Norway's digitalization strategy states that technology should contribute to quality improvement in schools and that ICT should come as a necessary and natural part of future learning (Kunnskapsdepartementet, 2017). The outcome of this research contributes to this field by providing lessons learned towards the use of ICT during the ERT due to COVID-19.

One of the two main results in this research came from the comparison of pupils' and teachers' experiences with the adoption of ICT and the implementation of ERT during the school closures. This comparison revealed elements within ERT that pupils and teachers experienced differently, which answered RQ1. These differences should be addressed in the future to make ICT an integrated part of future education. In order to make the comparison possible, there was a need to gain an overview of how ICT was adopted to maintain teaching and learning, and further how this ERT-implementation was experienced by pupils and teachers. The findings first led to a mapping of how ICT was adopted to maintain teaching and learning during the school closures, which demonstrated that the majority of elements used in ERT substituted the traditional teaching activities. Further, the findings generated an overview of how pupils and teachers experienced ERT.

An investigation of how pupils and teachers perceive that lessons learned from ERT can affect the use of ICT in the future was conducted to answer RQ2. The findings from this investigation, together with the results from the comparison, were used to discuss challenges in the digitalization process related to hardware, software, and teachers. The discussion showed that pupils and teachers did not have sufficient training in the use of ICT before the pandemic and that pupils and teachers had been exposed to digital activities and tools during the school closures that they found useful and wanted to use more. The second main result in this research was that most challenges and lessons learned during ERT were connected to software and teachers' competence.

1.6 Outline of Report

Chapter 2 describes the research problem by explaining the COVID-19 situation and the impact it has had on Norwegian upper secondary schools, in addition to introducing important components and theoretical models for the research. Chapter 3 examines the related work to gain insight and to provide a foundation for the research project. Chapter 4 thoroughly elaborates the methodologies used in the research. The research strategy case study is introduced together with a description of the specific case, the used perspectives and instruments, in addition to the data generation and analysis methods. Chapter 5 contains an overview of the data that was generated and analyzed. A discussion of the results and the limitations is presented in Chapter 6. Finally, a conclusion is provided in Chapter 7, which also includes suggestions for future work.

Chapter 2

Problem Description

In January 2020, the SARS-CoV-2 coronavirus (COVID-19) was discovered (NIPH, 2021). The virus, which developed into a global pandemic, has affected all education systems in the world as schools had to close down during spring 2020 to prevent further infection (UNESCO, 2020a). The virus spread rapidly, which led to schools not being able to prepare for remote teaching if they did not already have a contingency plan for the situation at hand. The urgency of the school closures created disruption and challenges, and headteachers had to mobilize staff to teach remotely with almost no preparation (Bubb and Jones, 2020). It was reported that more than 1.5 billion learners of all ages from around the globe were affected by school and university closures (Bozkurt and Sharma, 2020; UNESCO, 2020a). One year into the COVID-19 pandemic, close to half the world’s pupils are still affected by partial or total school closures (UNESCO, 2020a).

On the 12th of March 2020, the government decided to close the schools in Norway as a result of the pandemic. A national closure of schools has not happened in Norway since the second world war, that is, before the digital age. A consequence of the pandemic could be that it led to the disappearance of an educational offer for pupils. The teachers, therefore, had to adjust to fully remote teaching to ensure that the pupils had access to school (Fjørtoft, 2020b), which was an entirely new situation for them. The school closures led to major changes in the everyday school life for Norwegian teachers and pupils, and remote teaching required both teachers and pupils to use various digital tools and resources (König et al., 2020). This new use of digital technology accelerated the digitalization of teaching at record speed (Langford and Damsa, 2020). Several schools had plans to make greater use of ICT in teaching, but the changes that were supposed to be introduced over months or years had to be implemented in few days (Daniel, 2020).

Figure 2.1 gives an overview of the period from March 2020 until April 2021. When the schools closed in March, no one knew how long it would last. It took about two months before the schools gently opened for an ordinary offer, and upper secondary schools opened between the 11th and the 15th of May (Fjørtoft, 2020a). As the figure illustrates, it has been continuous changes, and Norwegian schools have been on and off with remote teaching between mid-August 2020 and the time of writing this report.

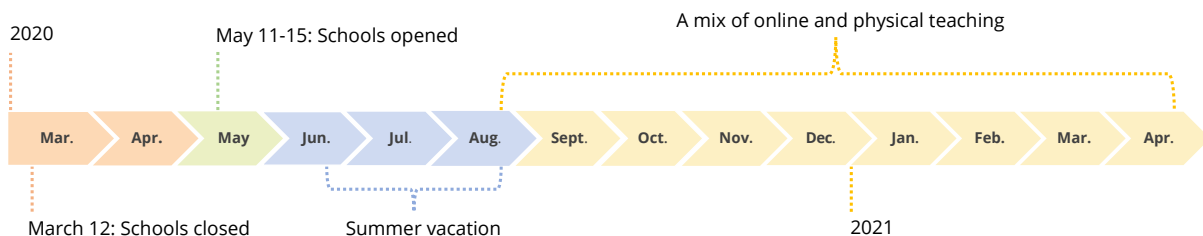


Figure 2.1: Timeline COVID-19 school closures

The COVID-19 pandemic led to a significant disruption in education, and the sudden acceleration in the use of ICT has greatly affected teaching and learning. This chapter describes the involved components in this challenging situation. In Chapter 2.1, the definition of temporary remote teaching is introduced and described. Chapter 2.2 presents the Norwegian digitalization strategy for Primary and Secondary Education and Training and gives an overview of how far the Norwegian schools had progressed with digitalization prior to the pandemic. Finally, Chapter 2.3 introduces two theoretical models for evaluating the implementation of teaching and learning during the pandemic.

2.1 Emergency Remote Teaching

The COVID-19 pandemic led to major school closures worldwide, which required that all face-to-face courses needed to be replaced with fully remote teaching solutions. Emergency remote teaching (ERT) is defined as a "temporary shift of instructional delivery to an alternate delivery model due to crisis circumstances" (Hodges et al., 2020). The emphasis is placed on the *temporary* element when discussing ERT, which means that the education situation will always return to the original format as soon as the emergency abates. In the timeline in Figure 2.1, one can see that schools repeatedly tried to return to the face-to-face courses during the pandemic, but that ERT was needed to some extent throughout the entire pandemic period.

A robust educational ecosystem is not a priority under such emergency circumstances. The main objective of ERT is to provide temporary access to education in a way that is quick to set up and available during an emergency (Hodges et al., 2020). ERT should therefore only be accepted as a short-term solution to an immediate emergency, as the rapid approach needed to initiate ERT could decrease the quality of the courses provided during the emergency situation. A quality online course requires time and effort, which contradicts with the ERT mindset of just "getting something online". Hodges et al. (2020) state that the ERT term emerged as an alternative used by online education researchers in order to be able to distinguish between these temporary online solutions and what is known as "high-quality online education". Research shows that effective online distance learning results from careful planning based on systematic models and design, and these careful processes and decisions have a great impact on the quality of the teaching (Hodges et al., 2020; Bozkurt and Sharma, 2020). Many creative approaches to ERT can benefit from what is known about online distance learning (Bozkurt and Sharma, 2020), and they are to some extent similar. However, it is important to not set them side by side, as a misunderstanding of these definitions could lead to misunderstanding in practices (Bozkurt et al., 2020). When rushing into ERT, the careful, systematic processes that define effective online distance teaching will be absent.

Lastly, the biggest difference is that ERT is an obligation, while online distance learning is an option. While ERT is just about pulling through a crisis with the available resources, online distance education requires more than uploading teaching materials online.

2.2 Digitalization in Norwegian education systems

Digitalization is about using technology to innovate, simplify and improve. It is a collective term describing the transition from analog and paper-based solutions to electronic and digital solutions (Regjeringen, 2019). Teaching, as it has traditionally been organized and practiced in schools, is changing. The Ministry of Education and Research in Norway has developed a digitalization strategy that is aimed specifically at Primary and Secondary Education and Training: "Future, renewal and digitalization" (Title translated from Kunnskapsdepartementet, 2017). This chapter will present the government's knowledge promotion reforms, results from studies about the use of ICT in Norwegian education prior to the school closures, and challenges associated with digitalization in Norwegian schools. The digitalization strategy and the progress of the digitalization process are important aspects of this research study, as it places Norwegian schools in a digitalization landscape prior to the pandemic.

In the digitalization strategy, the need for a future-oriented and updated Primary and Secondary Education and Training is described. The strategy states that "technology should contribute to quality improvement in schools" and that "ICT should come as a necessary and natural part of future learning" (Kunnskapsdepartementet, 2017). It contains objectives and measures for the pupils' digital skills, the teachers' competence, and the school's utilization of ICT. The strategy spans the years 2017-2021, and the main goals, presented in Table 2.1, show the government's ambition for pupils to have an education where learning and development in an inclusive community have the highest priority (Kunnskapsdepartementet, 2017).

| The Digitalization Strategy | |
|-------------------------------------|---|
| Main Goals | |
| 1. | Pupils should have digital skills that will enable them to experience a sense of accomplishment in life and succeed in further education, work, and social participation (Kunnskapsdepartementet, 2017). |
| 2. | ICT should be utilized well in the organization and conduct of training to improve pupil learning outcomes (Kunnskapsdepartementet, 2017). |
| Goals seen from perspectives | |
| Pupil: | Pupils should manage to acquire digital skills and judgment through the training and learn to exploit digital teaching resources creatively and inventively (Kunnskapsdepartementet, 2017). |
| Teacher: | Teachers should be able to lead the class' learning work and be confident in the choice of teaching aids and resources that contribute to the class and the pupils' learning outcomes (Kunnskapsdepartementet, 2017). |

Table 2.1: Main Goals of the Digitalization Strategy (translated from Norwegian)

2.2.1 Norwegian Knowledge Promotion Reforms

To take advantage of opportunities provided by digitalization, there is a need for more specialized and better general ICT competence in society (Kunnskapsdepartementet, 2017). For this to happen, digital skills and the pedagogical use of ICT needs to be central parts of education. In 2006, a Norwegian education reform: The Knowledge Promotion Reform (LK06), was introduced by the government. It covered all Primary and Secondary Education and Training and led to changes in the school's content, organization, and structure (Kunnskapsdepartementet, 2018). LK06 introduced, among other things, digital skills as one of the five basic skills in all subjects throughout education. According to The Norwegian Directorate for Education and Training (UDIR), digital skills involve being able to "use digital tools, media, and resources efficiently and responsibly, to solve practical tasks, find and process information, design digital products, communicate content and developing digital judgment by acquiring knowledge and good strategies for the use of the Internet" (UDIR, 2020). Digital skills are part of the school curriculum and are to be used as learning artifacts in all subjects (UDIR, 2020).

In 2020, a new Knowledge Promotion Reform (LK20) was introduced for Primary and Secondary Education and Training. LK20 was launched as a renewal of the existing LK06 and increased digitalization further by introducing programming and increase the focus on algorithmic thinking (Kunnskapsdepartementet, 2018). LK20 does also make it clear which subjects have the primary responsibility for developing various aspects of digital skills. LK20 took effect in August 2020 for all grades except 10th and 12th grade starting in 2021 and 13th grade starting in 2022. LK20 is one of the measures initiated by the government associated with the digitalization strategy (Kunnskapsdepartementet, 2017).

2.2.2 Adoption of ICT in Norwegian schools

Norwegian schools' adoption of ICT before the COVID-19 pandemic and school closures is described in this chapter. The chapter provides an overview of how far the schools have progressed with the use of ICT in teaching, and the prerequisites the schools had for handling ERT.

In Norway, ICT strategies where the pedagogical use of ICT and pupils' learning are in focus exists both at national, municipal, and school levels, but it varies how well the plans are implemented and carried out in different schools (Fjørtoft et al., 2019; Bakke, 2019; Krumsvik et al., 2013). According to the study from Fjørtoft et al. (2019), 11-13% of school leaders in Norway reports that they do not have an ICT strategy at the municipal level or the school level. Krumsvik et al. (2013) state that teachers experience to varying degrees that the school has a comprehensive plan for how ICT is to be integrated into the teaching - only 4.7% answer that the school has such a plan to a "very high degree." Something moving in the right direction is whether the schools have a plan for systematic competence development in digital competence among the staff. Here, the proportion of school leaders who have agreed to have such a plan has increased from 40.7% to 65.2% from 2016 to 2019, yet results from teachers' responses show that they learn the most from trial and error and self-study (Fjørtoft et al., 2019).

Norway educates pupils in environments with great access to ICT and educational resources (Fjørtoft et al., 2019; Krumsvik et al., 2013; Gilje et al., 2016). From a study done in the Eastern Norway County Network (Østlandssamarbeidet), a finding was that the schools already in 2013 held high standards with the technological equipment (Krumsvik et al., 2013). The teachers in upper secondary schools have their own laptops and they have access to a whiteboard, projector with screen and some have access to digital/interactive whiteboards and whiteboard camera (Fjørtoft et al., 2019; Krumsvik et al., 2013). All pupils in upper secondary school have their own laptops and the schools have wireless networks in the classrooms and at schools in general (Fjørtoft et al., 2019; Krumsvik et al., 2013; Gilje et al., 2016; Wastiau et al., 2013). This technology density places Norway high at an international level (Krumsvik et al., 2013; Wastiau et al., 2013), and it gave Norway a solid foundation to perform remote teaching

when the pandemic hit. However, studies show that many pupils experience being disturbed by laptops because they spend too much time on non-academic matters and that ICT can make them postpone school work (Kunnskapsdepartementet, 2017).

The majority of pupils in Norwegian upper secondary schools use the laptop quite often or always in subjects like language, social studies, history, and mathematics (Fjørtoft et al., 2019). The most common activities they use the computer to, according to Fjørtoft et al. (2019), is to write text, use spreadsheets, make presentations, solve math problems, search for/find information on the internet, use websites related to the textbook, use dictionaries and use translation tools. Activities that are not used as much, but used by 30-70% of the pupils are to look at explanation videos, look at animations/simulations, play games, and use quiz tools. Norwegian upper secondary schools also use learning management systems (LMS), mainly for academic submissions (Krumsvik et al., 2013), and they have ICT-based exams, both for formative and summative assessment (Krumsvik et al., 2013; European Union and Education, 2019). The learning activities pupils believe provides best learning outcomes are individual work, collaboration two and two, reading the textbook (not digital), and write notes with pen and paper. Only 28,6% agree that they learn better from solving tasks on a computer compared to solving it in a book (Fjørtoft et al., 2019). In the findings from Krumsvik et al. (2013), most pupils (70-90%) believe that they have good basic skills in using digital resources at school and good skills towards academic use of ICT. Over 80% of the pupils state that they master searching, locating, and producing information from various digital sources. A study from the European Commission about digital education at schools in Europe shows that Norway is one of two countries best at assessing digital competencies through national testing (European Union and Education, 2019).

There has also been a large increase in teachers' use of digital resources and equipment over the past years. According to Fjørtoft et al. (2019), 80% of teachers use digital resources to a large extent for problem-solving, to show examples, and to gather information, and 50-80% use it to a large extent for explanation videos, production of material, and collaboration/communication. This usage of digital resources has increased compared to results from a study conducted in 2011 by Wikan and Molster (2011), where 60% of teachers answered that they use ICT in teaching less than once a month. The use of the digital resources varies from teacher to teacher, and it is the didactic assessment that is the most decisive factor according to Fjørtoft et al. (2019), which is how well a teacher masters the use of digital teaching resources in a way that raises pupils' learning outcomes in the subjects. Teachers' adoption of technology to facilitate and support the teaching-learning process in the classroom has an impact on the quality of the teaching experience (Aldunate and Nussbaum, 2013; Kunnskapsdepartementet, 2017). There is a clear tendency indicating that teachers have quite good elementary and basic ICT skills, but their didactic ICT competence, digital learning strategies, and overall digital competence are more blended (Krumsvik et al., 2016). ICT confidence and ICT competence are both necessary factors for the teachers to be willing to explore the possibilities of ICT for improved teaching and learning (Wikan and Molster, 2011).

There are still variations between school owners and the schools when one investigates strategic investment, digital infrastructure, and teachers' competence in using ICT. ICT has not changed education as much as anticipated by policymakers (Thorvaldsen and Madsen, 2020). The teaching and learning processes supported by digital technology as practice in Norwegian schools are still somewhat immature but in development (Gilje et al., 2016). An overview of the challenges related to the digitalization process is outlined in Chapter 2.2.3.

2.2.3 Challenges with the Digitalization process in Norwegian schools

There are some challenges with the digitalization of Norwegian schools. The challenges are about the access to digital technology, but even more about how it can be used in a way that both raises pupils' digital skills and gives pupils the best learning outcome (Gilje et al., 2016; Kunnskapsdepartementet, 2017). This is supported by Spurkland and Blikstad-Balas (2016), which state that the issue is not the access to technology, but rather about what the teacher can do to make sure that the technology provides some value. The emergence of digital teaching tools has made the supply of teaching resources both large and partly confusing. This can make it difficult for teachers to select and assess the quality of teaching aids (Kunnskapsdepartementet, 2017). Researchers find that there exist few situations where teachers provide actual training in digital working methods in the subjects or situations where the digital tools are used to redefine the teaching in order to utilize the digital potential (Spurkland and Blikstad-Balas, 2016). This leads to a bigger issue - that pupils do not get the digital competence that the curriculum proposes that they should get. Spurkland and Blikstad-Balas (2016) also express their concern that so few schools can show innovative, or systematic, academic use of digital technology with clear objectives towards learning.

Another issue connected to the process is that pupils are dependent on a competent teacher, who is able to explain and "translate" how the digital tools work in an academic context. This means that the teacher is even more important when the number of computers increases in the classroom (Spurkland and Blikstad-Balas, 2016). Researchers state that how technology is used determines if it contributes to an increased understanding of the subjects (Jewitt, Moss & Cardini, 2007; Livingstone, 2009; Selwyn, 2010 in Spurkland and Blikstad-Balas, 2016). These challenges are summarized in Figure 2.2, which displays the Digital Triangle. The three corners of this triangle have to occur in order to achieve functional use of digital tools in the classroom (Spurkland and Blikstad-Balas, 2016). The three corners represent safe, competent teachers that are willing to make changes to the practices, good academic software, and reliable hardware. If some of the corners are weak, it will affect the overall use of digital tools.

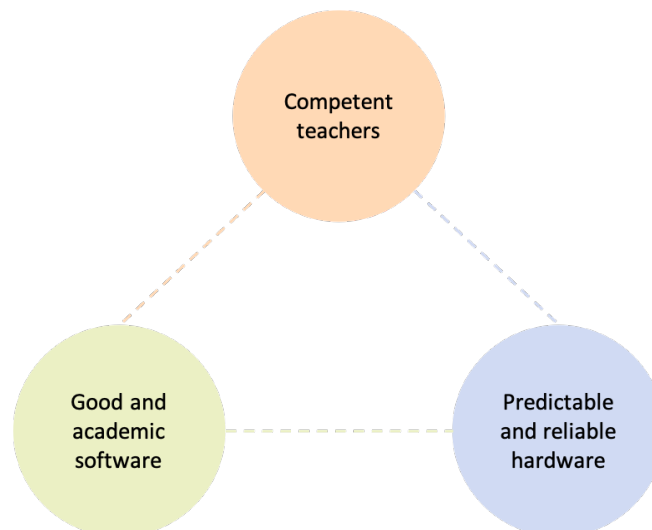


Figure 2.2: The Digital Triangle (translated, originally appearing in Spurkland and Blikstad-Balas (2016))

2.3 Theoretical Models for Evaluating ERT

This chapter presents two theoretical models for evaluating the implementation of ERT. The ERT approach consisted of two sides: The adoption of ICT and how the teaching and learning were implemented. It was therefore a need for two models to investigate both sides. The SAMR model was chosen as the evaluation model for the adoption of ICT during the school closures because it provided the possibility to discuss and categorize the use of technology. The CIPP model offered a way to evaluate how teaching and learning were implemented during the pandemic period. The CIPP model was chosen as it focuses on the context of the teaching and learning process, which was an important component during the COVID-19 school closures. The following chapters present the two theoretical models, which were further used in the discussion of the results in Chapter 6.

2.3.1 SAMR

During ERT, pupils and teachers needed to use ICT in a new manner compared to the traditional teaching situation. The SAMR model presented in Figure 2.3 is a four-level approach for selecting, using, and evaluating technology in education (Hamilton et al., 2016).

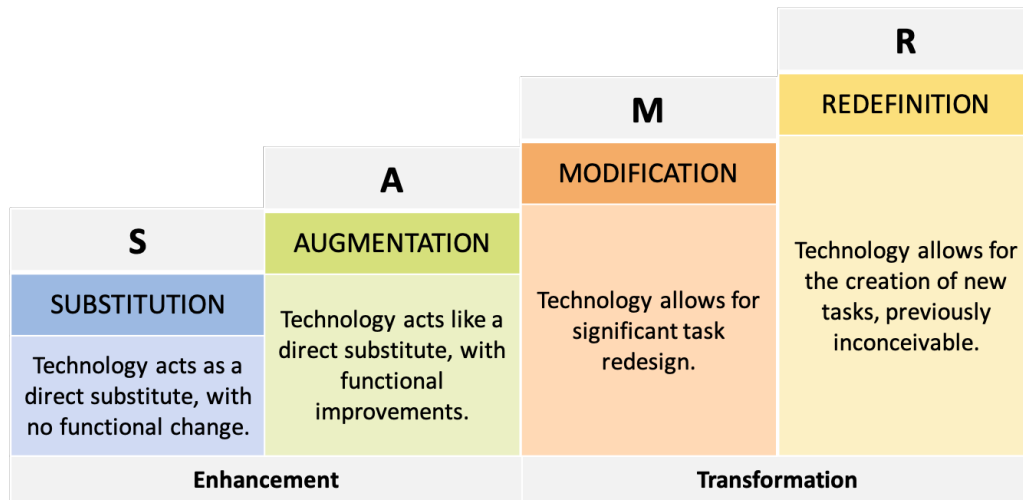


Figure 2.3: SAMR model

The different levels are Substitution, Augmentation, Modification, and Redefinition. The model encourages teachers to “move up” from lower to higher levels of teaching with technology, which leads to enhanced levels of teaching and learning (Hamilton et al., 2016; Best, 2015). At the first level in the model, substitution, digital technology is used as a replacement for analog technology. The challenge for the pupils and the working methods is unchanged, nothing new is added. As an example, a common school practice is to use the laptop to write down notes in a Word document. Here the technology is at the substitution level. At the next level, augmentation, technology is used as an aid in learning - the function of the task or tool positively changes in some way. At the third level, modification, the first real change occurs, technology integration requires a significant redesign of a task. Finally, at the last level, redefinition, one begins to work in ways and with content that would not have been possible without the technology. It is no longer an improvement on previous working methods and content, but new possibilities of technology are being used (Hamilton et al., 2016; Best, 2015).

There exist several standards, frameworks, models, and theories that offer ways to guide teachers' understanding and use of technology in teaching. For the purposes to discuss the adoption of technology in Norwegian upper secondary schools during ERT the SAMR model was deemed to fit. Some challenges reported with the model, according to Hamilton et al. (2016), are the absence of context and the focus on product over process. These were not considered challenges in this research, as the evaluation of the ERT considering process and context is done with the CIPP model, which is further described in Chapter 2.3.2. The SAMR model provides the opportunity to discuss which digital activities and tools substituted the traditional working methods in the school and which digital working methods added positive value to the teaching and learning.

2.3.2 CIPP

The difference between ERT and online distance learning explained in Chapter 2.1 should be recognized when evaluating how Norwegian upper secondary schools conducted ERT during the COVID-19 pandemic. Evaluation is "the process which is responsible for monitoring the progress of an institution towards desired goals and objectives" (Aziz et al., 2018). Hodges et al. (2020) state that a common mistake when evaluating ERT is to believe that comparing it to a face-to-face course is useful. One should instead recognize that schools and teachers are doing the best they can with what they have. There is a high probability of less effective learning experiences when rushing into ERT. Thus, Hodges et al. (2020) recommend using the CIPP model (Figure 2.4) to evaluate ERT. The CIPP model is an evaluation model that includes four elements: Context, Input, Process, and Product.

| CONTEXT | INPUT | PROCESS | PRODUCT |
|--|--|--|---|
| Background, history, goals, needs, and objectives of the school. | Strategy, action plan, material, time, physical and human resources needed for an effective functioning in the school. | The implementation of teaching and learning plans and practices. | Quality of teaching and learning and its usefulness for the individual and for the society. |

Figure 2.4: CIPP model

The origin of the CIPP model traces back to 1983 when it was proposed by Stufflebeam. The model makes a systematical evaluation possible, which was considered an advantage in this research. It also includes evaluating the context, input, process, and product from every angle, which creates a holistic view of the elements (Stufflebeam and Coryn, 2014). Figure 2.4 shows that the CIPP model consists of the quality evaluation of four elements within different aspects of education. The context evaluation includes the school's background and history, and the goals and needs that the school possessed. The input evaluation is the evaluation of strategies, infrastructure, resources, content, and curriculum that are needed. The process element consists of evaluating the teaching and learning processes, while the product evaluation refers to the quality and usefulness of the teaching and learning, which can be decomposed into attitudes, values, skills, and results. This element is often used to identify the outcomes and effectiveness of an educational program (Kellaghan and Stufflebeam, 2003).

The CIPP model was chosen because it provided a valuable way to evaluate the implementation of ERT in Norwegian upper secondary schools during the COVID-19 pandemic. It was crucial to ensure that it did not become an evaluation of the pupils or teachers, but instead an evaluation of the efficacy of the teaching and learning approaches. This makes it possible to learn from it in a way that could lead to

success in the future (Whittle et al., 2020). The CIPP model provides an opportunity to measure specific elements of ERT, without placing the pupils and teachers in the center of the evaluation. The CIPP model also distinguishes from other evaluation models because it focuses on the context of the teaching and learning processes (Stufflebeam and Coryn, 2014). This focus is very important when evaluating ERT, as the context of ERT differentiates a lot from both traditional teaching and planned online distance teaching. Evaluating with emphasis on context is useful when one is to assess needs and opportunities within a defined context, like the ERT situation caused by the COVID-19 pandemic in Norwegian upper secondary schools.

Chapter 3

Related Work

This chapter presents an overview of related work in the field. An extensive literature review was conducted to gain insight into the work already done, both nationally and internationally. Chapter 3.1 describes the literature review process. Chapter 3.2 explores how ICT has been adopted to maintain teaching and learning during school closures, while Chapter 3.3 investigates how pupils and teachers have experienced ERT. Chapter 3.4 covers how experiences with ERT can, and should, influence the digitalization of education.

3.1 Literature Review Process

The literature review was conducted to provide a foundation for the research and to get a better understanding of the work that had already been done (Oates, 2006). The objective was to gather information for answering RQ1.1 and RQ1.2. In addition, the literature review aimed to explore previous work connected to RQ2 about what one can learn from the experiences with ERT that can be useful in the ongoing digitalization process in Norwegian schools. The literature review process was conducted through several steps using Nvivo¹ beginning with an extensive literature search. This was done through the search engine Google Scholar² and the online database ACM Digital Library³. One then created a set of concept matrices so the literature search could happen methodically for producing a list of potentially useful references (Oates, 2006). Table 3.1 presents the concept matrix for RQ1.1. All concept matrices, in English terms, can be found in Appendix B. The literature search was done twice, first with the English terms, and then with Norwegian equivalents

| Concept 1 | Concept 2 | Concept 3 | Concept 4 |
|-----------|---------------------|-----------------|-----------------------|
| Adopt | ICT | COVID-19 crisis | School |
| Use | Technological tools | COVID-19 | Teaching and learning |
| | Technology | Coronavirus | Norwegian school |
| | Digital tools | SARS-CoV-2 | |
| | | Pandemic | |

Table 3.1: Concept matrix: RQ1.1

¹Nvivo (2021): <https://www.alfasoft.com/no/produkter/statistikk-og-analyse/nvivo.html>

²Google Scholar (2021): <https://scholar.google.com/>

³ACM Digital Library (2021): <https://dl.acm.org/>

The literature search was conducted in a quasi-systematic way (Travassos et al., 2008), by using the previously mentioned search terms and including articles and reports based on their title and abstract. Several articles were removed later in the process as they were deemed irrelevant during a more thorough reading. The three first matrices (Appendix B) contained search terms connected to the COVID-19 time period. Considering the school closures had happened quite recently when the searches were conducted, it was chosen not to focus on peer reviews or citations for the articles found. Additionally, results from before March 2020 were excluded as the COVID-19 timeline had not yet begun. The last matrix contained search terms aimed at the adoption of ICT before the school closures. Older sources were therefore included for this search and sources with higher peers/citations were prioritized.

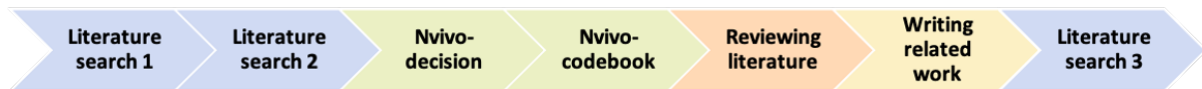


Figure 3.1: Literature Review Process

The literature review process consisted of the steps illustrated in Figure 3.1. The steps are further elaborated below.

Step 1: Literature search in September 2020

Resulted in a number of articles.

The articles were divided between the researchers and carefully read through to filter out irrelevant ones.

The relevant articles were later used to make assessments towards the questionnaire design during the fall of 2020 (Further elaborated in Chapter 4.3.1).

Step 2: Literature search in January 2021

It was decided to perform another literature search in January 2021 to look for new articles and reports within the research theme.

The actions in step 1 was repeated in this step.

Step 3: Nvivo-decision

During a meeting in January 2021, it was decided to use Nvivo to conduct the literature review.

The reason for using Nvivo was because it provided a better overview of how articles related to the research through a common codebook. In addition, it was a tidy way to divide and organize articles between the researchers.

Step 4: Developing a Nvivo-codebook for the literature review

The researchers read through a small number of common articles.

The researchers created a draft each for a codebook based on the read articles.

The researchers discussed the codebooks in a meeting.

One of the researchers merged the two codebooks into a common one.

The researchers conducted a last meeting where the common codebook was approved.

Step 5: Doing the literature review

The researchers divided the articles equally between them.

The researchers coded the articles independently.

Because of time and resources, the researchers did not both read all articles. Each article was therefore only read and coded by one researcher. If there emerged some uncertainties or confusion, the researchers communicated with each other to solve the issues.

When all relevant articles were read, reviewed and coded, this step was considered complete. The Nvivo projects were merged, and a final discussion of the codes and the project was conducted.

Step 6: Writing the related work

Finally, the codes from step 5 were used to write the related work that is presented in Chapter 3.2, Chapter 3.3 and Chapter 3.4.

(Step 7: A last literature search in May 2021 before writing discussion)

The last literature search was done in May to look for recently published articles regarding the research theme. Step 5 was repeated for the results from this literature search. The relevant codes found in this step were not included in Related work but they were taken into consideration in the discussion (Chapter 6).

3.2 Adoption of ICT to maintain teaching and learning during COVID-19 pandemic

This chapter presents the already conducted work connected to sub-research question RQ1.1 about how Norwegian upper secondary schools adopted ICT to maintain the teaching and learning during ERT. The chapter also includes results from research in other countries to get the international perspective of the situation.

Chapter 2.2.2, which described the adoption of ICT in Norwegian schools before the school closures demonstrated that upper secondary schools had the infrastructure for conducting digital teaching, as almost every teacher and pupil had access to a laptop. According to Federici and Vika (2020), 98% of upper secondary schools also had access to software for video-based communication and teaching (Teams, Zoom, Skype, etc.), and a majority of the teachers reported that the digital equipment and software worked "well" or "medium well" during ERT after March 12. Still, some challenges were reported during the pandemic period. Although the technology density and infrastructure in Norwegian schools are good, Fjørtoft (2020b) reports that 13.2% of teachers did not think they had the necessary equipment to carry out digital teaching, and 19.1% meant that the pupils did not have sufficient equipment. Federici and Vika (2020) also point out that there is a general pattern that teachers evaluate their digital equipment, network, and software better than pupils'. Pupils in Norwegian upper secondary schools have the opportunity to choose to use their own laptops, which causes the quality of the laptops to vary. This can affect the implementation of the teaching, sound quality, and the experience of the digital teaching resources (Fjørtoft, 2020b).

The digital tools that were popular to use during the lockdown were video-conferencing software. The most popular and used tools were Zoom and Microsoft Teams (Bubb and Jones, 2020; Hjelsvold et al., 2020; Lorås, 2020; Langford and Damşa, 2020). In the study from Langford and Damşa (2020), Canvas was also considered a popular tool, as this is an official LMS in Norway. Other tools mentioned in the study from Langford and Damşa (2020) were Mentimeter, Kahoot!, Microsoft Sharepoint, and Google Drive. At the university level in Norway educators at NTNU mentioned a total of 42 tools used for teaching and interacting with students (Hjelsvold et al., 2020). Even though there is a difference between university teaching and teaching at primary and secondary education, several tools are available for both and it illustrates that it was plenty of tools to choose between for teachers. Fjørtoft (2020b) states that most schools introduced digital solutions for communication, often integrated into the LMS (Canvas, It's Learning, etc.). According to Federici and Vika (2020), 70% of teachers reported that they were in contact with pupils over the phone, and a small proportion of teachers, fewer than one out of four, used social media when interacting with pupils, weekly or daily (Fjørtoft, 2020b). According to the study from Sandvik et al. (2020), there is a wide spread in how teachers in Norwegian upper secondary schools have exploited the potential of the tools during the ERT.

Studies from Portugal, Italy, India, Finland, and Sweden demonstrate that video-conferencing tools were also popular in these countries (Afonso et al., 2020; Giovannella et al., 2020; Shenoy et al., 2020; Niemi and Kousa, 2020; Bergdahl and Nouri, 2020). These were also countries that overall had reasonable technological infrastructure and resources to carry out distance learning. The most popular tools mentioned used for video-conferencing and communication in these studies were Zoom, Microsoft Teams, Skype, and Google Meet/Hangout. An analysis from a study done in Sweden revealed that the most requested functionalities were the possibility for real-time video-conferencing, prerecorded seminars, communication and collaboration, sharing materials, and digital learning resources (Bergdahl and Nouri, 2020). The teachers in Sweden appreciated tools that allowed communicating in both synchronous and asynchronous ways. Niemi and Kousa (2020) found that the strongest theme in teachers' responses in Finland was related to interaction with pupils, and all teaching was synchronous. Shenoy et al. (2020), a study from

India, mentioned that "the faculty feel there is no much difference between online and offline sessions as they can share PowerPoint, play videos and use board and marker as regular classrooms" (Shenoy et al., 2020).

Table 3.3 provides an overview of different tools that were used during the ERT situation in Norwegian schools based on the related work. The column "Digital learning resource" refers to tools that were used as a supplement in the teaching, for example, prerecorded seminars, games, and quizzes. The column "Communication" in the table refers to both synchronous and asynchronous communication.

| | LMS | Video-conference | Share material | Digital learning resource | Communication |
|----------------------|-----|------------------|----------------|---------------------------|---------------|
| Zoom | | X | | | X |
| Microsoft Teams | | X | X | | X |
| Skype | | X | | | X |
| Canvas | X | X | X | | X |
| It's Learning | X | | X | | X |
| Google Meet/Hangout | | X | | | X |
| Google Drive | | | X | | |
| Microsoft Sharepoint | | | X | | |
| YouTube | | | | X | |
| Kahoot! | | | | X | |
| Mentimeter | | | | X | |
| Websites | | | | X | |
| Social media | | | | | X |
| Phone (call) | | | | | X |

Table 3.3: Tools and their uses

The digital infrastructure in Norway is covered well in the previous research, as presented in this chapter and Chapter 2.2.2, making it unnecessary to conduct more research on it. It was considered sufficient to focus just on the digital tools in this research. Digital tools are in this study defined as hardware and software used to conduct the different digital learning activities during ERT. The related work shows that there was a large number of tools to choose between for teachers, and that there is a wide spread in how teachers in Norwegian upper secondary schools have exploited the potential of the digital tools and resources during ERT (Sandvik et al., 2020). There are some results about the tools and how they were used, but these results are quite vague. One, therefore, considered it interesting to investigate which- and how digital tools were used by teachers and pupils more thoroughly in this research. Previous research does not refer to the experience of the various tools. Thus, one found it useful to investigate how the tools were experienced by teachers and pupils.

3.2.1 Summary of Related Work: RQ1.1

Adoption of ICT during the COVID-19 pandemic

- Norwegian upper secondary schools had the infrastructure and software to conduct digital teaching. The quality of equipment, network, and software could still vary between schools and between teachers and pupils.
- Video-conferencing software was popular during the school closures, both in Norway and internationally.
- The digital communication during the lockdown mostly happened through the LMS and over the phone.
- Table 3.3 gives an overview of which tools were used in Norway during the school closures according to the related work.

3.3 Pupils' and teachers' experiences with ERT during the COVID-19 pandemic

This chapter examines the related work connected to teacher and pupil experiences with ERT during the pandemic (RQ1.2). Nordahl et al. (2020) state that one can be quite sure that pupils have experienced remote teaching differently from teachers, as the experiences of young people are subjective and based on their previous experiences. ERT will therefore also be experienced differently by different pupils.

Pandemics are a recurring threat to everyday life and education systems. SARS, the Bird flu, Swine flu, Zika, and foot-and-mouth disease are examples of pandemics that have occurred in later years (Nikiforuk, 2008 in Bergdahl and Nouri, 2020). The COVID-19 pandemic is, however, different from the previous pandemics and diseases because of the worldwide scale. The COVID-19 school closures impacted many schools, as about 49.6% of learners were affected by the school closures, which is a record number (UNESCO, 2020b).

Research has earlier pointed out a need for plans for preparedness to maintain education and teaching in emergencies (Faherty et al. 2019; O'sullivan et al. 2009; Olympia et al. 2005 in Bergdahl and Nouri, 2020). The COVID-19 outbreak demonstrated that many schools still found it difficult to maintain the teaching because of unstable Internet access, personal needs, and shifting governmental directives. There exist several examples internationally of teachers and schools being unprepared and overwhelmed by the emergency, where teachers struggled to use tools and adapt their pedagogy to the ERT situation (Trust and Whalen, 2020). Research shows that Swedish teachers did not have previous experience with school closures and that despite some schools having digital strategies, the guidelines were outdated and were not sufficient or helpful during the COVID-19 pandemic (Bergdahl and Nouri, 2020). In the survey presented by Federici and Vika (2020), the majority of Norwegian teachers also stated that they had no or little experience with remote teaching for pupils that could not meet physically at school before the pandemic. Further, Daniel (2020) states that many schools had created plans for using technology to a larger extent in teaching. However, the changes were intended to happen over years, not days. Some parts of the implementation still had to happen in a matter of days because of the pandemic.

Increased workloads and lack of time were frequently mentioned as challenges concerning ERT. When comparing the workload during the school closures to the normal situation, Federici and Vika (2020) found that 73% of teachers in Norwegian upper secondary schools reported an increased workload. Sandvik et al. (2020) supported this finding, as 79% of teachers stated that they spent more time on digital teaching than they would in the traditional teaching situation. The teachers typically spent much time searching for learning resources and experimenting with digital solutions, and six out of ten teachers agreed that the use of digital resources in teaching demanded more preparation than teaching without them (Fjørtoft, 2020b). Swedish schools had similar issues, where teachers stated that the COVID-19 situation resulted in a huge change with a large number of things that had to happen simultaneously and that it created "a job that never ended" (Bergdahl and Nouri, 2020). Giovannella et al. (2020) reported that time and workload were challenges in Italy as well, where learning to use tools, creating learning activities and material, and following up pupils required much time. Some Norwegian teachers described a demanding working environment because of the home-office situation with their own families at home, and that the distinction between work and spare time was somewhat wiped out (Fjørtoft, 2020b). Teachers expressed that it was hard to balance when to be online and offline and that working at night and on weekends was at the expense of time with their children and families. A study on higher education in Norway during the COVID-19 pandemic further found that some teachers were worried about their data privacy during the school closures (Langford and Damşa, 2020). The COVID-19 situation did, however, not only bring challenges. Teachers experienced that the home-office situation provided more time to plan teaching, create relevant assignments, and provide feedback to pupils (Bubb and Jones, 2020), which was beneficial

to them. Despite the increased workload and varied conditions and previous experience with the digital tools, the vast majority of teachers reported that something positive came out of this situation (Fjørtoft, 2020b).

A study conducted by Sandvik et al. (2020) reveals that 69% of Norwegian pupils stated that they experienced an increased workload during the pandemic period. It was challenging for pupils to stay patient and motivated enough to participate for longer times, which identified the extended hours in front of their computers as a disadvantage for pupils (Bergdahl and Nouri, 2020). The presence of pupils in the digital teaching situation was also frequently mentioned as a challenge in previous studies. Fjørtoft (2020b) states that some pupils behaved passively after some time with the fully digital setting, as they would keep their cameras off and their microphones muted during the teaching. The same study shows that this was very tiring for the teachers, who found the teaching difficult when only speaking to black screens without getting any questions.

The previous paragraphs have presented a brief overview of some general challenges, thoughts, and feelings that pupils and teachers have expressed regarding their experiences with ERT during the COVID-19 pandemic. In the following chapters, some frequently mentioned themes in the related work will be explored more in-depth.

3.3.1 Digital Learning Activities

This research study defines Digital Learning Activities as activities conducted to achieve the learning objectives during the school closures. A study conducted by Federici and Vika (2020) found that most Norwegian teachers stated that they maintained teaching and learning during the COVID-19 pandemic. Fjørtoft (2020b) and Sandvik et al. (2020) show that both pupils and teachers reported that "live" teaching and individual tasks were used frequently as digital learning activities to maintain teaching and learning during the school closures, followed by flipped classroom and prerecorded videos. This reflects what was known about teaching before the school closure, where classroom teaching and individual work were the most common learning activities (Fjørtoft et al., 2019). The related work shows that the pupils were satisfied with these methods, while teachers report challenges connected to one-way communication and time-demanding work.

Figure 3.2 summarises what digital learning activities Norwegian upper secondary schools typically used during the school closures, according to the related work.

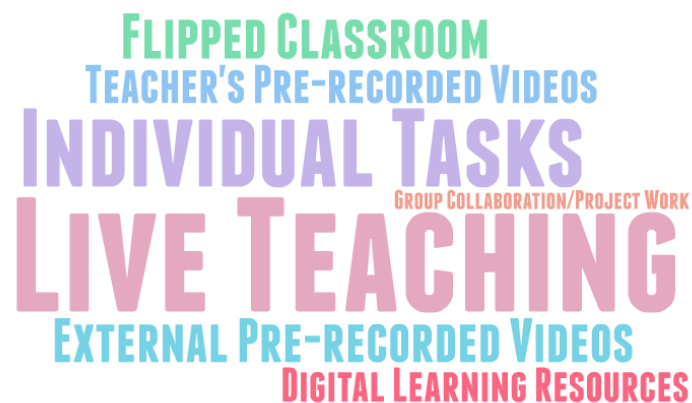


Figure 3.2: Digital Learning Activities

Since the COVID-19 pandemic emerged almost overnight, it forced schools to create an all-digital solution in a short amount of time. Many schools solved it with a traditional approach to the learning activities, which resulted in many written assignments in the LMS (Fjørtoft, 2020b), as the situation did not necessarily provide enough room to take a step back to reflect on digital practice in a pedagogical way. Another challenge mentioned by Fjørtoft (2020b) was that many teachers tended to do the same digitally as they would do analogously. To give the pupils an article as a pdf file, instead of giving it on paper, is not to utilize the possibilities technology provides. Hjelsvold et al. (2020) do, however, show that educators in Norwegian higher education also found it demanding to create digital learning activities that could substitute the traditional ones, which reflects the difficulties in Norwegian upper secondary schools.

Live teaching can be classified as synchronous teaching (Bergdahl and Nouri, 2020). 64,8% of teachers stated that they conducted daily live teaching during the school closures, while 24,4% responded that they did so weekly (Fjørtoft, 2020b). Findings in Sandvik et al. (2020) support this, where 81% of the pupils stated that the teaching happened in real-time (live) during the school closures. However, the studies do not say anything about the content, length, or quality of these live teaching sessions. 63,6% of teachers report that pupils actively participated through video or chat daily (Fjørtoft, 2020b), which implies that there existed some interaction during some of the video sessions. Live teaching was also frequently used in other countries, like Sweden and Italy (Bergdahl and Nouri, 2020; Giovannella et al., 2020). Some Swedish teachers expressed that they believed that a minimum amount of time should be allocated for interaction during the live sessions (Bergdahl and Nouri, 2020). Daniel (2020) does, however, argue that participants do not need to communicate simultaneously in most aspects of teaching and that one should instead take better advantage of asynchronous learning activities.

Flipped classroom and prerecorded videos are examples of asynchronous learning activities. These are activities that are independent of both time and location, where pupils can do them when it is most convenient for them (Scheiderer, 2020). Bergdahl and Nouri (2020) and Daniel (2020) state that asynchronous learning activities provide flexibility for pupils and teachers. They can also save time and be helpful for pupils who benefit from repetition. Pupils mentioned flipped classroom and prerecorded videos as frequently used learning activities (Sandvik et al., 2020). Four out of ten teachers reported usage of their own prerecorded videos in teaching, while six out of ten used videos created by others (Fjørtoft, 2020b). Pupils specifically expressed their satisfaction with using prerecorded videos as digital learning activities. This satisfaction was connected to the possibility to watch the videos multiple times, and that the pupils could watch them whenever it suited them (Sandvik et al., 2020). Lorås (2020) supports this finding, as the study reports that students in higher education also enjoyed the possibility to adapt the tempo and timing of their videos. Some disadvantages of asynchronous learning activities like prerecorded videos are that they limit interaction and that the pupils cannot ask questions directly to their teacher (Bergdahl and Nouri, 2020; Marshall et al., 2020).

Related work shows that digital resources was used during the school closures. Between 85-90% of teachers reported that they gave pupils tasks that required watching videos or reading texts on specific websites. These websites could be connected to the textbook, a publisher, or other academic learning resources online. One out of three teachers also used online quiz tools weekly (Fjørtoft, 2020b). Most of the teachers used digital learning resources that the school had bought licenses for, which was good regarding privacy concerns. However, three out of four teachers also supplied with other digital learning resources without a license that they found online (Fjørtoft, 2020b).

Both Fjørtoft (2020b) and Sandvik et al. (2020) indicate that the teaching often consisted of pupils doing individual tasks frequently and that less work required collaboration. In Fjørtoft (2020b), 78,7% of the teachers stated that the pupils worked with individual tasks daily, while only 8,5% of teachers reported that the pupils collaborated with other pupils daily (Fjørtoft, 2020b). However, research does show

that individual work is the most common type of work in the traditional teaching situation. This finding implies that one should not be too surprised by the extensive usage during the school closures (Gilje, 2017 in Fjørtoft, 2020b). The majority of pupils (62%) reported that they had collaborated less with other pupils during the school closures (Sandvik et al., 2020). The pupils expressed that they were pleased by the collaboration with others, and it seemed like they appreciated the social and academic contact with classmates and teachers (Sandvik et al., 2020). There was low usage of collaborative assignments in other countries as well (Giovannella et al., 2020; Bergdahl and Nouri, 2020). Teachers found it challenging to enable interaction and collaboration between the pupils using digital tools (Bergdahl and Nouri, 2020). Sandvik et al. (2020) show that 91% of teachers stated that their teaching typically consisted of pupils doing written assignments, and 87% stated that the assignments were often individual.

The related work says something about which and how activities were used during the school closures. However, how *both* pupils and teachers experienced the use of digital activities was not covered. In addition, it has not been investigated how technology supported the activities. It was therefore considered interesting to explore how pupils and teachers experienced the digital learning activities. Further, how the technology supported them from both the technological and the pedagogical perspectives was in focus.

3.3.2 Learning Outcomes and Effects

The part of the related work connected to the learning outcomes and effects during the school closures is explored in this chapter. Most teachers experienced that the pupils' academic profession was normal or slightly below (Fjørtoft, 2020b). Albó et al. (2020) suggest that a lower emphasis on the pedagogical effectiveness during the school closures could affect the learning outcomes, as schools have mainly focused on communicating and meeting basic requirements for conducting ERT. In addition, the learning outcomes could be limited by technical problems and limited follow-up during the pandemic period (Giovannella et al., 2020).

Fjørtoft (2020b) found that it was variations within the class and between pupils regarding learning outcomes. The teachers were surprised to see that some pupils behaved differently in the digital classroom than in the traditional teaching situation (Bergdahl and Nouri, 2020). The variations in pupil behavior ranged from pupils that lured away, to pupils that noticeably improved academically. Related work suggested that some pupils experienced being more comfortable with an individual setting behind a screen compared to the open and physical classroom. Teachers also mentioned that some pupils seemed to enjoy more peace and less stress in their everyday life, both in school and in leisure time (Fjørtoft, 2020b). In Bubb and Jones (2020), one teacher stated that "the difference between pupils' learning outcomes has been greater than in normal school". Research shows that pupils that experienced challenges in the physical classroom also encountered difficulties during homeschooling (Fjørtoft, 2020b). The all-digital teaching situation could make it difficult for pupils to keep up with the academic progression if they did not meet the requirements for attendance, which could have been prevented if they had to physically attend in the classroom (Fjørtoft, 2020b; Niemi and Kousa, 2020).

Many teachers still reported that the use of digital activities and resources made the teaching more varied and that it provided more pupil activity during teaching (Fjørtoft, 2020b). It was also beneficial that the teachers had to spend less time on class management in an all-digital teaching situation, like preventing noise, pupils talking, or pupils leaving their seats during class. Bergdahl and Nouri (2020) found that pupils concentrated better at home because the distraction from classmates was absent. Teachers reported that letting pupils work at their own pace resulted in better learning outcomes. The work peace in the home environment was also a positive effect on their learning outcomes. The positive effects typically applied to pupils that were particularly quiet in the traditional classroom. Pupils that previously were noisy and disrupted their classmates in the physical classroom also got a positive effect (Fjørtoft, 2020b).

The all-digital teaching situation led to some challenges for teachers, as they had to handle new situations. The teachers had to decide whether they should force pupils to use the camera and how much pupils had to participate. What types of activities to use and how much work and breaks to provide were also challenging. These decisions could affect the pupils' learning outcomes (Fjørtoft, 2020b). Teachers also experienced that pupils cheated through dividing the school work within a group and sharing the answers, or pupils joining the live sessions without participating or even seeing the lecture. The latter was hard to control when the pupils had their cameras and microphones turned off (Fjørtoft, 2020b). The result of this was often that the pupils decreased their workload and finished their assignments quickly, but they did not learn the things they were supposed to. Niemi and Kousa (2020) also found that even though pupils completed their assignments, the teachers were unsure if the pupils learned something, or if they copied their results from somewhere else.

One should also consider the pupils' perception of their own learning when one discusses the learning outcomes and effects during the COVID-19 school closures. Sandvik et al. (2020) show that pupils mastered their assignments, that a majority of them studied more than usual, and that half of the pupils felt that the situation was good for their concentration. Related work shows that pupils were able to work with their assignments at their own pace. They appreciated the opportunity to manage when to work with the different subjects and doing it effectively (Sandvik et al., 2020; Babinčáková and Bernard, 2020). The pupils asked in Sandvik et al. (2020) reported that they spent more time on their schoolwork, which according to Yates et al. (2020) could result in better learning outcomes, as pupils who worked more also learned more.

However, it could be seen in the related work that the pupils were divided when answering whether the remote teaching had a positive or negative effect on their learning. In the study by Sandvik et al. (2020), 43% of pupils responded that they disagreed that remote teaching had a positive influence on their learning, making it evident that many pupils have experienced that the COVID-19 school closures affected them negatively. Related work also shows that most pupils reported that they learned less during the school closures (Daniel, 2020). Some pupils described that the remote teaching did not motivate them and that the situation became worse as the school closures continued over time because they were not able to deal with their lack of self-discipline and their problems without help from a teacher (Niemi and Kousa, 2020).

The related work described the overall picture of pupils' learning outcomes during the school closures. It also covered some activities that pupils liked. But how did the chosen digital activities affect the pupils' learning outcomes according to pupils and teachers? One found it interesting to investigate how much pupils and teachers perceived that pupils had learned the school closures, in addition to how technology had supported the learning processes.

3.3.3 Digital Competence

This chapter explores the part of the related work connected to how teachers' and pupils' digital competence affected the transition to ERT and how ERT affected their digital competence. Digital competence does in this study concern the skills, knowledge, creativity, and attitudes that are needed for using digital activities and tools in teaching.

Chapter 2.2.2 described teachers' digital learning strategies and overall digital competence as blended (Krumsvik et al., 2016). There is a difference between conducting professional digital practices in a technologically rich, but physically classroom, compared to ERT over a longer period. Integrating digital resources in subjects demands a different approach in online teaching than in the traditional classroom, but both situations require that the teachers handle practical and technical aspects to be able to understand the possibilities and limitations within the different digital learning resources (Fjørtoft, 2020b).

According to Fjørtoft (2020b), a large proportion of teachers had their first meeting with video conferences, recordings, and navigating digital resources during the transition to ERT. The development of digital skills was, therefore, a priority. It then made reflections on digital didactics a second priority for most teachers (Fjørtoft, 2020b). In Fjørtoft (2020b), one teacher told how an otherwise "relatively well-functioning pedagogical repertoire" began to dilute after just over six weeks of homeschooling. According to Fjørtoft (2020b), a part of the explanation is that teachers have focused mainly on learning the practical use of digital resources, rather than gaining competence in teaching methods and didactics in digital environments. Basic skills (i.e. reading, writing, speaking) change in digital environments (Fjørtoft, 2020b). Therefore, the teachers themselves must develop skills in the use of new and relevant tools in teaching (Fjørtoft, 2020b). Although teachers lacked experience in remote teaching and preparation, their attitudes were positive, and they were willing to go the extra mile to move teaching to online platforms (Gudmundsdottir and Hathaway, 2020).

Many teachers felt that the start-up was difficult, as there were high expectations and pressure (Comanducci, 2020 in Bubb and Jones, 2020). Teachers were overwhelmed with suggestions for digital resources (i.e., apps, websites). Thus, they were concerned about difficulties caused by their unfamiliarity with delivering high-quality teaching remotely (Bubb and Jones, 2020). Some felt like "everyone else was doing something much better and more modern" (Bubb and Jones, 2020). In the study from Fjørtoft (2020b), several teachers said that they experienced a steep learning curve when transitioning to remote teaching.

As a result of remote teaching, studies have found that the teachers' digital competence has increased (Fjørtoft, 2020b; Federici and Vika, 2020). According to the national survey from Federici and Vika (2020), over 90% of teachers in upper secondary schools said that their digital competence has improved during the school closure. The concept of competence is undefined in the research, but according to Federici and Vika (2020), it is probably about digital skills, that is, the practical aspects of using different digital resources and equipment.

In the study from Fjørtoft (2020a), the majority of teachers considered their own "trial and error" as the most useful when transitioning into ERT. More than seven out of ten also stated that they somewhat benefited from guidance from a colleague or an IT resource person at the school (Fjørtoft, 2020a). These findings also occurred in results from educators in higher education (Langford and Damşa, 2020). When asked what helped with the transition to digital education, the most popular answers were self-help and obtaining support from others (Langford and Damşa, 2020). In the study from Fjørtoft (2020a), slightly less than half of the teachers also agreed that participation in internal and external courses had been helpful to some extent.

The related work only consists of the teachers' perspectives regarding the pupils' digital competence. During the school closures, multiple teachers discovered that pupils did not have as good digital skills as one might have the impression of (Fjørtoft, 2020b). Some teachers experienced that pupils had trouble with deliveries, opening hyperlinks and videos online, proper storage, navigation, and video conferences (Fjørtoft, 2020b). Also in studies from Sweden and Slovakia, teachers expressed that secondary school pupils are less skilled and less competent in managing the technologies effortlessly for learning (Bergdahl and Nouri, 2020; Babinčáková and Bernard, 2020). Several teachers pointed out that pupils learned and increased their digital skills over time (Fjørtoft, 2020b). Day et al. (2021) show that pupils with previous online experience were more successful in their ability to "concentrate on school subjects, finish homework by the deadline, and motivate themselves to do schoolwork."

The related work shows that the teachers' digital competence has improved, but it is mentioned that competence concerning digital didactics was a second priority during the first school closure. The related work still covered teachers' digital competence to a sufficient level, while the teachers' perception of their pupils' digital skills is only covered to some extent. The related work does not make it possible to check

whether the pupils agreed with these perceptions in the already existing material. One decided that the research should make such a comparison possible. Thus, the pupils' digital competence was in focus during this research.

3.3.4 Digital Follow-up

In the traditional teaching situation, the follow-up of pupils is often done physically in the classroom. When teaching remotely, there is a need for other alternatives for the teachers to communicate with and follow up the pupils. As ERT was a new situation for everyone, the need to follow up pupils was considered even more important. This chapter explores the related work connected to the digital follow-up of pupils during ERT.

Feedback on school work is one type of follow-up. According to the study from Federici and Vika (2020), the majority of teachers reported that they were able to help pupils with the school work. Bubb and Jones (2020) support this finding, as more than half of the teachers agreed that they gave more useful feedback on pupils' work than usual. They expressed that they had probably divided their attention more fairly between the pupils during ERT. Sandvik et al. (2020) show that 63% of the pupils got help from classmates and that 52% collaborated with classmates on assignments. In a study from Denmark, pupils expressed that it was easier to get help from classmates than from teachers and parents (Nordahl et al., 2020). Nevertheless, Sandvik et al. (2020) show that a significant part of pupils had not experienced good help, either from classmates or parents.

Some challenges were reported by several teachers, which were related to body language and communication through digital solutions. The digital classroom was missing the informal contact between pupil and teacher, which the physical classroom provides. It made it difficult, or even impossible, for the teacher to interpret the pupils' body language and working style (Fjørtoft, 2020b). Teachers found it difficult to know who understood the subject, and which pupils needed help. In many cases, it was a challenge that the pupils were "hidden" and had a muted microphone (Fjørtoft, 2020b). Teachers were more dependent on the pupils contacting the teacher if they needed help, as it was hard to identify pupils that needed support (Fjørtoft, 2020b). In the traditional situation in a physical classroom, it is easier to understand who needs extra support. Studies from Sweden and Finland found similar issues (Bergdahl and Nouri, 2020; Niemi and Kousa, 2020). In the study from Finland, the teachers recognized the need to support pupils during remote teaching, but it was difficult to complete in practice (Niemi and Kousa, 2020). In a study from Denmark, one could see a decline regarding feedback given to pupils, when comparing remote teaching with the traditional school situation (Nordahl et al., 2020). The exception was written feedback, which the pupils have experienced somewhat more of during ERT through the learning platforms used. However, there has been less oral feedback in remote teaching (Nordahl et al., 2020).

Another type of follow-up of pupils is on a more personal level. The national study from Federici and Vika (2020) reports that most teachers reported having good contact with pupils and parents during the school closure. Sandvik et al. (2020) support this statement by stating that most teachers (91%) experienced regular contact with their pupils. The number of pupils is somewhat lower. 73% of the pupils experienced regular contact with their main teacher, which indicates that almost one out of four had minor contact with their teacher during the ERT (Sandvik et al., 2020). A significant number of pupils reported that they did not have any contact with their teacher during the ERT period in Denmark, which Nordahl et al. (2020) considered to be severe. According to Fjørtoft (2020b), several teachers emphasized that daily contact with the pupils was crucial to maintain relationships, structure, and a certain sense of belonging to the class. The teachers' responses illustrate that they found it problematic to build and maintain a good community in the class, in the digital platforms, because the contact with the pupils always was planned and they lost the spontaneity they otherwise would have had (Fjørtoft, 2020b).

A few teachers experienced losing all contact with some pupils, despite persistent attempts by telephone, digital channels, and in some cases physical contact. These were mainly pupils in upper secondary school or adult education (Fjørtoft, 2020b). Federici and Vika (2020) found that only 9% of upper secondary school teachers experienced that there were more than a few pupils they had not been in contact with. According to the study from Federici and Vika (2020), the proportion who answered that they were "partially" able to follow up vulnerable pupils was high, which indicates that it was difficult to follow up all pupils during ERT. Merely 23% of upper secondary school teachers stated that they were able to follow up vulnerable pupils (Federici and Vika, 2020). Giovannella et al. (2020) found the same in Italy, where 10% of the teachers declared to have lost contact with 20% of the students or more. Only 25% of the teachers had not lost communication with any students.

In Chapter 3.3.1, it was mentioned that less work required collaboration between pupils during the ERT. According to Sandvik et al. (2020), most pupils in Norwegian upper secondary schools have felt lonely in the school work, and pupils have missed physical conversations with their teachers. This finding emphasizes the essential role that the school and teacher play in pupils' social community (Sandvik et al., 2020). A study from Finland by Niemi and Kousa (2020) shows that the school has multiple functions in pupils' lives. Both social relationships (chatting, playing, having lunch, etc.) and collaborating (working together, sharing ideas, etc.) can impact their motivation to learn. These elements influence pupils' wellbeing, and according to Niemi and Kousa (2020), they are not present enough in remote teaching.

The related work illustrates that teachers were able to help and follow-up pupils on an overall level. Still, they found it hard to maintain a good community in the class on the digital platforms (Fjørtoft, 2020b) and follow up every pupil - especially vulnerable pupils (Federici and Vika, 2020). It is crucial to notice that these results are based mainly on the perception of teachers. The related work does not show whether the pupils felt they got the help they needed from teachers on the school work. One found it interesting to investigate whether the pupils agreed that they got the help and follow-up they needed to handle school work during ERT. How the follow-up was accomplished was also in focus.

3.3.5 Summary of Related Work: RQ1.2

Experiences with ERT during the COVID-19 pandemic

- Schools and teachers experienced a low degree of preparedness for such an educational emergency that the COVID-19 pandemic led to.
- An increased workload, time management, and pupil presence in live sessions were challenging for both teachers and pupils.
- Related work mentioned live teaching and individual tasks as the most frequently used digital learning activities, followed by flipped classroom, prerecorded videos, and digital learning resources.
- Pupils expressed their satisfaction towards prerecorded videos, as they could watch the videos multiple times and when it suited them.
- The majority of the tasks and assignments during the school closures were written work. The pupils rarely collaborated with classmates.

Continuation: Experiences with ERT during the COVID-19 pandemic

- There were variations within classes and pupil groups regarding learning outcomes during the school closures. Some pupils behaved differently in the digital classroom than in the traditional teaching situation, and some pupils experienced being more comfortable with the individual setting.
- The use of digital activities and resources made teaching more varied and led to more pupil activity. However, teachers struggled to decide whether they should force pupils to use the camera and how much pupils had to participate. What types of activities to use and how much work and breaks to provide was also challenging.
- Teachers experienced that pupils cheated on their tasks by dividing work and sharing answers.
- Pupils studied more and mastered their assignments, but they were divided on whether the remote teaching had a positive or negative effect on their learning. Most pupils reported that they learned less during ERT and that the situation got worse as the lockdown continued.
- Teachers needed to handle practical and technical aspects of digital teaching to understand possibilities and limitations with ERT.
- Many teachers had their first meeting with video conferences, recordings, and digital learning resources during the school closures, and they were overwhelmed with all the suggestions available. Still, the basic and practical digital competence of teachers has increased during ERT.
- Multiple teachers noticed that pupils' digital skills were not as good as expected, but that the pupils learned and increased the skills over time.
- Pupils expressed that it was easier to get help from classmates than from teachers, and a lot of pupils did not experience good help at all. Teachers were dependent on pupils contacting them if they needed help because it was hard to identify pupils that needed support.
- The majority of teachers reported good contact with pupils, but a few experienced losing all contact with some pupils. The majority of pupils in Norwegian upper secondary schools felt lonely in their school work.

3.4 ERT and Digitalization of Education

This chapter explores related work regarding RQ2 about how the ERT experiences can influence the digitalization process in Norwegian schools. The chapter includes results from studies done on ERT due to COVID-19, both nationally and internationally, on how the school closures might affect education systems, and how the situation has impacted the teachers' and pupils' mindsets towards future use of ICT in teaching. The related work also includes thoughts, feelings, and concerns connected to what pupils and teachers have experienced and learned during the school closures, which should be considered when adopting ICT in the future.

The related work in Chapter 3.3 shows that one can learn a lot from the pupils' and teachers' to understand how teaching and learning were maintained during the pandemic, and the experiences can give indications on what works and not during school closures. However, one should recognize that pandemics are not the only threat that could lead to school closures, even if pandemics are considered the biggest risk in Norway (DSB, 2019). One should also be aware that other countries have experienced school closures to a larger extent than Norway due to war, terrorism, natural disasters, or other emergencies. In a future perspective, Whittle et al. (2020) state that the need for digital solutions may increase in the future because of an increased likelihood for future school closures due to pandemic outbreaks, wildfires, active shooter incidents, or other emergencies. This implies that one should learn from previous experiences with school closures both nationally and internationally, to increase the preparedness for future emergencies. Reimers and Schleicher (2020) state that "it is about looking seriously and dispassionately at good practices in our own countries and elsewhere to become knowledgeable about what works." These experiences could be useful in the creative problem solving that is required when planning education in crises, where one has to generate several different solutions that are helpful for schools and learners in lockdown (Hodges et al., 2020).

The transition to ERT was a rapid adjustment and Aguilera-Hermida (2020) states that it is important to explain that the COVID-19 experience was only a response to an immediate emergency. One should recognize that the ERT situation does not represent the studied field of online teaching when discussing the future use of ICT and the digitalization of education systems. Research from before COVID-19 shows that integrating ICT in teaching is both a complex and gradual process that depends on the teachers getting time to adapt the use of it to their teaching style (Wikan and Molster, 2011). This required time was missing when the pandemic emerged with an immediate need for ERT. However, Giovannella et al. (2020) defines the ERT situation as a "catalyst for change" and states that it can be seen as an opportunity to reflect on how education systems are built. This implies that the ERT situation still produced experiences, both for teachers and pupils, that should be considered in the discussion about the ongoing digitalization of schools.

Bubb and Jones (2020) found that many pupils expressed that they experienced some positive outcomes from the school closures, as it led to flexible school days where they were able to organize their activities to a larger extent. They were then able to work at their own pace and gained a stronger feeling of independence. This was supported by Fjørtoft (2020b), who found that teachers encountered that the pupils had to learn how to work independently and that it was a useful experience for them. In addition, many teachers reported that they were positively surprised by the pupils' motivation, patience, engagement, and digital competence (Bergdahl and Nouri, 2020). Spoel et al. (2020) found that remote teaching made many teachers more aware of the possibilities provided by technology in teaching, while other studies report that teachers have gotten a higher level of confidence towards the use of ICT than before the pandemic (Albó et al., 2020; Fjørtoft, 2020a). This implies that teachers might have had positive experiences during the school closures that they will consider when they are integrating ICT in the future. The positive attitudes might imply that teachers do not oppose online teaching and that they

will be more positive towards using it in the future (Hjelsvold et al., 2020). However, although there exist many positive attitudes and experiences towards ERT and the future use of ICT in teaching, many teachers also express their concerns connected to it (Bergdahl and Nouri, 2020; Fjørtoft, 2020b). It is specifically pointed out that the situation is still new, and that unfortunate consequences will appear after some time (Bergdahl and Nouri, 2020). Teachers also emphasized that the learning that happens in the classroom community could never be replaced by digital tools. Further, the majority of them never envisioned a life as full-time digital teachers. Some teachers said explicitly that they needed a break from working digitally after the pandemic and that they looked forward to meeting the pupils physically (Fjørtoft, 2020a).

Still, Federici and Vika (2020) found that a total of 80% of teachers in Norwegian upper secondary schools reported that their experiences during the COVID-19 school closures will influence how they will teach in the future. This was supported by other studies as well, where teachers reported that they intended to use ICT more in their teaching after the pandemic, compared to how often they used technology before (Spoel et al., 2020; Fjørtoft, 2020b). Thus, related work shows that the future teaching will be influenced by how ICT was used during the COVID-19 pandemic, which implies that the digitalization process in Norwegian schools will also be affected. However, the related work does not investigate how teachers intend to use ICT specifically in their teaching. Thus, one found it interesting to explore how pupils and teachers envisioned that experiences from the school closures could play a role in the future use of ICT in the ongoing digitalization process of Norwegian schools.

3.4.1 ERT's effect on Digital Competence and use of ICT

The pandemic situation demonstrated that the teachers had varied grounds for solving the challenges imposed by ERT, because of differences in previous digital competence development and/or own interest in digital tools and resources. The sudden shift to ERT and the extensive use of ICT, therefore, led to a major boost for many teachers towards the development of digital skills, which in turn will likely lead to more teachers having the prerequisites to participate in the pedagogical and didactic reflections on the use of ICT in education (Fjørtoft, 2020b). The development of digital competence requires practice and experience, which the pandemic and school closures forced on teachers. As a result, many teachers experienced an increased digital competence and several teachers expressed that they had learned a lot that they could use when transitioning back to the traditional teaching situation (Fjørtoft, 2020b).

Research shows that the responses to the pandemic increased the use of digital technology for teaching and learning and that the forced use of digital tools and resources due to the ERT situation presented a unique opportunity to explore the adoption of ICT in teaching (Albó et al., 2020). Many teachers reported that they had seen the utility value in digital resources that they had not used much before and that their pedagogical toolbox had expanded as a result of the ERT experiences. Fjørtoft (2020b) found that some teachers expressed that the ERT experiences could be useful to adjust the traditional teaching situation, where one should be able to be more flexible about the course of training for pupils that are struggling with school refusal. The teachers envisioned that this could be solved with partial digital teaching in certain subjects or periods of time. The teachers also expressed that they in general would continue to use the digital tools and resources in the future, and that the digital tools presented opportunities for a larger extent of variation in the teaching and that it made it easier to differentiate between pupils (Fjørtoft, 2020b). In addition, the results from Fjørtoft (2020b) indicate that teachers are on their way to exploit the opportunities that lie in digital technology to a greater extent and that this is a result of the experiences from the school closures. The same is found in Japan, where the experiences from the COVID-19 pandemic have accelerated the process of enhancing the use of ICT in teaching through improving classroom infrastructure, building the capacity of teachers and pupils, and making changes to the perceptions of online learning (Bozkurt and Sharma, 2020).

In Norway, teachers envisioned that they to a larger extent would use video solutions, both for meetings and to record videos to use in teaching (Fjørtoft, 2020b). This was supported by Delic and Riley (2020), who states that teachers will discover that time can be saved through creating teaching videos that can be reused. Fjørtoft (2020b) also mentioned flipped classroom as a solution that teachers intended to use more, in addition to increased use of digital homework through i.e., submission of text, sound recordings, and videos. Some concerns were connected to the understanding of the amount of time that is required to create effective and quality assured digital learning materials to use in teaching (Bozkurt et al., 2020).

Another challenge that Bozkurt et al. (2020) found, was that the use of ICT during the pandemic was closely connected to the teachers teaching style before the pandemic. This implies that teachers tried to do the same style of teaching with similar teaching activities during the school closures as they did before the COVID-19 pandemic. The challenge was that the digital teaching strategies were a reflection of their educational values. This statement indicates that a teacher who values objective assessment will deliver remote lectures and tests/exams using digital tools. Further, a teacher who values inquiry-based learning will use discussion boards and emphasize information sharing through using technology. Last, a teacher that values project-based learning lets pupils demonstrate what they have learned through using technology in a project-based, creative way (Bozkurt et al., 2020). This indicates that the pupils often experienced the use of ICT during the school closures differently based on what kinds of teachers they had.

3.4.2 Summary of Related Work: RQ2

| ERT and Digitalization processes |
|---|
| <ul style="list-style-type: none"> • The COVID-19 school closures provided an opportunity to reflect on how education systems are built and how they use ICT. • The ERT situation has produced experiences, both for pupils and teachers, that should be taken into consideration when discussing the ongoing digitalization of schools. • Pupils experienced flexible school days where they were able to organize their activities, work at their own pace and gain a feeling of independence. • Remote teaching made teachers more aware of the possibilities provided by technology in teaching. Teachers have gotten a higher level of confidence towards the use of ICT compared to before the pandemic. • Many teachers experienced an increased digital competence and that they learned a lot during the school closures that they could use in the future. • A majority of teachers in Norwegian upper secondary school report that the ERT experiences will influence how they will teach in the future. • Teachers found utility value in digital resources they had not used before and expanded their pedagogical toolbox as a result of ERT. They envision to keep using digital tools and resources in the future. • Specific digital activities that teachers envision to use more in the future are video solutions for meetings and recording videos, flipped classroom, and digital homework. |

Continuation: ERT and Digitalization processes

- The course of training should be more flexible through the use of ICT for pupils that struggle with school refusal.
- Teachers still emphasize that digital tools can never substitute the learning that happens in the classroom community.
- Another challenge was that the use of ICT is closely connected to the teachers' teaching style, which can lead to varied experiences for pupils.

Chapter 4

Methodologies

This chapter describes the research strategy, in addition to the data generation and data analysis methods used in this research. The COVID-19 pandemic that reached Norway in March 2020 greatly affected Norwegian education systems as it forced the schools to conduct ERT. The Norwegian education systems were in an ongoing digitalization process that was affected by the national school closures. The first research question of this study includes an exploration of how pupils and teachers in Norwegian upper secondary schools experienced the adoption of ICT differently during school closures. The second research question focuses on how lessons learned from ERT could influence the ongoing digitalization process in Norwegian education. A case study was conducted as the research strategy to answer the research questions.

A case study focuses on one instance of the "thing" that is to be investigated (Oates, 2006). In this research that was one Norwegian upper secondary school. The reason for choosing a case study was because it was possible to gather more detailed data compared to a survey study on multiple upper secondary schools. In addition, it was considered to be too time-consuming to gather data from numerous schools, as schools were hard to get in contact with during this period with "on and off" remote teaching. Crowe et al. (2011) state that the case study approach "lends itself well to capturing information on more explanatory *how*, *what* and *why* questions." This made the strategy fit this research, as the research questions considered *how* ICT was adopted during ERT, *how* it was experienced by teachers and pupils, and *why* it was experienced like that. The chosen school was studied in-depth, using a variety of data generation methods to develop a thorough understanding of the case (Crowe et al., 2011).

Chapter 4.1 further elaborates details about the chosen case. In Chapter 4.2, the reasoning for choosing a teacher-pupil perspective is described, and the instruments used in the research to investigate the teachers' and pupils' experiences are explained. Chapter 4.3 presents the data generation methods. Lastly, the data analysis methods are described in Chapter 4.4.

4.1 Case Description

The chosen case was a public Norwegian upper secondary school, which was named Dandelion school in this research. After pupils finish primary and lower secondary education (1st-10th grade) in Norway, most begin at upper secondary schools. Upper secondary schools consist of the grades 11th-13th, which are referred to as first-, second-, and third upper secondary school (Vg1, Vg2, and Vg3). Dandelion school was located in a city in Norway, and there were around 1000 pupils and 250 teachers in total. The school was recruited by contacting the school management through the head of the department. Table 4.1 presents an overview of the population and the educational programmes at Dandelion school.

| Case: Dandelion Upper Secondary School | | |
|--|---|---|
| Population | Pupils | Approximately 1000. |
| | Teachers | Approximately 250. |
| Educational programs | Education Programme for Specialization in General Studies | Provides a basis for studying at university and college. In this programme, pupils can immerse themselves in science subjects or language/social studies/economics. |
| | Supplementary Studies qualifying for Higher Education | An education programme for pupils that have studied Vocational Education Programme but want to get general university and college admissions certification. |
| | Media and Communication | The focus in this programme is on media and communication subjects. Pupils also get general university and college admissions certification. |
| | Vocational Education Programme | This is practical education programmes and provides competence for working life (i.e., building and construction, food and beverages, sales, service and tourism etc.). |

Table 4.1: Overview of Dandelion school

One reason for choosing this particular school was that it was considered typical, which makes generalization possible (Oates, 2006). The school was considered typical because it offers the educational programmes most Norwegian pupils attend (UDIR, 2021). By studying a particular instance it is possible to gain insight and knowledge that also might be relevant to other situations (Oates, 2006), which in this case were other schools. The second reason for choosing this case was because of convenience (Oates, 2006), as one of the researchers had a connection to the school that made it easy to get in contact.

Teachers and pupils from Dandelion school were invited to participate in the study. Only pupils from Vg2 and Vg3 were invited due to the aspect of timing, as Vg1 pupils began in august 2020 and therefore did not experience going to Dandelion school when the school switched to ERT in March 2020. Pupils and teachers from Vocational Education Programme did not participate, as they were involved in another study at the time of data collection. However, some data concerning vocational courses were gathered as some teachers had experience with teaching vocational subjects, and some pupils were studying it when the pandemic erupted in March 2020. The pupils were included in the study because they had begun studying Vg3 Supplementary Studies after the summer vacation. Table 4.2 provides an overview of the number of pupils and teachers who were invited to participate.

| Invited participants | |
|---|--------------------|
| Pupils | Approximately 370. |
| Teachers | 65. |
| Pupils and teachers from the whole school except Vg1 and Vocational Education Programmes. | |

Table 4.2: Overview of invited participants

4.2 Research Perspectives and Instruments

RQ1 aimed to explore the differences between how Norwegian upper secondary school pupils and teachers experienced ERT during the COVID-19 pandemic. One reason for choosing to explore and compare the views of both pupils and teachers was that already conducted research of Norwegian upper secondary schools' experiences with ERT, elaborated in Chapter 3, did not look at both perspectives. Another reason for including the pupils' perspective is that young people's experiences and opinions are important and will make a difference in how they commit to learning and their learning outcome (Rudduck and Flutter, 2000). Pupils are capable of insightful and constructive analysis of their experience of learning in school, and they can explain which teaching approaches and contexts are helpful in their learning (Brown and McIntyre, 1993; Harris et al., 1995; McCallum et al., 2000; Rudduck and Flutter, 2000 in Deaney et al., 2003). Further, the digitalization strategy states that "pupils and teachers should collaborate on and reflect on the choice of teaching aids and assignments" (Kunnskapsdepartementet, 2017), which implies that both groups should be included in the discussion about the implementation of ERT during the school closures. Pupils' perspectives play an important role in shaping activities that take place in school settings. They should be seen as active participants in shaping educational processes rather than viewed as passive recipients of them (Pollard and Tann, 1993 in Deaney et al., 2003). Thus, including both perspectives in this research provided the opportunity for both pupils and teachers to gain an active role in the process of learning from the ERT implementation.

RQ1, and more specifically the sub-question RQ1.2, aimed to investigate the *experiences* of teachers and pupils. Learning experiences can take place both in traditional academic settings (schools, classrooms) and interactions (pupils taught by teachers) and in nontraditional settings (homeschooling) and interactions (games, software applications). An *experience* in this research context was therefore a broad and complex term. Hence, it was decided to use the method of reductionism, which means breaking the concept down into smaller pieces (Oates, 2006). The idea was to investigate the simpler components, in order to understand the more complex term *experience* (Fang and Casadevall, 2011). The related work was carefully examined, which resulted in five components of the learning experience that were frequently mentioned and that needed further investigation. The components are presented and described in Figure 4.3 and they were used as instruments in this research.

| Instruments | Explanation |
|-------------------------------|--|
| Digital Learning Activities | Activities conducted to achieve learning objectives. Examples of such activities are live teaching, group work, flipped classroom, etc. |
| Digital Tools | The digital tools are the hardware and software that were used to conduct the different learning activities. |
| Learning Outcomes and Effects | What the individual has learned, and what the individual can do after participating in the learning activities. This topic also looks at other effects the digital homeschool has had. |
| Digital Competence | The skills, knowledge, and attitudes that one needs to be able to use digital activities and tools for teaching and learning. |
| Digital Follow-up | The digital actions and tools used to provide help and guidance during the school closures. |

Table 4.3: Instruments within the term "experience"

4.3 Data Generation Methods

This chapter describes the data generation methods used in the study. Oates (2006) states that one can utilize multiple data generation methods that produce quantitative and qualitative data. The study, therefore, included the methods questionnaire, focus group, and interview. The main reason for using all three data generation methods was to obtain a *data triangulation* for RQ1. In addition, the use of multiple data generation methods can increase the validity of a study (Crowe et al., 2011). The combination of methods can show a significant pattern even if it is not possible to find significance in each method alone (Miesing, 1991). Approaching the same issue from different angles and getting similar conclusions from several methods can also produce a holistic overview of the problem (Crowe et al., 2011). Thus, using multiple sources can enhance the study. Still, the most crucial aspect is to collect data of quality regardless of method (Harrell and Bradley, 2009), consequently, the methods needed to be designed properly.

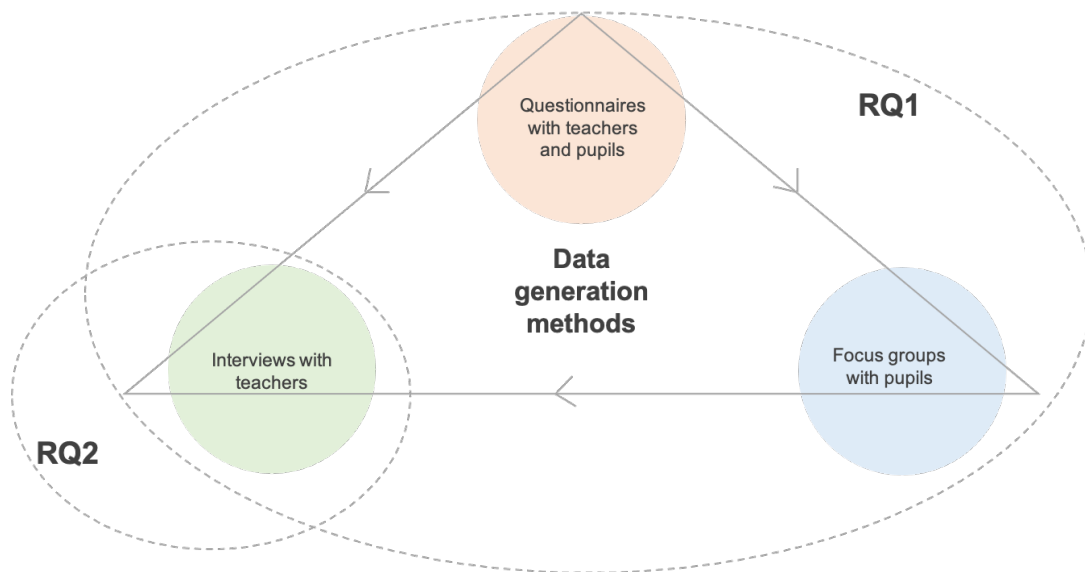


Figure 4.1: Data Generation Methods

Figure 4.1 illustrates how the data generation methods were triangulated and to what research question each method contributed to. The questionnaire method was mainly used to get an overview of the use of ICT (RQ1.1) and the experiences with ERT (RQ1.2). The questionnaire method was well suited to answer RQ1 because one were able to ask pupils and teachers the same questions, which made it possible to compare their experiences. One chose the focus group method to gain more detailed information from pupils' perspectives based on the preliminary results from the questionnaires. The focus group interviews were conducted to confirm or refute findings from the questionnaires, and to gather more qualitative in-depth data. The interviews were used to obtain in-depth data from the teachers' perspectives towards RQ1. The interviews included findings from the questionnaire method and focus group method to conduct the triangulation. In addition, one used the interview method to investigate the teachers' thoughts towards how the ERT situation can influence the digitalization of Norwegian schools (RQ2).

The data collection for this research happened between January 2020 and April 2020, but it concerns experiences for the whole period between March 2020 and April 2021. The following chapters describe the design of the data generation methods in detail. Chapter 4.3.1 introduces the questionnaire as a data generation method and describes how this method was used in the study. Chapter 4.3.2 presents the focus group method, while Chapter 4.3.3 covers the implementation of the interview method.

4.3.1 Questionnaire

A questionnaire is a *pre-defined set of questions, assembled in a pre-determined order* used to identify patterns and make generalizations (Oates, 2006, p.219). One decided to use two questionnaires as data generation methods in this project, one aimed at teachers and one at pupils because it provided the ability to ask both teachers and pupils similar questions. One argued that the questionnaire method was well suited for this study because it made it possible to compare the experiences of both teachers and pupils towards ERT. The questionnaires were made to gather data regarding the first research question (RQ1). Thus, one decided to define two questionnaire objectives towards the sub-questions that RQ1 consisted of, which is presented in Table 4.4.

| Research Question | Questionnaire objective |
|---|---|
| RQ1.1: How did Norwegian upper secondary schools adopt ICT to maintain the teaching and learning during the school closures? | To obtain a mapping of what digital tools Norwegian upper secondary schools adopted to maintain the teaching and learning during the school closures. The mapping was to consist of the used tools and an overview of how they were used. |
| RQ1.2: How did pupils and teachers experience the emergency remote teaching during the school closures? | To investigate the experiences of pupils and teachers in a way that made it possible to compare their thoughts, feelings, and opinions considering the ERT due to the COVID-19 pandemic. The focus of this part of the questionnaire was to gain an overview of how pupils and teachers experienced the use of technology during the school closures, and get an impression of which activities and tools they liked, what pupils learned the most from, etc. |

Table 4.4: Questionnaire Objectives

The questionnaires were designed based on a framework presented by Gendall (1998) in addition to supporting theories from Marsden and Wright (2010) and Lietz (2010). The framework was selected for this study because it was a simple and logical structure for the process of questionnaire design. Gendall (1998) proposes several general and specific principles for questionnaire design.

| General Principle | Implementation |
|--|--|
| The respondent of the questionnaire defines what you can do. | Measures taken were reducing the use of words that could be unfamiliar or difficult. The questionnaires were designed in Norwegian, as this was the native language of the respondents. A main focus was to keep it as short as possible (15 minutes). |
| Ask questions that can be answered truthfully. | This principle implies that attitudes and opinions are only a minor part of questionnaire design. It was therefore not implemented in this study, since a main goal for the questionnaire was to investigate experiences and feelings. |
| Don't impose your values, perceptions or language on the respondent. | The questions were asked in a neutral manner and avoiding words that were positively/negatively charged, as this could reduce social desirability. |

Table 4.5: General Principles of Questionnaire Design

Table 4.5 presents the general principles and actions taken to meet them. Gendall (1998) states that the framework consists of a small number of general principles that broaden out into multiple specific principles for questionnaire design. These specific principles are more focused on why you do the questionnaire and how you create the design. There are four layers of specific principles: Objectives, Question Design, Question Wording, and Layout, and each layer is presented in Table 4.6.

| Specific Principle | Implementation |
|--|--|
| The objectives of the questionnaires should be obtained before creating the questions. | The objectives of this research were planned prior to the questionnaire design based on the relevant research questions and can be found in Table 4.4. |
| "A good question is one that produces answers that are reliable and valid measures of something we want to describe" (Fowler, 1995, as cited in Gendall, 1998). | One included introductions to questions/series of questions and used closed questions. A focus was also to make the questionnaire less time-consuming. Several open-ended questions were included, as they could add richness to the findings (Marsden and Wright, 2010). |
| The questions should be kept short, simple and specific, and a no opinion/don't know should always be offered. | The questions were designed to be short and specific. Any words or concepts that may be perceived as unknown were explained in an introduction. The closed questions included options for "don't want to answer" and/or "don't know". The closed questions included an "other"-alternative, in case the desired alternative was not presented. |
| "Questionnaires should be designed to make the task of reading questions, following instructions and recording answers as easy as possible for interviewers and respondents" (Fowler, 1995, as cited in Gendall,1998). | The questionnaires were grouped into specific categories. Each group included an introduction that showed what the researchers were trying to figure out within each category. Questions that were not relevant for all the respondents were filtered away. One used the same scale for all scaling questions. |

Table 4.6: Specific principles of Questionnaire Design

One built the questionnaires using the digital tool Nettskjema, as this was the provider that NTNU had a data processor agreement with (Bostad, 2019). Nettskjema is a solution that can be used to gather data through the internet. The solution can be used both on the web and in mobile applications. This flexibility made it a suitable choice for the conduction of the questionnaires.

The experiences with ERT were in this research, as described in Chapter 4.2, divided into the following instruments: Digital learning activities, Digital tools, Learning outcomes and effects, Digital competence, and Digital follow-up. The questionnaires reflected this division, as they were structured after the same six categories. Page turns and introductions separated each category. The questionnaires aimed to investigate the parts of each category that were not thoroughly covered in the related work. Table 4.7 further elaborates the focus of each instrument in the questionnaires.

| Instrument | Questionnaire Focus |
|-------------------------------|--|
| Digital Learning Activities | The questionnaires included questions about how pupils and teachers experienced the used digital activities during the school closures and how the used technology supported them, as this was not sufficient covered in the related work. |
| Digital Tools | The questions in this category aimed to investigate which and why digital tools (hardware and software) were used to conduct the different digital learning activities during ERT for RQ1.1. One also focused on capturing the experiences with how the tools worked in the opinions of pupils and teachers. |
| Learning Outcomes and Effects | The questions in this category aimed to investigate what digital activities teachers and pupils perceived that the pupils learned the most from and why. Some focus was also directed towards how the pupils felt that ERT affected their learning. |
| Digital Competence | One considered that the related work covered the teachers' digital competence to a sufficient level, meaning that it was unnecessary to investigate it more. Questions in the digital competence category were therefore focused on the pupils digital competence. The main focus was to capture whether the teachers and the pupils had the same understanding of the pupils' digital competence. |
| Digital Follow-up | The related work mostly covered the teachers' perception of the digital follow-up during the school closures. Thus, one decided to explore the pupils' experiences towards the help and follow-up they received during the school closures. One also investigated how the digital follow-up was accomplished. |

Table 4.7: Questionnaire Focus

Appendix C presents the translated versions of the questions in each category in a matrix, which maps the questions to the related RQ's. Further, the appendix shows that the questionnaires asked questions about the specific activities and tools that the respondents chose as their "most-liked" ones. To avoid a too time-consuming questionnaire, one decided to restrict how many activities and tools the respondent could choose. Thus, the respondents were able to choose up to three activities and tools in those questions.

Lyberg et al. (1997) argue that answer categories should be aligned vertically while scaling categories should be aligned horizontally, which was implemented in the questionnaire design. Likert scales were used for all the scaling questions. A Likert scale is *"a psychometric scale that has multiple categories from which respondents choose to indicate their opinions, attitudes, or feelings about a particular issue"* (Nemoto and Beglar, 2014). One decided to use Likert scales because of the advantages they provide related to quick gathering of data from a large number of respondents, and because the data they provide can be compared and contrasted (Nemoto and Beglar, 2014). The scales in the questionnaire moved from a weaker endorsement (low degree) to a stronger endorsement (high degree).

Pilot Test

Oates (2006, p.226) states that it is a good idea to run a pilot test of the questionnaires before distribution. A pilot test is a test where a group of people pretends to be the target respondents and completes the questionnaire. Thus, one conducted a pilot test of the questionnaires, where five independent participants

completed the questionnaires. Researchers typically ask colleagues to participate in the pilot tests due to resources (Oates, 2006, p.226), which was also the case in this study. Thus, the five participants were Informatics-students at NTNU, which meant that they were closer to the pupil-participants in the research.

The participants monitored the time spent on completing the questionnaires. As mentioned, the questionnaires were designed to last for 15 minutes. The pilot test revealed that all the participants used a reasonable time to complete it. All participants expressed that it was easy to understand how to complete the questionnaires and that they liked the structure. However, during the pilot test, the participants discovered some issues with the questionnaires:

- Some questions had misspellings or misplaced text.
- Two questions were somewhat difficult to understand.
- The pre-defined closed questions and responses did not include all the desired answers. One participant expressed that he/she felt a need to explain the chosen scale element when a satisfaction question was asked. This explanation could not be elaborated on anywhere in the questionnaire.

The participants provided feedback on how one could improve the questions, which one considered before distributing the questionnaire. The issues were solved by correcting mistakes, including explanations to the unclear questions, and adding voluntary, open questions, which provided an opportunity to elaborate.

4.3.2 Focus Group

Focus group research is research that involves the use of in-depth group interviews (Rabiee, 2004). A focus group is "a special group with a specific intention" (Krueger & Casey, 2000 in Rabiee, 2004), and the group is "focused" on a particular topic (Rabiee, 2004). The topic in focus in this research was the adoption of digital tools and experiences surrounding ERT during the COVID-19 period (RQ1). One chose to use focus group research as a data generation method to get more qualitative in-depth data considering the pupils' experiences with ERT. Focus groups can generate a large amount of data in a relatively short period of time (Rabiee, 2004), which made it fit this research, as the study had a limited amount of time available. Other advantages with the use of group interviews were that the participants could help to generate consensus views. In addition, they could generate more responses, as one participant's views were challenged by others (Oates, 2006). Table 4.8 presents the focus group objectives.

| Research Question | Focus Group objective |
|---|--|
| RQ1.1: How did Norwegian upper secondary schools adopt ICT to maintain the teaching and learning during the school closures? | Obtain more detailed information about how the different digital activities and tools were used in teaching. |
| RQ1.2: How did pupils and teachers experience the emergency remote teaching during the school closures? | Obtain more detailed information about pupils' experiences with the use of ICT during the ERT. |

Table 4.8: Focus Group Objectives

One designed the focus group interview as a semi-structured interview. A semi-structured interview is an interview where it is prepared a list of themes and questions that should be addressed, but it is possible to change the order of questions and add questions depending on the flow of the 'conversation'

(Oates, 2006, p.187). According to Kallio et al. (2016), semi-structured interviews are a common data gathering method in qualitative research, which made it fit this part of the research. The interview was designed to last approximately 1 hour, which is a common length for a focus group interview (Rabiee, 2004; Onwuegbuzie et al., 2009).

The decision to conduct focus group interviews was taken late in the research process, which resulted in a short preparation time between the decision and the actual focus group interviews. Thus, one quickly created the interview by utilizing the instruments described in Chapter 4.2. Like in the questionnaire, one made overall themes and created related questions relevant for the study. Table 4.9 elaborates the focus of each instrument. Questions related to specific findings from the questionnaire were also included to capture the pupils' perspectives more in-depth. The interview guide (Appendix D) was not structured after these instruments, as one considered it more important to ask questions in an order that provided a good flow in the interview. The interview guide was pilot tested by one researcher interviewing the other researcher.

| Instrument | Focus group Focus |
|-------------------------------|--|
| Digital Learning Activities | As the questionnaire only asked specific questions about the activities the pupils liked the best during ERT, it was considered relevant to ask more questions about what they actually used the most during ERT and experiences and challenges with these. |
| Digital Tools | The questionnaire only asked specific questions about the tools pupils liked the best during ERT. Thus, one considered it relevant to ask more questions about what tools they actually used the most during ERT. One also explored experiences and challenges with these tools. |
| Learning Outcomes and Effects | One decided to ask some questions about what the pupils thought about their learning outcomes and what challenges they met during the closures regarding their learning. One also investigated whether they felt that different subjects gave different learning outcomes. |
| Digital Competence | This category was considered covered after the questionnaire and was not prioritized in the interview. |
| Digital Follow-up | Results from the questionnaires found that pupils did not feel they got enough help during ERT. One, therefore, decided to ask the pupils how they experienced it and what they meant the teachers did to follow-up pupils. |

Table 4.9: Focus group Focus

Transcribing group interviews can be more difficult than individual interviews because people talk across each other (Oates, 2006). To make the transcribing less time-consuming, one researcher was responsible for facilitating the discussion, and the other researcher was responsible for taking notes and observe the conversation. The facilitator was also responsible for creating a relaxed and encouraging environment for the participants and to ensure that everyone got heard, which both are central in a focus group interview (Rabiee, 2004; Oates, 2006).

4.3.3 Interview

An interview is a conversation where the researcher gains information from the interviewee and it was chosen as a data generation method for this research to gather detailed information, ask open-ended questions, and explore experiences and feelings that cannot easily be observed or obtained through questionnaires (Oates, 2006, p.187). As with the focus groups, one decided to use semi-structured interviews to gather more qualitative data and in-depth experiences. The interview was made to gather more detailed data from the teachers' perspective regarding the first research question (RQ1) and its sub-questions, but also to obtain data regarding the teachers' thoughts on the second research question (RQ2) about how ERT can influence the digitalization process in Norwegian schools. Table 4.10 presents the interview objectives.

| Research Question | Interview objective |
|--|---|
| RQ1.1: How did Norwegian upper secondary schools adopt ICT to maintain the teaching and learning during the school closures? | Obtain more detailed information about how the different digital activities and tools were used in teaching. |
| RQ1.2: How did pupils and teachers experience the emergency remote teaching during the school closures? | Obtain more detailed information about teachers' experiences with the use of ICT during the ERT. |
| RQ2: What can be learned from the emergency remote teaching that can influence the ongoing digitalization process in Norwegian schools? | Obtain data regarding what the teachers' thoughts are concerning how ERT can influence the digitalization of Norwegian schools. |

Table 4.10: Interview Objectives

Like with the questionnaire and the focus group interview, the instruments described in Chapter 4.2 were used when creating the questions. Additionally, it was added questions to obtain data on RQ2. The focus of each category is elaborated in Table 4.11. Questions connected to specific results from the questionnaires and focus group interviews were also included to get the teachers' perspectives.

| Instrument | Interview Focus |
|-------------------------------|---|
| Digital Learning Activities | As the questionnaire only asked specific questions about the activities the teachers liked the best during ERT, it was relevant to ask more questions about what they used during ERT. The questions included experiences and challenges with the digital activities. |
| Digital Tools | As the questionnaire only asked specific questions about the tools the teachers liked the best during ERT, it was relevant to ask more questions about what they used the most during ERT. Including experiences and challenges with the digital tools. |
| Learning Outcomes and Effects | The questionnaire did not cover differences between subjects. It was considered relevant to ask the teachers if they perceived some subjects to be easier or harder to teach during ERT, and why. |
| Digital Competence | This category was considered covered after the questionnaire and was not prioritized in the interview. |

| Continuation | |
|------------------------|---|
| Digital Follow-up | Results from the questionnaires and the focus group interviews found that pupils did not feel that they got enough follow-up during ERT. It was therefore decided to ask the teachers what they did to help/follow-up their pupils. |
| ERT and digitalization | Based on the related work, the exploration of how experiences from ERT will play a role in the implementation and use of ICT in the ongoing digitalization process of Norwegian schools was considered interesting. As teachers are part of the use of ICT in schools and their mindset can influence how they implement digital tools and resources in the future, it was considered relevant to investigate what their thoughts were on this topic. |

Table 4.11: Interview Focus

The interview was designed based on "The Interview Protocol Refinement (IPR) Framework" presented by Castillo-Montoya (2016). This framework is suitable for refining semi-structured interviews and therefore fitted this interview. The framework can enhance the reliability of interview guides, and thus increase the quality of data obtained from interviews. (Castillo-Montoya, 2016). The IPR framework is a four-phase process. The four phases and how they were met in this study are described in Table 4.12.

| Phase | Implementation |
|--|---|
| Phase 1: Ensuring interview questions align with research questions | As suggested by Castillo-Montoya (2016) it was created a matrix for mapping the interview questions onto research questions to make sure the questions gave data to answer the research questions. The interview matrix can be seen in Appendix E, where it has been translated to English. With the matrix, it is also possible to observe the order of the questions. The matrix was used as the interview guide when the interviews were conducted. |
| Phase 2: Constructing an inquiry-based conversation | As Castillo-Montoya (2016) recommended, the guide was created with a balance between inquiry (asking questions for specific information related to the study) and conversation (talking about a particular topic i.e. respondent's certain experiences). This was done by: <ul style="list-style-type: none"> • expressing the questions in everyday language in Norwegian, • following social rules of ordinary conversation, i.e. not interrupt participants, ask clarifying questions and transition from one topic to another, and • have written down likely follow-up questions to support the natural conversation style. |
| Phase 3: Receiving feedback on interview guide | The interview guide was created by one of the researchers. The other researcher read through the guide to make sure it covered the important themes, was understandable, and of quality. |

| Continuation | |
|--|--|
| Phase 4: Piloting the interview guide | The interview was piloted to practice the interview, to get an idea of how much time it required and whether participants would be able to answer the questions. As it was generally difficult to get hold of teachers during the pandemic period, the interview was piloted on a 26-year-old man with general ICT competence and some knowledge of which tools are used in upper secondary schools. The results from the pilot test revealed that some questions were redundant and could be removed, but in total the questions were understandable. |

Table 4.12: The Interview Protocol Refinement (IPR) Framework

4.4 Data Analysis Methods

The data generation methods produced large amounts of data. This data consisted of quantitative and qualitative data, which needed to be systematically analyzed in order to make full use of the results (Harrell and Bradley, 2009). The quantitative data from the questionnaires were analyzed through the use of tables and graphs and descriptive statistics. This was done by searching for patterns and visualizing the results. The qualitative data from the questionnaires were analyzed with the counting method, while the analysis of qualitative data from the focus groups and interviews consisted of thematic analysis. The counting method and thematic analysis were chosen as analysis methods because they provided the possibility to find themes through identifying patterns in the large qualitative data sets (Clarke and Braun, 2014; Oates, 2006). Chapter 4.4.1 describes how the quantitative data were analyzed, while the qualitative data analysis is presented in Chapter 4.4.2.

4.4.1 Quantitative Analysis

The quantitative data set in the research project consisted of answers from pupils and teachers on several closed questions in the questionnaires. The closed questions were either multiple choice questions where the respondents were asked to pick one or more alternatives or Likert-scale questions where the respondents were asked to rate their agreement to several statements, as illustrated in Table 4.13.

| Very low degree | Low degree | Neutral | High degree | Very high degree |
|-----------------|------------|---------|-------------|------------------|
| 1 | 2 | 3 | 4 | 5 |

Table 4.13: Likert-scale

The multiple-choice questions generated nominal data, which is data that describes categories and has no actual numeric value, while the individual Likert-scale questions provided ordinal data, which are numbers allocated to a quantitative scale. As mentioned in Chapter 4.3.1, the respondents were asked questions about specific activities and tools that they chose as their "most liked" ones. These questions were added together as a composite score for activities and tools and were, therefore, considered to be and treated as interval data (Oates, 2006, p.247). The quantitative analysis was conducted through the following two steps:

Step 1: Simple analysis using tables, charts, graphs

The simple form of analysis using charts and tables to present the results was used.

The visualization of the results allowed the researchers to explore and search for values and patterns (Oates, 2006).

This type of analysis could be used on all questions regardless of data type.

Step 2: Descriptive statistics

A simple statistical technique was used on the interval data to find more patterns in the descriptive statistics.

The chosen measures to calculate were *mean* and *standard deviation (SD)*.

The mean is the average value in a data set (Oates, 2006), while SD represents the average variability in the data set, which means the average distance from the mean.

The use of statistical tests to check for statistical significance was considered at the beginning of the analysis, but one decided not to spend time and resources on it because of the low number of respondents (41 in total). The small sample size imposed a risk of errors that could lead to ambiguous results and conclusions (Salkind, 2017), and the risk was deemed too big. All results from the quantitative analysis should, therefore, be treated with caution, as they can be biased.

4.4.2 Qualitative Analysis

The qualitative data set consisted of all the qualitative data from the questionnaires, focus groups, and interviews. The qualitative results from the questionnaires were different from the other two data generation methods. They were, therefore, handled independently. Table 4.14 presents the qualitative analysis of the questionnaires.

| Qualitative Analysis of Questionnaire results |
|---|
| <p>Data set</p> <p>The qualitative data set from the questionnaires consisted of textual answers from pupils and teachers from 10-18 open questions. The number of questions varied for each respondent depending on how many activities/tools they chose as "most liked". The questions considered why the respondents liked the activities/tools, how they were used, and comments related to their agreement on different statements. In addition, there were textual answers if the respondents chose "other" on closed questions, for instance on what learning activity gave the best learning outcome. Many of the open questions were voluntary to answer. Due to this, the largest proportion of answers/quotes were complete sentences and were of good quality. The quotes ranged from a few words to 2-3 sentences.</p> |
| <p>Data preparation</p> <p>The data preparation consisted of translating the quotes from Norwegian to English. There were a few irrelevant answers in some mandatory questions, such as "e" and "meow". These were removed before analyzing the data.</p> |
| <p>Counting method</p> <p>The majority of the generated data from the open questions consisted of sentences that already was divided into categories, depending on which part of the questionnaire and which question the answers belonged to. Thus, the data were analyzed using a qualitative inductive approach in combination with using quantitative (numerical) analysis. This analysis was conducted by counting how many pupils and teachers answered something similar to a question (Oates, 2006, p.266-270).</p> <p>The answers connected to a question in each category were further divided into related themes according to what the participants had answered. As an example, one theme could be "I like live teaching because it resembles classroom teaching". All respondents that had answered something that meant the same were counted, and it became clear whether the respondents shared the same views on activities and tools.</p> <p>The result chapter include quotes that one considered to be the most relevant quotes in combination with the quantitative data gathered.</p> |

Table 4.14: Qualitative Analysis of Questionnaire results

The qualitative results from the focus groups and the interviews were quite similar. Thus, one decided to use the same analysis method for both data sets. Table 4.15 shows the analysis process of the focus groups and interviews.

| Qualitative Analysis of Focus group and Interview results |
|---|
| <p>Data set and preparation</p> <p>The focus groups and interviews were recorded and transcribed, as the data set had to be transcribed into written form to use thematic analysis (Clarke and Braun, 2014). The transcription process can be a very tedious and boring activity (Clarke and Braun, 2014; Oates, 2006). The researchers, therefore, decided to collaborate in transcribing all the recordings. The transcribing was conducted by dividing the work with each recording between the researchers. Thus, the researchers transcribed half of every recording.</p> |
| <p>Thematic Analysis</p> <p>The results from the focus groups and interviews were analyzed using thematic analysis. The thematic analysis method includes identifying, analyzing, and reporting themes within a data set (Clarke and Braun, 2014). The method consists of six steps:</p> <ul style="list-style-type: none"> Step 1: Get familiarised with the data Step 2: Create initial codes that describe the content Step 3: Search for themes across the data set Step 4: Summarise and review the themes Step 5: Define and name the themes Step 6: Write the results <p>One of the researchers conducted the thematic analysis process using the previously mentioned qualitative data analysis software Nvivo, which was also used for the literature review. The analysis was just conducted by this one researcher because of limitations in time and resources, which could reduce the reliability of the results. The codes were, therefore, consolidated and checked for completeness and consistency by the other researcher. All the codes were then thoroughly gone through by the other researcher to check that everything was coded correctly to ensure some reliability. Lastly, the themes were summarised and grouped on the RQ they were related to, before the results were translated from Norwegian to English and included in the result chapters 5.2, 5.3, and 5.4.</p> |

Table 4.15: Qualitative Analysis of Focus group and Interview results

Chapter 5

Results

This chapter presents the results found with the data generation methods described in Chapter 4. The quantitative data is presented through tables, charts, and descriptive statistics, while examples from the qualitative data are presented in quotes. First, Chapter 5.1 describes the participants in the methods. The results in Chapter 5.2 concern the adoption of ICT to maintain teaching and learning during the pandemic. Chapter 5.3 describes findings regarding how pupils and teachers experienced ERT during the school closures. Further, Chapter 5.4 shows how the teachers and pupils perceive how the ERT situation could influence the ongoing digitalization process.

5.1 Participants

Before inviting teachers and pupils to participate, an application was sent to NSD. All research projects involving people have an obligation to notify NSD if the study processes personal data of any sort. The research study was approved by NSD before any data was gathered (Appendix A). The teachers and pupils further accepted to participate in the study by accepting a consent form, which informed them about the research project, their anonymity, and their rights. The consent forms can be found in Appendix I. Table 5.1 shows an overview of who participated in the different data generation methods.

| Participant Overview | | | |
|----------------------|----------------|--------------|------------|
| | Questionnaires | Focus Groups | Interviews |
| Pupils | X | X | |
| Teachers | X | | X |

Table 5.1: Participant Overview

The participants in the questionnaires consisted of 32 pupils and 9 teachers. The participants were sampled through the self-selection sampling (Oates, 2006, p.98), by distributing the questionnaires through e-mail to pupils and teachers and collecting data from anyone who responded. This distribution was done with the help of a head of department at the school. The sample size of the questionnaires was somewhat small with answers from 32 pupils and 9 teachers. The questionnaires were distributed to a total of 370 pupils and 65 teachers. The quantitative results should therefore be treated with caution. However, the open questions generated extensive and detailed qualitative data, which also provided some assurance of the quality of the rest of the data.

It was conducted two focus group interviews, with a total of seven participants. One group consisted of four pupils, and the second group consisted of three pupils. The participants were sampled through convenience sampling (Oates, 2006), by asking pupils that were easy to get in contact with for the researchers because of acquaintanceship. The focus groups are referred to as Focus Group #1 and Focus Group #2 in the results. Both groups consisted of pupils from friend groups, which made them comfortable

talking to each other and the facilitator. According to Rabiee (2004), some researchers recommend that participants should not know each other because it can encourage more honest expressions of views and a wider range of responses. By interviewing a group of friends, one can risk that the opinions expressed are those deemed to be ‘acceptable’ within the group (Oates, 2006). Considering that it was upper secondary school pupils that would participate, one decided to choose groups of friends, as teenagers tend to be quiet with strangers. As Oates (2006) states; ”it is important that the participants feel comfortable sharing their thoughts, opinions and experiences”. The participants consisted of both boys and girls and they had backgrounds from educational program for specialization in general studies, supplementary studies, and media and communication studies.

The participants in the interviews consisted of three teachers. One sampled the participants through snowball sampling (Oates, 2006), by asking the head of department at the school for names of teachers that could be contacted. After the participants were interviewed, they were also asked if they knew more teachers that would like to contribute to the research. The interview participants are referred to as Informant #1, Informant #2, and Informant #3 in the results. The participants consisted of one male and two females. They had been teachers between 2-13 years and they did not have any ICT education. All participants had taught education programme for specialization in general studies and one had taught vocational subjects. Over the past year, two of the participants have been teaching Vg1 and Vg2, while one has been teaching Vg1, Vg2, and Vg3. The subjects the participants have taught in the last year are social science, history, and language (Norwegian, English, and Spanish). It was decided not to provide more information about the participants to guarantee their anonymity.

5.2 Adoption of ICT to maintain teaching and learning during COVID-19 pandemic

This chapter provides an overview of the results that aimed to answer RQ1.1 about the adoption of ICT to maintain teaching and learning during the pandemic. The results only concern *which* and *how* digital tools were used. The results presented in this chapter are from the questionnaires, focus group interviews, and interviews. Table 5.2 shows a mapping of the tools used to maintain the teaching and learning.

| Tool | Usage |
|-----------------|--|
| Canvas | <p>Canvas is the schools' LMS and was used to almost everything related to teaching. The use of this LMS includes teachers distributing important information about the subjects, communication between pupils and teachers, a calendar with an overview over assignments/homework, group work, tests, assessment, and teaching.</p> |
| | <p>Canvas Video Conference was mainly used for live teaching. Here, the pupils could see the teacher and themselves, but not the rest of their classmates. They could hear each other. Canvas Video Conference allows the teachers to share PowerPoints, YouTube videos, etc.</p> |
| | <p>Canvas Inbox was used for communication. The pupils used it to send messages with the teacher, and sometimes with classmates. It was possible to send a message to everyone that was signed up in the subject, both pupils and teachers. The teachers used it to communicate with the class, both individual pupils, and information to the whole class.</p> |
| | <p>Canvas Tests was used to conduct tests/tasks about the subject matter. It made it possible to check if pupils had learned concepts, facts, etc., after reading a text or watching a documentary, etc.</p> |
| | <p>Canvas Discussions, Canvas Collaboration, and Canvas Studio: There was no qualitative data about these functionalities.</p> |
| Skype | <p>Also a tool that was used for live teaching by some teachers. Here, the pupils and teachers could see and hear the whole class.</p> |
| Microsoft Teams | <p>Only used by teachers and not the pupils. It was used for video meetings and chat. Teachers could share experiences with ERT, for instance during the lunch break.</p> |
| Zoom | <p>Also a tool that was used for live teaching by few teachers. Here, the pupils and teachers could see and hear the whole class.</p> |
| NDLA | <p>Teachers used NDLA in combination with live teaching or gave the pupils assignments/homework. E-lectures (external videos) and animations were also mentioned. The pupils used NDLA for finding information, texts, and tasks related to the subjects.</p> |

| Continuation | |
|---|--|
| Kahoot! | Used in combination with live teaching and as variation and repeating of the subject matter. It is a quiz tool where pupils competed against each other and learned at the same time. |
| Youtube | Teachers used YouTube to show examples and to variate the teaching. They often gave tasks in combination with the videos. The pupils watched videos about the specific theme and answered tasks. Sometimes the pupils had to watch the videos before the teaching session. |
| PowerPoint | Used by teachers during live teaching or prerecorded with sound and/or picture (screencast). Pupils also used PowerPoint in combination with audio files as an alternative to oral presentations. |
| Quizlet Live | Digital quiz-tool used by some teachers for variation in the teaching. |
| Other | A few respondents did also mention that they used various editors and various tools to create screencasts and podcasts. |
| Tools used for communication and follow-up on pupils | Video calls, phone calls, chat, and e-mail were used for communication between pupils and teachers. Both for regular communication and communication with a focus on help with academic tasks. Video calls and chat were used the most. |

Table 5.2: Digital tools and how they were used

In the open questions in the questionnaire, several pupils mentioned that Canvas was the only tool they used. Both focus groups agreed that Canvas was used the most. The main usage, according to the focus groups, was live teaching with Canvas Video Conference. One informant in Focus Group #2 described the usage like this:

”When we had conferences, they (the teachers) explained what we were going to do. We did it while the conference was on, sort of. They asked questions, and then we answered in the chat.”

Another pupil in Focus Group #2 also mentioned the ”raise hand” functionality in the conference. The pupil said that the teachers used the functionality to control who could speak. The teacher informants from the interviews agreed that Canvas was used for almost all purposes.

As one can see in the last row in Table 5.2, the participants were asked questions about which tools they used for communication. The questions in the questionnaire included both regular and academic communication between pupil and teacher. Figure 5.1 and Figure 5.2 visually present the results from these questions.

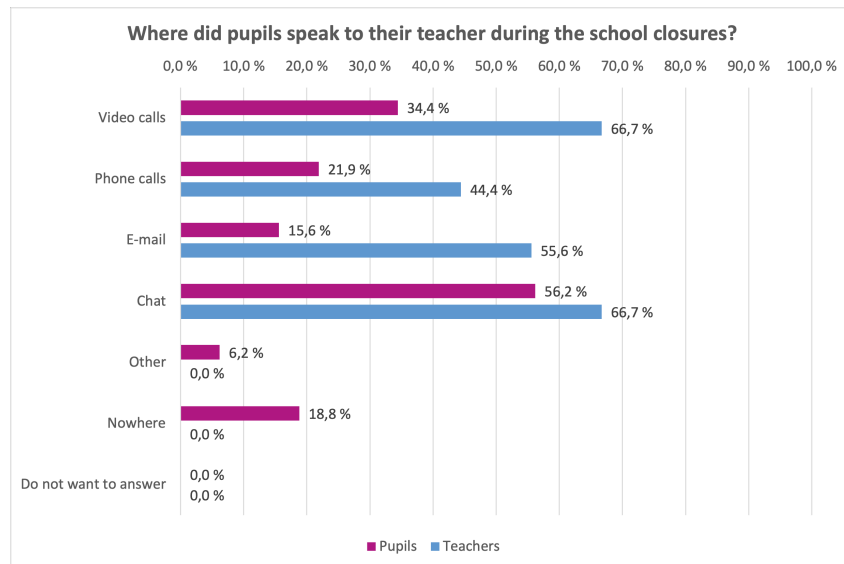


Figure 5.1: Tools for regular communication, pupils (n=32) and teachers (n=9)

Figure 5.1 shows that Video calls and Chat were the most used tools for regular communication between pupils and teachers. The graph also shows that 18,8% of the pupils did not speak with their teacher. According to the answers from the interviews, teachers used phone calls and messages to contact the pupils (mainly the pupils in the class the teacher was responsible for). Informant #2 explained it like this:

”I called home to my ‘contact pupils’, but I have a lot of other pupils as well. With them, I used messages on Canvas, with those who understood how.”

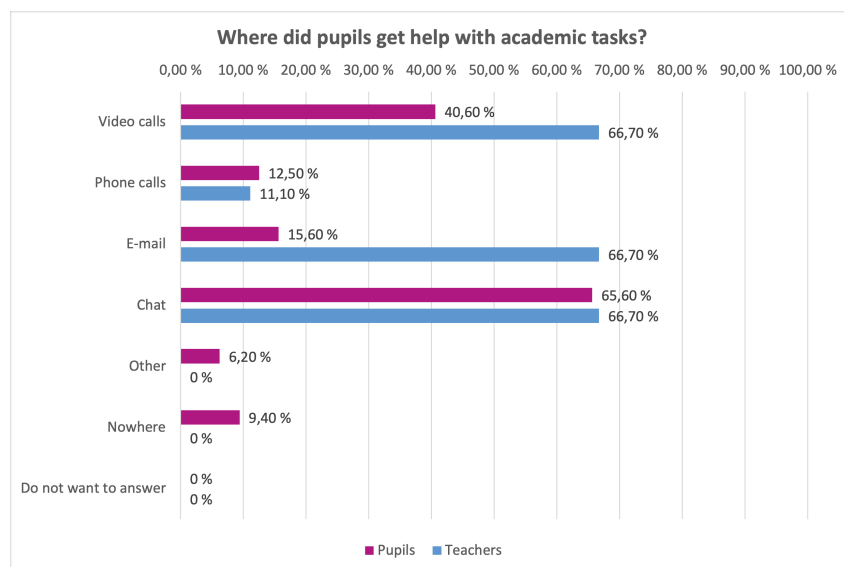


Figure 5.2: Tools used for help with academic tasks, pupils (n=32) and teachers (n=9)

Figure 5.2 shows that Chat was the tool both pupils (65,6%) and teachers (66,7%) meant was used for help with academic tasks. The graph also shows that a larger amount of teachers than pupils meant that Video calls and E-mail were used. Like in the question presented in Figure 5.1, about communication between pupil and teacher, there are also in this question some pupils (9,4%) that chose ”Nowhere”.

5.3 Pupils’ and teachers’ experiences with ERT during the COVID-19 pandemic

This chapter will present the results connected to the experiences of pupils and teachers towards ERT during the school closures due to the COVID-19 pandemic (RQ1.2). The experiences were complex, so as mentioned in Chapter 4.2, it was reduced to the following instruments: Digital Learning Activities, Digital Tools, Learning Outcomes and Effects, Digital Competence, and Digital Follow-up. However, to understand the results connected to each instrument, one should have an understanding of the prerequisites the pupils and teachers had to handle an ERT situation.

The interviews discovered that all informants mentioned that the school did not have any contingency plan at hand for an emergency like ERT and that they were not prepared to transit to an all-digital situation. One of the interviewed teachers explained that they had conducted some teaching for individual pupils that had to stay home for various reasons, which indicates that they had that type of experience. However, they did not have a system for it and did not know how to do it on such a large scale. The teachers experienced that they early were told what to do, as Informant #3 described:

”When it closed for the first time a year ago, then it quickly came messages where we were told what to do. And it was primarily about posting things on Canvas, which is the learning platform we use. To post teaching arrangements like tasks and files. And after a while, we were encouraged to use video conferences.”

The following chapters present the results from all data generation methods. Each chapter presents the results from the questionnaires first, then focus groups, and interviews last. The chapters correspond to the used instruments, while Chapter 5.3.6 summarizes the results.

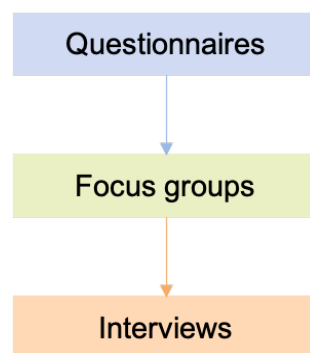


Figure 5.3: Order of results

5.3.1 Digital Learning Activities

This chapter presents the results from the data generation methods towards the digital learning activities used during the school closures, which were defined as activities conducted to achieve learning objectives, in Table 4.3 in Chapter 4.2.

Results from Questionnaires

Pupils and teachers were asked to choose the digital learning activities that they liked the best during the school closures. Figure 5.4 shows which activities that were liked the most by pupils and teachers.

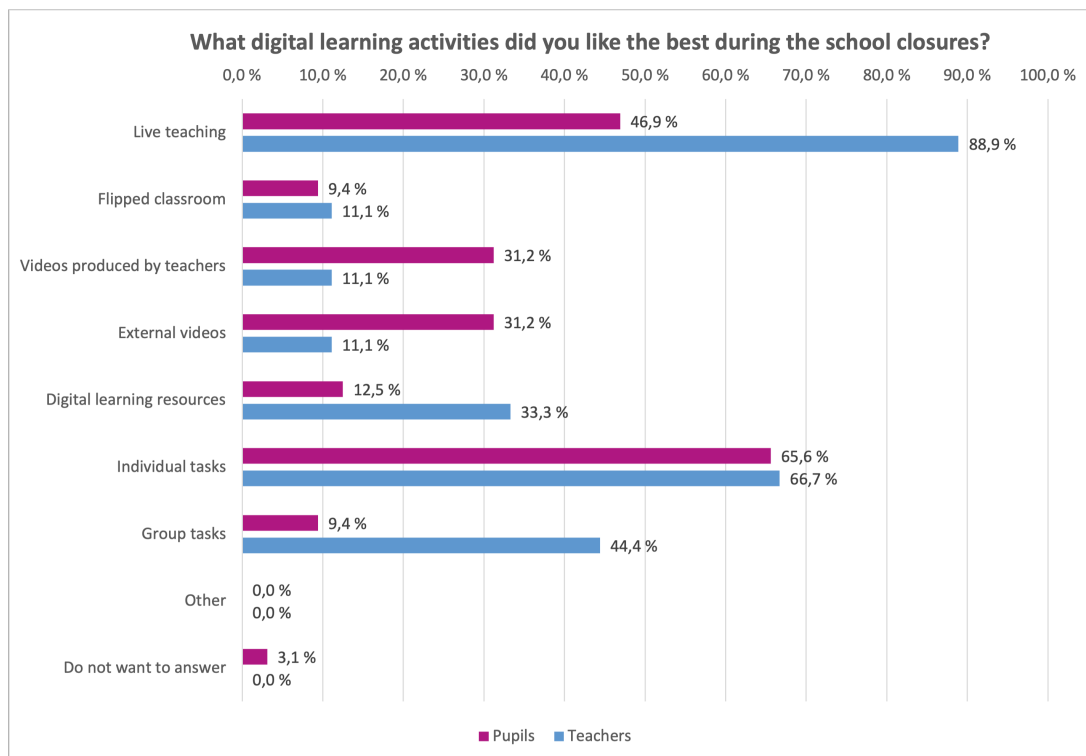


Figure 5.4: Best liked activities, pupils (n=32) and teachers (n=9)

Each respondent was able to choose up to three digital activities in this question. Results show that pupils chose 2.1 digital learning activities on average, while teachers chose 2.6 activities on average. Figure 5.4 shows that many pupils and teachers agreed that they liked live teaching (46,9% and 88,9%) and individual tasks (65,6% and 66,7%) the best.

The respondents were asked to elaborate on why they liked the specific activities in an open question. Four pupils expressed explicitly that they liked live teaching best because it forced them to structure their days. Another pupil answered:

"I get much more motivated to do the work when someone else teaches it."

Other reasons mentioned by pupils were that live teaching reminded them the most of the traditional teaching and that it made communication easier. Teachers agreed with the two latter reasons. One teacher expressed it with this response:

"I think it resembles the classroom teaching the most."

Twelve pupils stated that they liked individual tasks because it made it possible to work at their own pace and to structure the work in a way that suited them and their time, which teachers agreed upon. One pupils expressed it this way:

"You know well what you need to spend more time on, and you can dispose the time yourself."

Many pupils also liked videos produced by teachers and external videos, as both had a response rate of 31,2%. Five pupils stated that they liked prerecorded videos because it made it possible to take breaks, to fast forward and rewind, and watch them several times:

"When I am learning new things, I can stop the video or replay it if something happened that I did not entirely understand."

Six pupils stated that they liked external videos better because they were of higher quality. One pupil explained:

"The teachers had then found the best videos, that could be of higher quality than if they were to make similar videos themselves."

One pupil did, however, mention the lack of opportunity to ask questions as a disadvantage of prerecorded videos.

Teachers, on the other hand, to a larger extent chose group tasks (44,4%) and digital learning resources (33,3%) as the most liked digital learning activities:

"In my subjects, collaboration is essential, and forming colloquium groups around a project was a useful way for students to process a subject and for learning."

The respondents were further asked questions about specific activities, which were the activities they chose as their most liked ones. Table 5.3 shows descriptive statistics for these questions. The numbers in this table are related to the Likert scale (1-5), and each cell contains the mean of what respondents answered on each question for their chosen activities. The table is a short summary of the descriptive statistics for these two questions. An overview of the full descriptive statistics can be found in Appendix F.

| Mean of Means | | |
|--|--------|----------|
| Questions | Pupils | Teachers |
| Q5 = To what degree did the pupils master activity*? | 4,02 | 3,95 |
| Q6 = To what degree did activity* work for its use? | 3,91 | 4,00 |
| <i>*activity were replaced with a specific activity.</i> | | |

Table 5.3: Descriptive Statistics - Digital learning activities

Table 5.3 shows that each question has a mean close to 4, which means that pupils and teachers had an average answer of "To a high degree" on these questions. This shows that pupils and teachers largely agreed on these questions. These results show that respondents thought on average that pupils mastered

the activities to a high degree and that the activities worked to a high degree for their use. Figure 5.5 and Figure 5.6 present illustrations of the Likert-answers to the same two questions, but here for each activity. Each activity have a different number of respondents based on how many respondents that chose it as their best liked activity, which should be taken into consideration for these figures. The figures illustrate that the means in Table 5.3 are applicable for all specific activities.

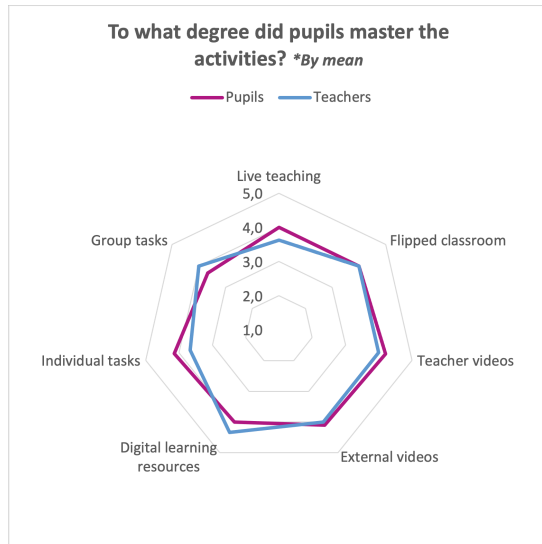


Figure 5.5: Q5

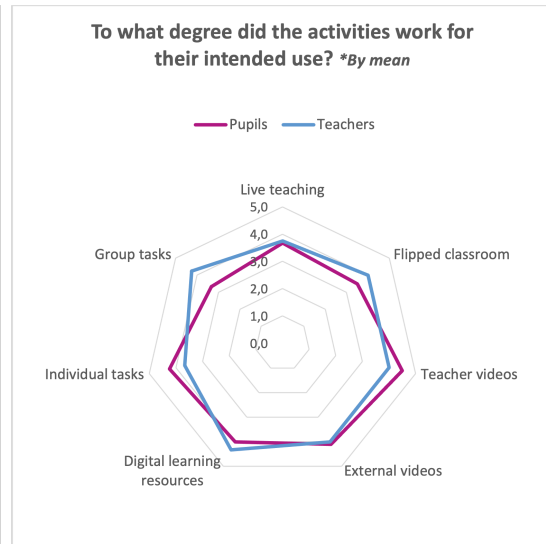


Figure 5.6: Q6

The respondents were also presented with two statements, and they were asked to state to what degree they agreed with them. The first statement was: "I think we had the digital activities we needed during the closures". Figure 5.7 presents the results for this agreement statement.

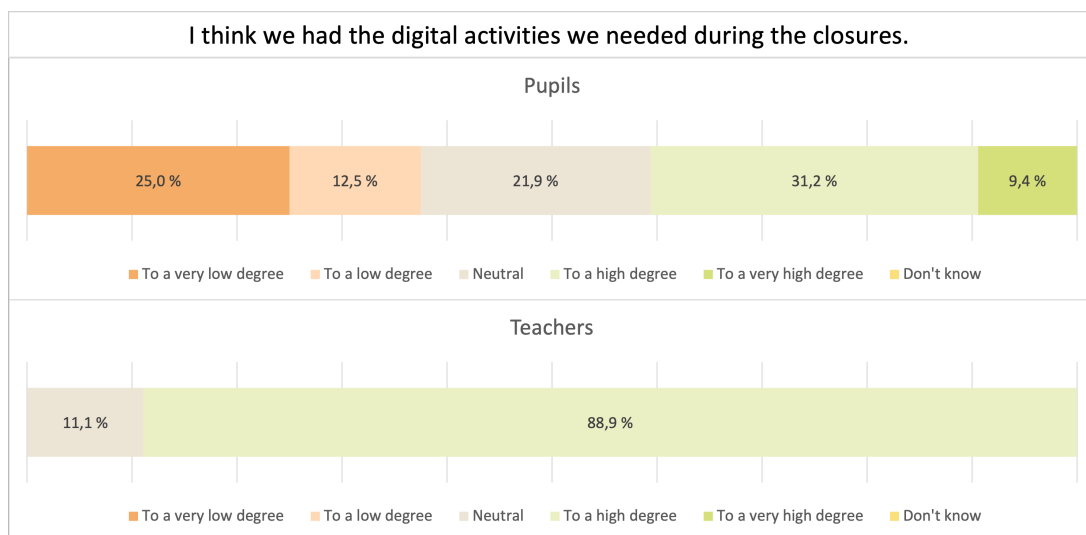


Figure 5.7: Sufficiency of digital learning activities, pupils (n=32) and teachers (n=9)

Here the majority of teachers answered that they agreed that they had the digital activities they needed during the closures (88,9%). The pupils were rather divided. 40,6% of pupils agreed to a high or a very high degree, while 37,5% agreed to a low or a very low degree that they had the digital learning activities that they needed. One of the pupils from the latter group described a lack of individual communication with teacher.

The second statement was: "I am satisfied with the how we used the digital learning activities during the school closures". Figure 5.8 presents the result for this agreement statement.

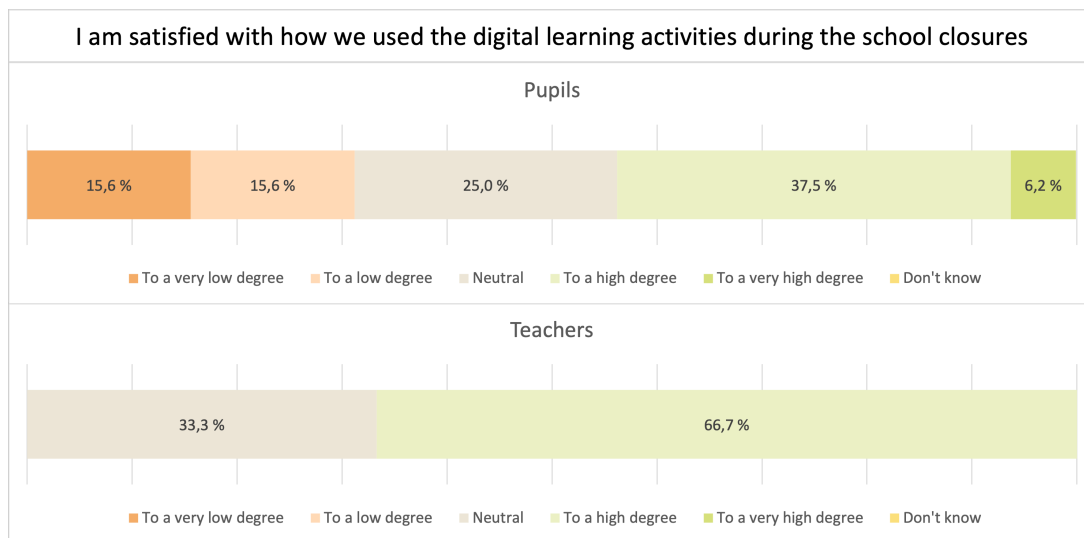


Figure 5.8: Satisfaction with digital learning activities, pupils (n=32) and teachers (n=9)

Figure 5.8 shows that 66,7% of teachers answered that they agreed with this statement to a high degree, while the rest was neutral. The pupils have to a larger extent answered that they agreed to a low or very low degree (31,2%). The pupils also seemed to be somewhat divided over this statement, as 43,7% stated that they agreed to a high or very high degree. The division of how pupils have experienced the digital learning activities could be connected to the general academic strengths of the pupils, as one teacher stated that the stronger pupils have managed well during the school closures, while the weaker pupils suffered more, which concerned the teacher. The teacher explained:

"The experience is that the strongest pupils managed the best during the homeschooling, while the weaker pupils struggled more/fell more behind than before. You will then have an even greater variation in the pupil group when you go back to the traditional teaching situation, and a lot of time will have to be spent on the repetition of what you have worked on in the digital teaching, which could be challenging."

Four pupils stated that they thought the teaching had not been conducted well enough:

"I do not feel that it has been good enough performance of any teachers."

Results from Focus Groups

The questionnaire provided valuable information about the digital learning activities conducted during the school closures. There was still a need to investigate some points closer, and this chapter presents the results from the focus group interviews with pupils. The first issue that was discovered with the questionnaires was that it only obtained information on the *most liked* activities. It was identified a need for further investigation of how the digital activities were used in the teaching. The focus groups were asked about how teaching was conducted. Focus group #2 stated that the teaching consisted of live teaching and assignments:

"We had to show up to almost every class that had video conferences and tasks."

Nevertheless, Focus group #1 reported that how the teaching was conducted depended on each subject and each teacher, as some teachers had presentations where the pupils had to participate, while in other subjects there was no work at all. The differences in provided activities could be connected to the age segments of teachers, according to Focus group #1, as they got different amount of work from teachers at different ages. The same group stated that the pupils had little experience with digital activities prior to the pandemic and expressed that the usage had increased during the pandemic. Focus group #2 described that the use of digital activities evolved beyond live teaching and written tasks during the school closures:

”When we were having oral presentations, then we used a PowerPoint-presentation and delivered a sound file in addition to the presentation. In that way, we could present from home.”

The answers from the questionnaires illustrated that only 9,4% of pupils liked group tasks during the school closures, which Focus group #1 elaborated. One of the participants in the group expressed that their dislike towards group tasks was based on the group composition. Group tasks were often used during Canvas Video conferences, where the class was divided into random groups:

”One often ends up in a group with people that you normally do not hang out with a lot. Then it happens that no one says anything and it becomes awkward. When you try to ask something, no one replies.”

The participants in Focus group #1 did not think that group tasks worked well. They believed that the teachers used group tasks to socialize pupils, but that it was not working well considering the academic outcomes. They did, however, not believe that it would have worked better with their friends either and stated that working together physically would be much better.

Further, a finding from the questionnaire showed that about 1/3 of pupils were not satisfied with how the digital activities were used during the school closures. The questionnaires did not reveal why pupils were dissatisfied. This finding was discussed more closely in the focus groups. Focus group #1 stated that a reason for this was that the teachers did not make use of all the things they could have used:

”Teachers do not use everything that they could use to make it more interesting so that we pay attention and are more engaged.”

Another pain point mentioned by Focus group #1 was that teachers did not go through what the pupils did at home:

”Some teachers give assignments and homework that are not reviewed in class. Then it is all forgotten again, when it is not reviewed thoroughly.”

The pupils did, however, recognize that the adjustments in use of digital activities based on pupils' expectations were difficult for the teachers, as Focus group #1 stated:

”Not all pupils like the same either, so it can possibly be hard to adjust so that all pupils are satisfied”.

The focus groups were also presented with one teacher's statement from the questionnaire, where it was said that pupils' satisfaction with the learning activities depended on the general academic strengths of each pupil and that pupils that struggled were more dissatisfied. Both groups agreed that this could be true. Focus group #2 described it this way:

"The pupils that know a lot and learn easily have probably had it a lot easier with the information you get during school closures compared to the pupils that struggle and have a harder time learning things."

Further, 2/3 of teachers in the questionnaire stated that they were satisfied with how the digital learning activities were used during the school closures, while the rest remained neutral. The focus groups were asked why pupils and teachers had different perceptions of the use of digital activities. Focus group #1 responded that it was connected to the feedback from the pupils to teachers and that the teachers did not know that the pupils were dissatisfied, because they did not ask about it. Both groups agreed that they would like to be asked what they think, as they had a lot of thoughts to share with the teachers. Focus group #1 reflected on the matter:

"It could be that if they had gotten feedback from us pupils, then things could have been changed. They could have taken criticism and done something about it. But that is not how it is, and we don't do it either. So the teachers - how should they really know?"

When asked why they did not give their teachers the feedback, the focus groups expressed that it was because it was scary. Both groups agreed that the pupils were scared of their teachers reactions to criticism, as Focus group #1 stated:

"You don't really know how the teacher will react, so it can be frightening to send the message. Many teachers are kind and listen to what you tell them, but then there are those who don't do listen too."

Results from Interviews

This chapter covers the qualitative data gathered from the interviews about the teachers' views on the use of digital learning activities during school closures. As mentioned in the previous chapter, it was a need to investigate more in-depth how teaching was conducted, the satisfaction with digital learning activities, and feedback from pupils to teachers.

Both teacher Informant #1 and #2 agreed that they conducted teaching using live teaching, screen-casts/prerecorded videos and assignments. Informant #3 used screencast and assignments, but preferred not to use live teaching. The reason was because pupils did not use the web camera, they were muted during the whole live teaching sessions and rarely answered in the chat. Informant #3 elaborated:

"I stopped using live teaching, simply because I had no idea who participated. I tried to say that the pupils could answer me in the chat, if they did not want to show face or voice, but even that they did not dare. So it ended up being a monologue."

Informant #3 also explained that privacy concerns were a major component when deciding not to use live teaching, as it was uncomfortable not to know how many and who were watching. Informant #3 had a fear of being recorded and posted online, as the informant was a very private person. The informant recognized that this could possibly be a fear for pupils as well, and that privacy concerns could be a reason for pupils staying off-camera and muted. The solution for Informant #3 was therefore to use screencast to replace the live teaching:

"I have recorded many lectures too. I sit like this and record it and distribute the file to them. I felt that it was a safer way to do it."

The teachers also responded that how teaching was conducted depended on each subject and teacher. Two teachers (#1 and #2) explained how they had to adjust the digital learning activities based on what worked well in their subjects. Informant #1 explained:

"It was more PowerPoint (with sound) in Spanish, while in History it was more use of live teaching with assignments."

The informants explained that how teachers wanted to use digital learning activities varied, as Informant #1 brought up that there was differences between how creative teachers were. The same informant explained that the willingness to implement new activities could vary between teachers in different age segments:

"Some are very loyal to their old, traditional things, and they don't want to learn something new because they are retiring soon anyways."

Informant #3 also recognized that the variations in digital learning activities could be affected by the home situation of teachers:

"I did not have the capacity to get acquainted with so many things, because I had two small children at home, so I had to deliver the bare minimum."

When asked about how group tasks worked, Informant #2 explained that it seemed like the pupils liked it, but the informant also mentioned that it could be quiet in the break-out rooms:

"I logged into the break-out rooms to listen a little and it was often very quiet."

The teachers were further presented with the questionnaire results that showed that 1/3 of pupils were dissatisfied with the digital leaning activities while teachers were more satisfied. Informant #1 reflected over how the teaching had been conducted by different teachers that could have affected the satisfaction of pupils:

"The creative part that replaces the pure live teaching sessions or submissions, that is where you might feel that you did not do well enough when you saw other colleagues being very creative."

Feedback was also mentioned as an important factor regarding how teaching was conducted and the satisfaction with the teaching arrangements. The lack of feedback from pupils was difficult for Informant #1:

”We, teachers, did our best... We received little feedback as well. We had to kind of make the way as we went.”

The teachers were a bit divided on whether they asked their pupils for feedback. Informant #1 did not ask for feedback from pupils, Informant #2 tried to have a dialog with the pupils to get feedback on what worked throughout the closures, while Informant #3 asked for feedback after using something new:

”If I have implemented something new, then I have asked them afterward and evaluated it. Like ‘How do you think it worked?’. And if it was thumbs down, then I took it into consideration.”

5.3.2 Digital Tools

This chapter presents the results regarding pupils' and teachers' experiences with the different digital tools. As stated in Table 4.3 in Chapter 4.2, digital tools are the hardware and software that were used to conduct the different learning activities. The results concerning their usage are presented in Chapter 5.2.

Results from Questionnaires

In the questionnaires, pupils and teachers were asked to choose the digital tools that they liked best during the school closures. Figure 5.9 shows which tools were liked the most.

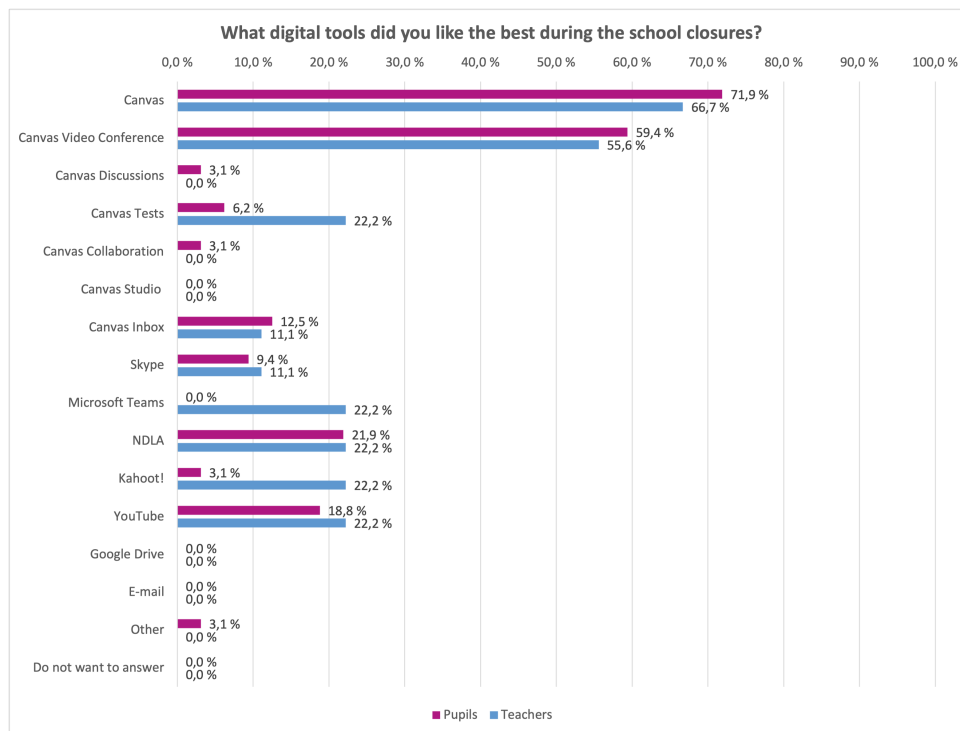


Figure 5.9: Best liked digital tools, Pupils (n=32) and teachers (n=9), percentage

Each respondent were able to choose up to three digital tools. Pupils chose 2,1 tools on average, and teachers chose 2,6 tools on average. Figure 5.9 shows that Canvas - the whole learning platform (71,9% and 66,7%) and Canvas Video Conference (59,4% and 55,6%) were the tools both pupils and teachers liked the most. In an open question, the respondents could elaborate why they liked the tools. The main reasons that pupils liked Canvas were because they were familiar with it before the crisis and because they could find everything they needed on the platform. One pupil expressed it as follows:

"I like Canvas because I know it already and that's where all the information I need exists."

Reasons why teachers liked Canvas were that it was easy to use and because it was a place where they had contact with pupils. One teacher stated:

"It is our learning management system and it is where we can have all the contact with pupils."

Canvas Video Conference was, according to 16 pupils and 4 teachers, mainly used for live teaching. As in Chapter 5.3.1, about the learning activity live teaching, the reason why teachers and pupils liked Canvas

Video Conference was because it was used in a way that resembled classroom teaching the most. The opportunity to ask questions and communicate were appreciated. One pupil and one teacher expressed it like this:

Pupil: *"I like that the teachers are present and that you can ask questions along the way."*

Teacher: *"Canvas Video Conference provided the opportunity for direct communication with the class."*

One pupil mentioned a disadvantage with Canvas Video Conference. The disadvantage was that you could only see yourself and the teacher on the video conference, and not the rest of the class. This opinion was supported by looking at answers on why some pupils liked Skype the most, where pupils agreed that it was nice to see fellow pupils. One pupil stated:

"I wish you could see more than yourself and the teacher at Canvas Video Conference, when using a webcam."

Microsoft Teams were only liked by teachers (22,2%) and no pupils. The reason may be that pupils did not get the opportunity to use it. One teacher explained it like this:

"I have had many Teams meetings and used the chat. I use it more and more now too. Pupils cannot use Teams yet. It will be rolled out to them - it should have been done a long time ago."

The teachers and pupils were also asked about what digital tools they were familiar with before the school closures, and the result are presented in Figure 5.10.

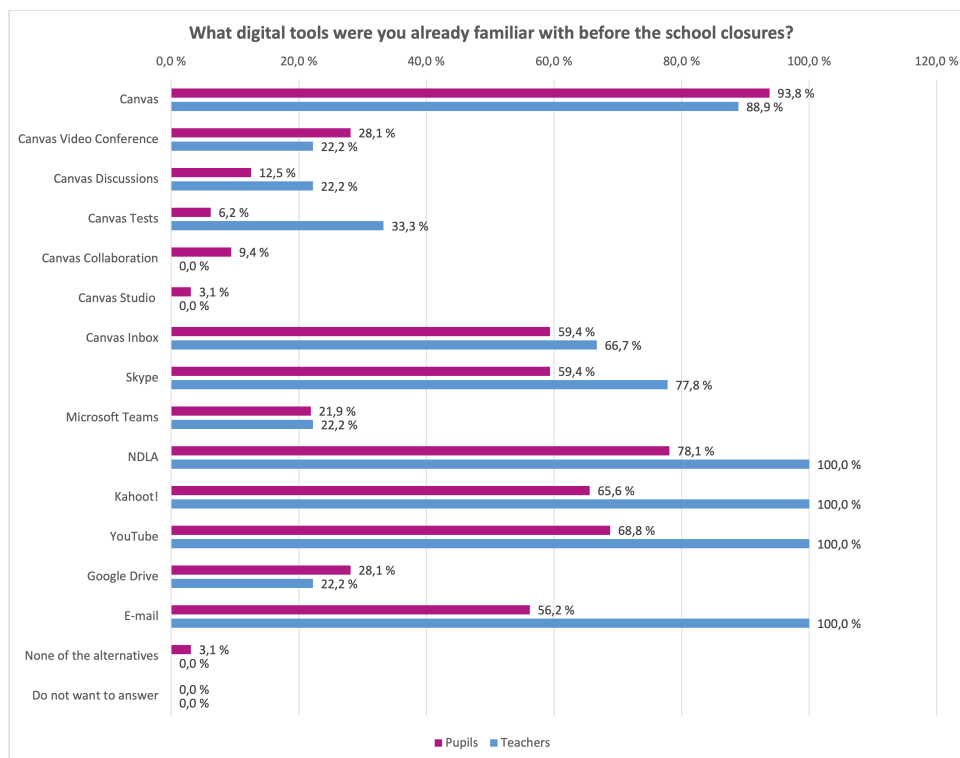


Figure 5.10: Digital tools known from before, Pupils (n=32) and teachers (n=9), percentage

In the question in Figure 5.10, the respondents could choose as many tools they wanted. The pupils chose 5,9 tools on average and the teachers chose 7,6 tools on average. This suggested that the respondents mostly had experience with the various tools, however, it was not known to what extent. Figure 5.10 shows that a large proportion of both pupils (93,8%) and teachers (88,9%) were familiar with Canvas before the school closure. Other tools that over 50% of pupils and teachers had knowledge about were Canvas Inbox, Skype, NDLA, Kahoot!, YouTube and E-mail.

As in Chapter 5.3.1, the respondents were asked questions specifically about tools they chose as "most liked". Table 5.4 shows the descriptive statistics for these questions. The numbers in this table are related to the Likert scale (1-5), and each cell contains the mean of what respondents answered on each question for their chosen tool. The table is a short summary of the descriptive statistics for these three questions. An overview of the full descriptive statistics can be found in Appendix G.

| Mean of Means | | |
|---|--------|----------|
| Questions | Pupils | Teachers |
| Q16 = To what degree did the pupils master tool*? | 4,35 | 3,69 |
| Q17 = To what degree did tool* work for its use? | 4,21 | 4,00 |
| <i>*tool were replaced with a specific tool.</i> | | |

Table 5.4: Descriptive Statistics - Digital tools

Table 5.4 shows that teachers and pupils had a similar agreement to Q17, while question Q16 had a small distinction between pupils and teachers, where pupils agreed more than teachers on what degree they mastered the digital tools. Here, the pupils had a mean between 4 (to a high degree) and 5 (to a very high degree), but the teachers' mean were between 3 (neutral) and 4 (to a high degree). The results show that the tools to a high degree worked for their use. The spider graphs in Figure 5.11 and Figure 5.12 show a visualization of the answers for each specific tool.

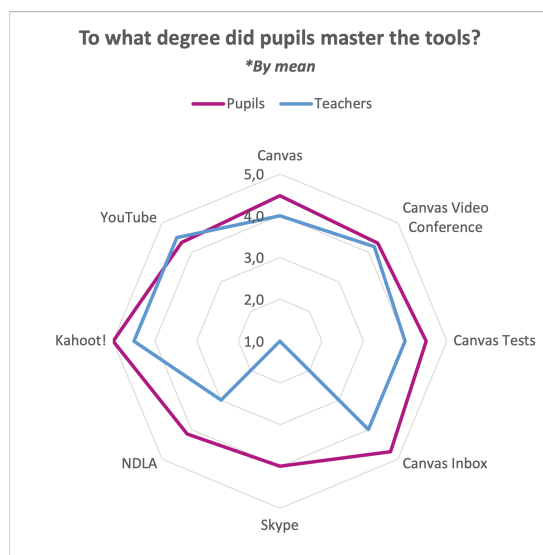


Figure 5.11: Q16

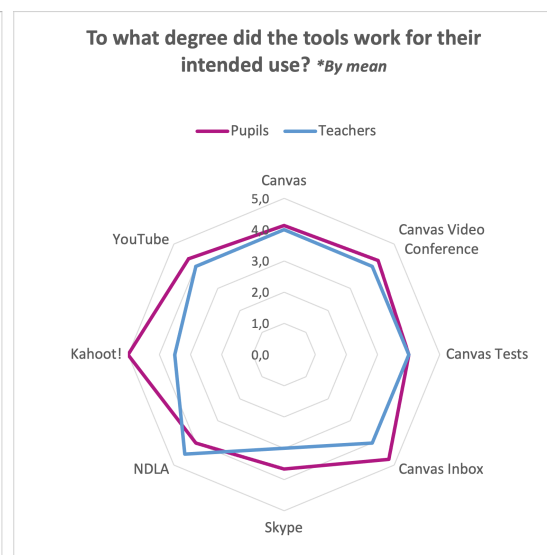


Figure 5.12: Q17

The respondents were further presented with two statements about digital tools, and they were asked to state to what degree they agreed with them. The first statement was: "I think we had the digital tools we needed during the closures". Figure 5.13 present the results from this statement.

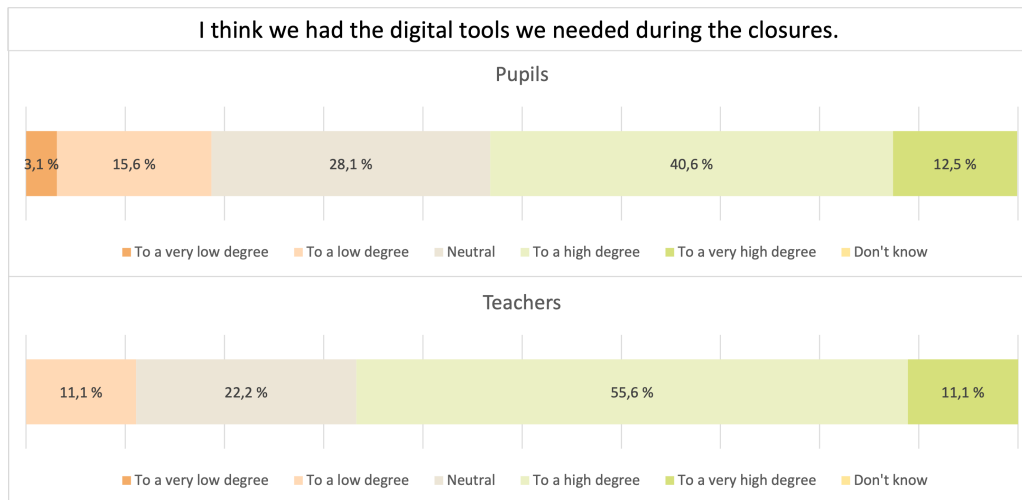


Figure 5.13: Sufficiency of digital tools, pupils (n=32) and teachers (n=9)

The majority of teachers (66,7%) agree to a high- or very high degree with this statement. However, there were some that did not agree, and one teacher pointed out:

"I would love to get Teams sooner. We got it gradually - and the pupils do not yet have it."

More than half of the pupils (53,1%) agreed that they had the tools they needed during the closure, while 18% disagree.

The other statement was: "I am satisfied with how we used the digital tools during the school closures". Figure 5.14 shows the result from this statement.

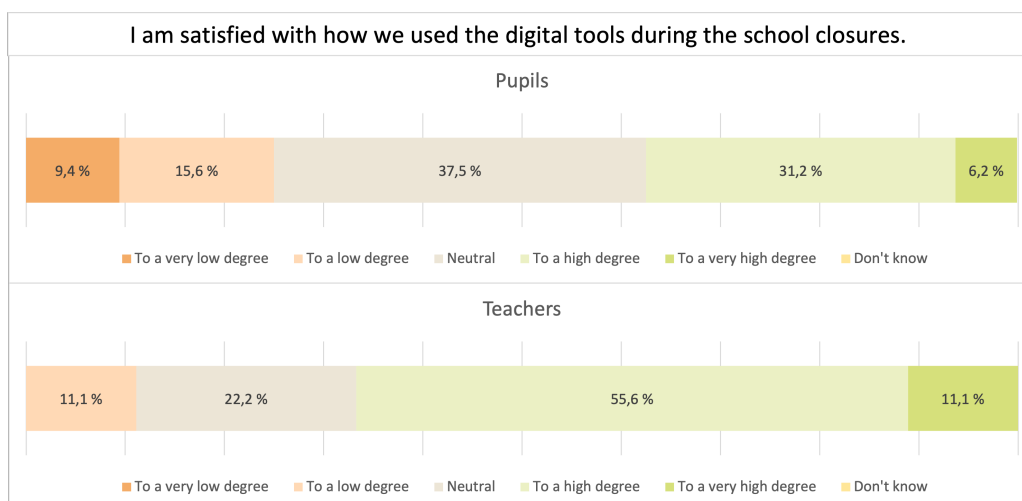


Figure 5.14: Satisfaction with digital tools, pupils (n=32) and teachers (n=9)

Figure 5.14 shows that the pupils were divided about this statement and that the teachers were more in agreement with each other. It was a larger proportion of pupils (25%) than teachers (11,1%) that disagreed with this statement. In a question where the participants could elaborate around their answer, a pupil stated:

”Some teachers have too little competence with the tools.”

The majority of teachers (66,7%) were to a high- or very high degree satisfied with the use of the digital tools. But one teacher agreed with the pupils about the lack of competence and explained it like this:

”During the shutdown, it became clear that we did not have enough expertise about the digital tools that were available. As an example, we have never received any training in Canvas Tests and Canvas Video Conferencing. We had to figure out these tools on our own.”

Results from Focus Groups

In this chapter, more qualitative data regarding pupils’ experiences with digital tools are presented. The main findings concern positive and negative aspects of the use of digital tools. It was asked specifically about the satisfaction with the use of digital tools during the school closure, as pupils and teachers were not in agreement on this statement in the questionnaire (Figure 5.14).

The groups were asked what they thought was the reason for the teachers to be more satisfied with the usage of the digital tools than the pupils. One informant from Focus group #2 stated:

”I think it’s because it was so... messy. It was... Things were in different places, and it was difficult.”

The information-sharing was experienced poorly by several informants from both groups. According to the groups, the teachers posted information in different places. One informant from each group also pointed out that some teachers had trouble with sharing links. The digital tools were not utilized in a manner that made it easy for pupils to obtain necessary information, for instance about where to find assignments and submission deadlines. As one informant from Focus group #2 explained:

”Canvas can be quite confusing at times.”

According to the informant, things got better over time, as the teachers started to collaborate but not all informants agreed.

The groups were also asked about how it went to use digital tools to collaborate and communicate with each other during the school closures. The groups were divided when it came to collaborating with others digitally. Focus group #1 felt it was difficult and stressful. One informant stated:

”I think it was completely hopeless. I remember we made a podcast once, over a video call, where we had to record the video call. And it was very difficult.”

Focus group #2 felt it went pretty well, as they had experience with co-writing documents and making PowerPoint presentations with classmates remote from before. This group also mentioned that the ”raise hand” functionality worked well in the digital video conferences. The informants in Focus group #1 mentioned that group collaboration in video calls was difficult because the sound was delayed, and if the group members had turned off their camera, then it was complicated to know when you could talk. Thus, it often got very quiet and did not work well.

Results from Interviews

This chapter presents more qualitative data from the teachers' perspective regarding the experience with the digital tools, both for teaching and communicating with pupils.

In the interviews, the teachers were asked what digital tools they had experience with from before, and it turned out that the school recently had changed their LMS from It's Learning to Canvas. Informant #1 stated:

"We have switched from It's Learning to Canvas recently, and there are a few different platforms built in that maybe not all teachers knew how worked."

Informant #3 had experience with the functionality on It's Learning, but were not familiar with how to use Canvas for all the same purposes. A quote from the interview was:

"On It's Learning, I used the discussion forum, which was a separate function in there, where pupils could discuss with each other digitally. I also used multiple choice tests where they could test themselves as a way to prepare for larger tests."

The digital tools the informants mentioned they had experience with in the interview were: It's Learning, Canvas (not all functionality), Co-writing documents (OneNote, Google Docs), PowerPoint, Excel, Screencast, Mentimeter, Kahoot! and a few games on the internet. This confirms the results from the questionnaire that the teachers had experience with several tools, but not all functionality each tool offered.

As with the focus group interviews, the teachers were asked why they thought teachers were more satisfied with the usage of digital tools during ERT than pupils. Informant #3 thought it could be because several teachers have learned something new. The informant explained:

"Most teachers have learned some new functionality and think that is great. While pupils always want more. They are rarely very happy, and not least, they are digitally and technologically further ahead of us. That teachers master video conferences is not a 'wow' for them."

The informant also mentioned that older teachers might have slightly more dissatisfied pupils than the rest, as they were more reluctant to learn how to use new technology. Informant #2 mentioned that the situation with remote teaching made it difficult for the pupils to get an overview of everything. A quote from the interview was:

"There was a lot of information and the pupils got numerous emails, so I think it was information overload. It was too much."

All informants preferred to use Canvas Video Conference for live teaching. They mentioned that some teachers used Skype, Zoom and Microsoft Teams, but they chose to stick to the school's LMS. In Canvas, the pupils also got a pop-up notification when the conference began, which Informant #1 appreciated. Informant #2 pointed out:

"There was a certain amount of confusion all the time, so I chose to stick to one platform."

One challenge with the use of Canvas that Informant #3 pointed out was that the platform was quite new. The informant mentioned that he/she felt it was enough to post messages, links and use Canvas Video Conference. However, the informant also pointed out that it had gotten better during the year:

"During the past year, I have gotten a pretty good overview of Canvas."

Another topic that was addressed in two of the interviews, that connects with the topic "Digital tools", was remote group work between pupils. The pupils in Focus group #1 mentioned that collaborating over video calls worked poorly because it was hard to get a good flow in the conversation, and the teachers were asked what their thoughts about this were. Informant #1 stated:

"It is probably very person-dependent, but it can be about safety... It just seems like a higher threshold, for some strange reason. I notice it with adults as well, when we are in meetings. It takes a little longer before anyone speaks."

Informant #2 informed that when he/she divided the class in break-out rooms and checked in with the groups, it was often quiet. The informant pointed out that this was the case in the video conferences as well:

"There are some pupils who at least turn on the microphone and say "hello", but then there are some who think that's awful, so..."

The lack of participation from the pupils in the conferences was considered another challenge with using digital video conferencing tools in teaching.

5.3.3 Learning Outcomes and Effects

This chapter presents the results related to pupils' learning outcomes during ERT and other different effects (i.e. stress), from both pupils' and teachers' perspective. As stated in Table 4.3 in Chapter 4.2, learning outcomes and effects considers what the individual pupil have learned and other effects the digital teaching has had.

Results from Questionnaires

Pupils and teachers were asked about pupils learning outcomes and effects in the questionnaire. Figure 5.15 shows the results of which learning activities the respondents felt the pupils learned the most from during the school closures.

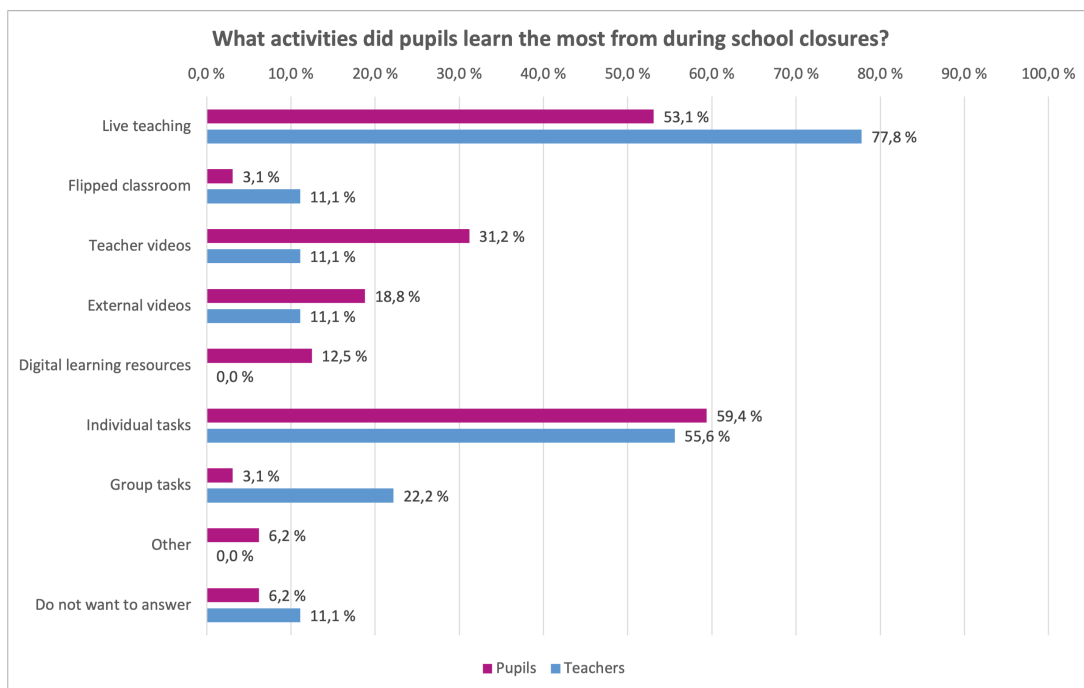


Figure 5.15: Learning activities perceived outcomes, pupils (n=32) and teachers (n=9)

In this question, the respondents were able to choose up to three digital learning activities. The results show that pupils chose 1,8 digital activities on average, while teachers chose 1,9 activities on average. Figure 5.15 shows that pupils and teachers agreed that Live teaching (53,1% and 77,8%) and Individual tasks (59,4% and 55,6%) were the activities that provided the best learning outcome. When asked about why Live teaching was chosen as one that gave learning outcomes, ten pupils and six teachers mentioned in their written answers that it was possible to ask questions or that it was the activity most similar to regular teaching. One pupil explained it like this:

"It was like a 'regular' school lesson, and you had the opportunity to ask questions along the way if you were wondering about something."

Eleven pupils that chose Individual tasks explained that it was because they were able to work at their own pace and structure the work as they liked. One pupil stated:

"I like to work for myself, because then I can be in my own bubble and focus. This is something I like and therefore it is something I learn a lot from."

A larger proportion of pupils than teachers chose Teacher videos and External videos as activities that had the best effect on learning outcomes, while a larger proportion teachers than pupils chose Group tasks. The reasons in the written answers were similar to the results in Chapter 5.3.1 about the best liked digital learning activities.

The respondents were also in this category presented with statements in which they answered to what extent they agreed with each statement. The first statement was: "Pupils have learned just as much at digital homeschool as they would in the normal school situation". The results for this statement is presented in Figure 5.16.

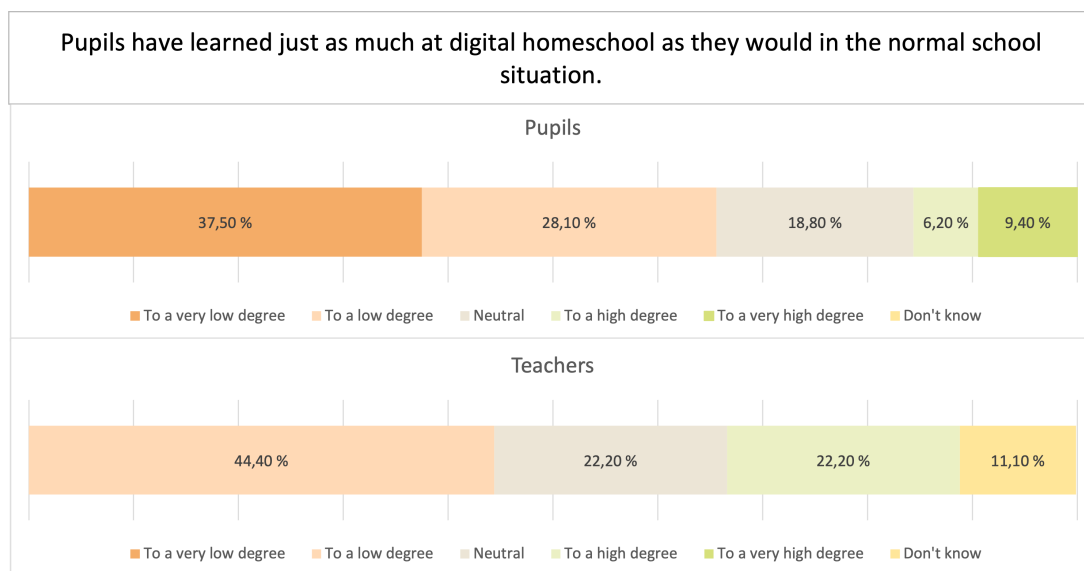


Figure 5.16: Learning situation 1, pupils (n=32) and teachers (n=9)

Figure 5.16 shows that the majority of pupils (65,5%) agreed to a low- or very low degree that the pupils had learned just as much at digital homeschool as in the normal school situation, while only 15,6% agreed to a high- or very high degree. 44,4% of the teachers did also disagree with this statement, which is the double of the number of teachers that agreed (22,2%).

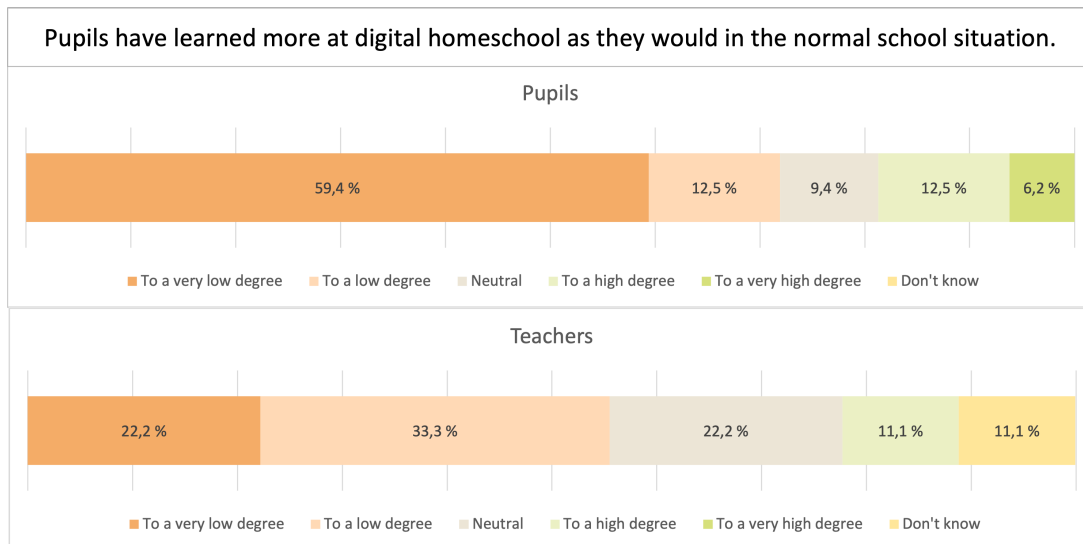


Figure 5.17: Learning situation 2, pupils (n=32) and teachers (n=9)

The second statement was: "Pupils have learned more at digital homeschool as they would in the normal school situation". The results for this statement is presented in Figure 5.17. The figure shows that even more students and teachers disagreed with this statement. Here 71,9% of pupils, and 55,5% of teachers agreed to a low degree. 59,4% of the pupils agreed to a very low degree.

Results from Focus Groups

This chapter provides an overview of more qualitative data gathered concerning pupils' learning outcomes during ERT. From the questionnaire, it was clear that both pupils' and teachers' meant that pupils learned less during ERT (Figure 5.16 and Figure 5.17). The questions in the focus group interviews were concentrated on what pupils thought was the reason for this, and if they experienced it differently between subjects or different teachers.

The focus groups were asked if they agreed with the findings from the questionnaire about lower learning outcomes during digital homeschooling, and all informants agreed. They got several suggestions on why they learned less during remote teaching. An effect that emerged at the beginning of the remote teaching, according to the informants in Focus group #1, was that the pupils were stressed. All informants in Focus group #1 agreed that they were very stressed at the beginning of the period with digital teaching and that this affected their learning outcome. They said that it got better after some time when they got used to ERT and when the teachers reduced the amount of work.

Another reason mentioned, from several informants in both groups, was low work effort on assignments and tasks they were given. They only worked to reach the minimum requirements, and never did tasks that were optional. One informant from Focus group #1 stated:

"It was about completing tasks, just to get them done. Not to learn anything new."

It was also mentioned that it was easy to "cheat," for instance, by asking classmates to send assignments or to google different answers without reading about the topic. The informants in Focus group #1 additionally felt that it was hard to stay focused at home. One informant mentioned:

"It was difficult to concentrate alone, I got easily disturbed."

In some periods with remote teaching, the class was divided into two groups, and the groups were physically at school every other day. One informant also mentioned that various tasks they were given at home were not always reviewed in the class afterward. This made the teaching and learning difficult to follow because it was not coherent. According to the results from the questionnaire, it was a connection between the most liked learning activities and learning activities that the pupils felt gave the best learning outcome, and this was also confirmed in the interviews. One of the informants in Focus group #1 said:

"If the teachers uses activities that pupils like, then pupils will be much more motivated to actually do the school work. It will be much more fun to do it, and it will be easier to learn from it."

The focus groups were asked if there were differences between subjects or teachers in terms of how much learning outcome they felt they received. Both groups felt it was a huge difference between teachers, and all informants agreed that it may relate to the age of the teachers. They mentioned that the young teachers managed to create a pretty good arrangement, while there was more clutter with the older teachers. One informant from Focus group #2 explained:

"There is a difference between the teachers in how they teach and how they use the digital aids. It has been a bit challenging with some of the teachers who are a bit older."

Another difference between the teachers that Focus group #1 mentioned was that the teachers chose different strategies in how much schoolwork they provided. As one of the informants stated:

"Some teachers elaborate the subject more, and had several school hours where we had to be present and where they went through presentations. In other subjects, one may not get anything to do at all."

Regarding the different subjects, several informants felt they did it better in reading subjects, as they could read and complete tasks at their own pace, and because it was quieter at home. Language subjects (Spanish, German, etc.) and mathematics were considered the most difficult subjects during remote teaching. An informant from Focus group #1 said:

"There were some subjects I felt I did better in, but I find mathematics difficult to learn on my own... In that subject I would like to receive more guidance from the teacher."

Results from Interviews

In this chapter, results from the interviews regarding pupils' learning outcomes are presented. As in the focus group interviews, the teachers were asked if they agreed with the results from the questionnaire. Additionally, they were asked if some subjects were easier or harder to teach remotely.

The teachers agreed that the pupils had learned less. One of the reasons, according to Informant #2 and #3, was that it always was uncertainty about the pupils work effort. They felt they never knew how much the pupils learned at home and felt they had to repeat the subject matter after each period with remote teaching. This caused more time spent on less material. Informant #3 described it like this:

"When the pupils have returned to school after a lockdown, I have repeated everything. Not because pupils have requested it, but because I do not trust that it was taught in the period when they were home."

Another reason mentioned by Informant #1 was that some teachers were satisfied with just delivering the theory and then making the pupils complete tasks. The informant pointed out:

"It may not be the best solution for a long period of time."

According to Informant #2, the pupils did not receive any in-depth learning when the teachers conducted remote teaching. It was more surface learning. The informant pointed out that the contexts and connections in the subjects may not have appeared clear for the pupils.

The teachers were asked if they considered their subjects to be easier or harder to teach, compared to other subjects. All the informants mentioned that language subjects (Norwegian, Spanish, German, etc.) and mathematics were considered more difficult to teach compared to History and social studies. Informant #2 stated:

"Social studies worked best. In that subject it was more facts. In Spanish, I had to plan for more maintenance of material rather than the introduction of new material, because that did not work."

Informant #3 also mentioned that there existed more digital resources they could use in subjects like social studies:

"In social studies, I used a lot of online resources from before, such as films, documentaries, articles and links. And these are things that can be done from anywhere."

5.3.4 Digital Competence

This chapter presents the results related to digital competence. Table 4.3 in Chapter 4.2 defines digital competence as the skills, knowledge, and attitudes that one needs to be able to use digital activities and tools.

Results from Questionnaires

The digital competence of pupils was investigated, and the respondents were asked whether the pupils had experience with live teaching, flipped classroom, prerecorded videos, or digital learning resources before the school closures. Table 5.5 shows the mean of means for this question, in order to get an overview of the pupils' general experience with digital activities prior to the closures. The full statistics of this question can be found in Appendix H.

| Mean of Means | | |
|--|--------|----------|
| Questions | Pupils | Teachers |
| Q30 = To what degree did the pupils have experience with activity* prior to the school closures? | 2,46 | 2,58 |

Table 5.5: Descriptive Statistics - Experience with digital activities

Table 5.5 shows that the pupils had an average answer of 2,46, which meant that they on average agreed to a low degree or neutral that they had experience with digital activities before the closures. Teachers had an average answer of 2,58 (also between a low degree and neutral).

The respondents were presented with agreement statements, in which they were asked to state their opinion. The respondents were first asked to what degree they agreed that pupils had a lot of experience with digital tools prior to the school closure. Figure 5.18 shows the results for this agreement statement.

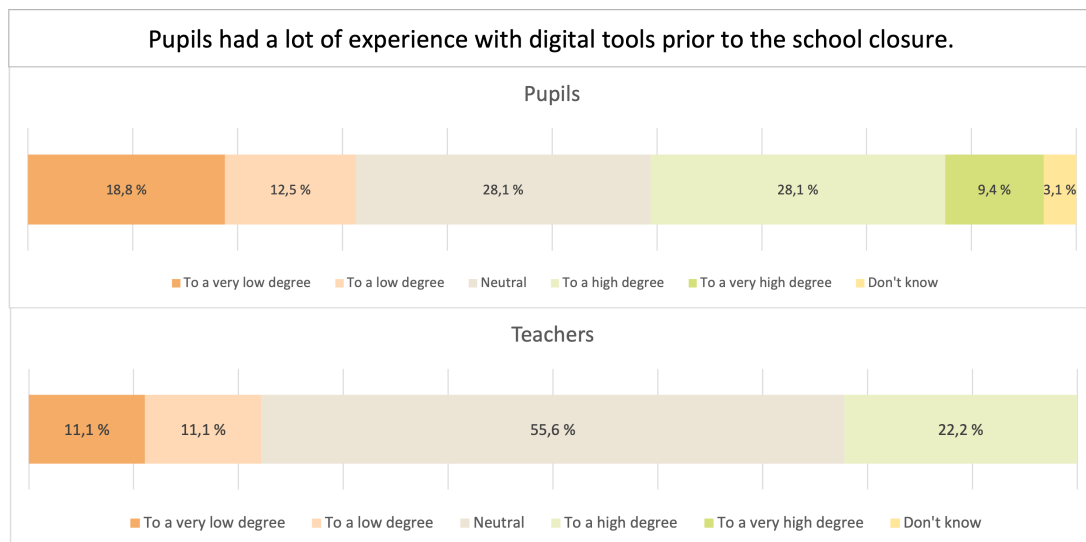


Figure 5.18: Pupils' experience with digital tools, pupils (n=32) and teachers (n=9)

Results show that 31,1 % of pupils agreed to a low or very low degree that they had experience with digital tools prior to the school closure, and 22,2% of teachers answered the same about their pupils' experience with digital tools.

A majority of teachers stated that they were neutral (55,6%) in this question, which also applies to 28,1% of pupils. However, 37,5% of pupils and 22,2% of teachers agreed to a high or very high degree that pupils had experience with digital tools prior to the school closures. The respondents were further asked whether pupils knew beforehand how to use the digital tools when the school closed.

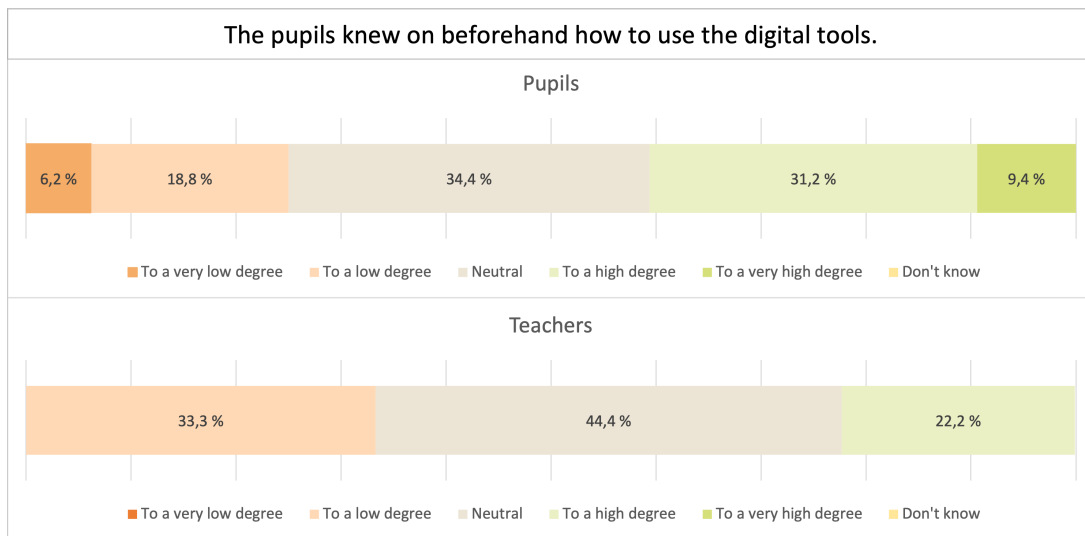


Figure 5.19: Pupils’ knowledge of the use of digital tools, pupils (n=32) and teachers (n=9)

Figure 5.19 shows that a majority of teachers (44,4%) answered that they were neutral to this question, which 34,4% of pupils did too. A majority of pupils (40,6%) stated that they agreed to a high or very high degree that they knew beforehand how to use the digital tools, which was supported by 22,2% of teachers. However, the respondents were rather divided in this agreement statement, as 25% of pupils and 33,3% of teachers agreed to a low or very low degree.

Lastly in this category, respondents were asked to state to what degree they agreed that pupils experienced challenges while using digital tools for school work. Figure 5.20 presents the results for this agreement statement.

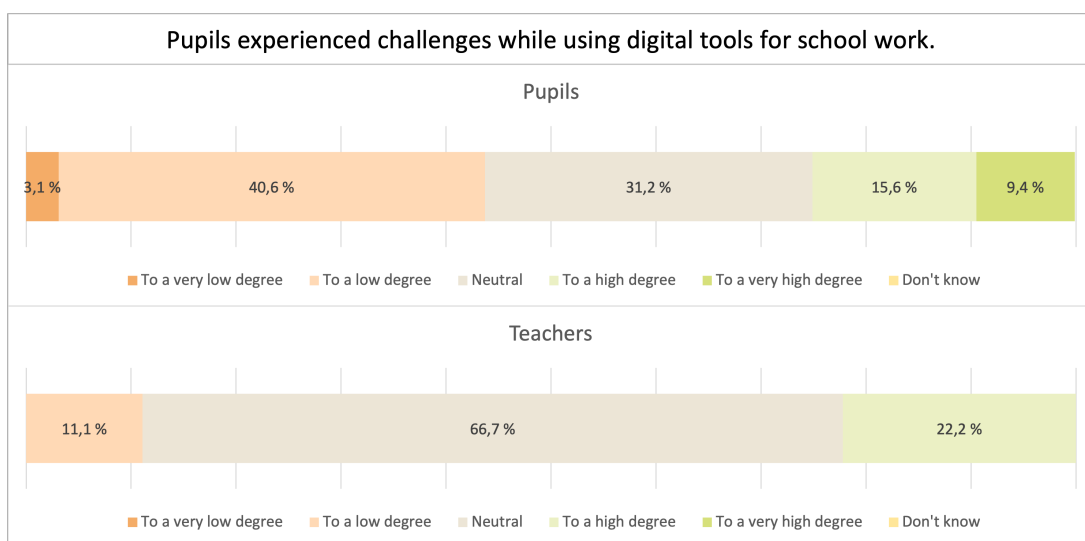


Figure 5.20: Pupils’ challenges with digital tools, pupils (n=32) and teachers (n=9)

One can see that 43,7% of pupils agreed to a low or very low degree that they experienced challenges while using digital tools for school work. 11,1% of teachers stated that they also agreed to a low degree. A large majority of teachers (66,7%) said that they were neutral to this statement, and 31,2% of pupils did the same. 22,2% of teachers stated that they agreed to a high degree that their pupils experienced challenges, and 25% of pupils agreed to a high or very high degree.

Results from Focus Groups

The questions in the focus group interviews concerned what pupils had challenges with when using digital tools for school work, to get more qualitative data regarding the result from the questionnaire. The informants in Focus group #2 mentioned that it was a bit difficult to use all the digital tools at the beginning. The informant explained it like this:

"I did not quite know how everything worked in the beginning, like putting on the camera and stuff. It was completely new, so it was challenging in the beginning."

The informants agreed that it got easier quite fast. The questionnaire demonstrated that the largest amount of pupils did not experience many challenges while using digital tools for school work. The focus groups agreed and Focus group #1 described it like this:

"We pupils learned it fast because we are used to mobile and PC and stuff. But it was probably worse for the teachers.."

Results from Interviews

Digital competence was not a major component in the interviews with teachers, as a lot of information was already gathered about it in the related work and questionnaires. Informant #2 did, however, explain that the school closures had affected the feeling towards the use of digital tools and resources:

"I feel that I have not been so innovative. But I have of course become better and safer with these different aids that we have."

5.3.5 Digital Follow-up

In this chapter, the results regarding the experience of the digital follow-up during ERT are presented. As described in Table 4.3 in Chapter 4.2, digital follow-up is defined as the digital actions and tools used to provide help and guidance during the school closures.

Results from Questionnaires

The questionnaire included a statement connected to the digital follow-up of pupils. Here, the respondents chose to what degree they agreed with the statement, which was "Pupils got the help they needed from teachers during the school closures". Figure 5.21 presents the results from this statement.

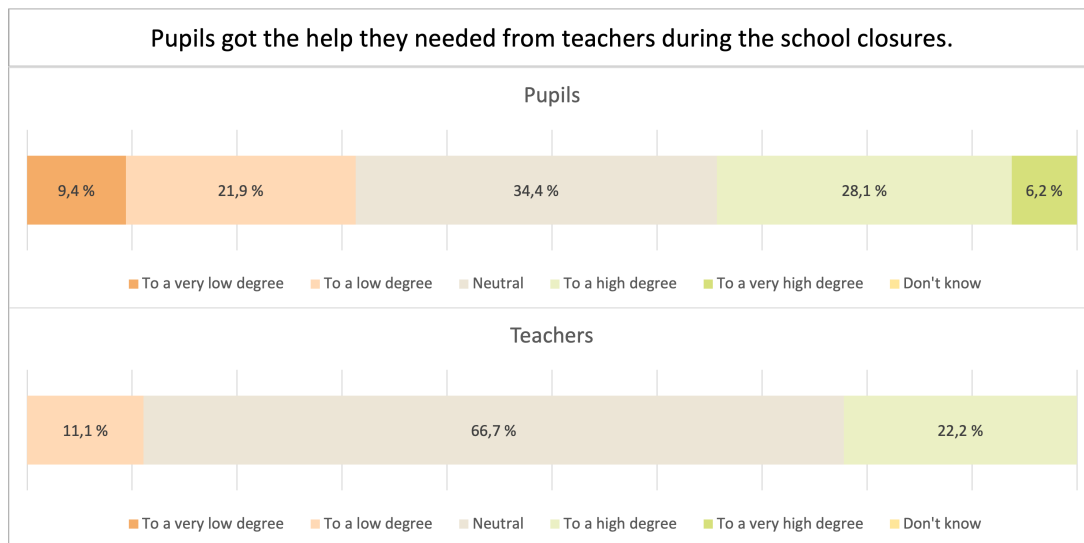


Figure 5.21: Pupils getting the help they need from teachers, pupils (n=32) and teachers (n=9)

Here, there was a great variation in the answers of the pupils. 34,3% of the pupils agreed that they got the help they needed during the closure, 31,3% disagreed and 34,4% were neutral.

Results from Focus Groups

In this part, the results from the focus groups towards the digital follow-up of pupils during the school closures are presented. The questionnaire results showed that 31,3 % of pupils disagreed that they got the help they needed during the school closures, which was further investigated in the focus groups. The focus groups explained that their teachers did not ask them if they needed help and that they had to send a message to get help, as one participant in Focus group #2 described:

"You had to ask (for help) yourself. They did not ask individual pupils if they needed help or if they understood things or something like that."

Focus group #1 agreed with this statement and further elaborated that it was not sufficient to ask for help for the pupils, because of the time it took to get help:

"They (teachers) were not very good at asking. And if you sent a message to them saying that you needed help with something, then you did not get help before the next day. So it was a bit difficult to get help".

Both focus groups agreed that the time it took to get help during school closures was difficult compared to the traditional teaching situation and that pupils that required extra help did not get the help they needed. Focus group #2 explained that it often took at least 2-3 hours to get an answer when they for help with an assignment. Another challenge that emerged when the pupils had to ask for help themselves, according to Focus group #2, was that pupils were scared to ask for help:

”There are some who think it is uncomfortable to send a message to ask for help. So there are many who don’t dare to ask too.”

Further, the pupils experienced a confusing time scheme during the period from August 2020 to April 2020 when the school shifted between traditional school and ERT. Focus group #1 explained that the school and teachers did not follow up enough with information sharing during these changes:

”When we were to start with school again after new years, we were told at 18.00 the day before that we were going to school the next day. And then, around 21.00-22.00 the same night, we got a message saying that we were not going to school the next day anyways. So at that time, it was very poor information.”

Lastly, the pupils’ presence in the digital school became a theme in the focus groups. Both focus groups admitted that it could be difficult for the teachers to be able to follow up on whether pupils attended class or not. Both groups explained that live teaching was conducted a lot so that teachers could check that the pupils paid attention. Focus group #2 stated that it was hard to be present in digital home school:

”It is easy to zone out when you are at home and only have tasks that should be delivered at the end of the day. Then it is easy to find something else to do.”

Focus group #1 also agreed that it was easy to not pay attention in class, and proposed a solution to solve the issues with pupil presence:

”Could have been, for example, that we had to turn on the camera during classes. Because if we don’t, we can cook food or sleep instead.”

Results from Interviews

This chapter presents more qualitative data from the teachers’ perspectives towards the digital follow-up of pupils during ERT. Results from the questionnaire demonstrated that the pupils were quite divided on whether they felt they got the help they needed during the remote teaching, and 66,7% of teachers were neutral to this statement. This was further investigated in the interviews.

Both Informant #1 and #2 stated that they used phone calls to communicate with the pupils they were responsible for. As Informant #2 stated:

”The average pupil you manage to have some form of communication with, but then there are those who disappear a bit. Then, it was a direct phone call that helped... It can be something as simple as the internet being unstable.”

With other pupils, they communicated through Canvas, either in the video conferences or by messages on the platform. Informant #2 also pointed out that the challenge with ERT primarily was that the physical meetings were gone. The informant stated:

”For me, it was not actually switching to working digitally that was the big transition, it was more about losing the classroom proximity. The fact that a pupil can ask you questions when he is wondering about something, and such. That was hard.”

This informant also stated that the communication with the pupils did not become any better throughout the period:

”I think the communication became more challenging maybe. Because you have become accustomed to not having that communication... The average pupil you manage to have some form of communication with, but then there are those pupils who disappear a bit. With them it was a direct phone call that helped, I think.”

Informant #1 did also mention that different pupils handled the situation differently and that some needed more follow up. The informant said:

”Very few pupils, independent pupils, probably managed this situation very well, but then there are some who really fall behind.”

The informant explained that some pupils got a personal schedule. According to the informant, it did not work as planned.

”... Not that it worked for the two pupils I tried this with, but it was an adaptation. We tried.”

The pupils’ presence in live teaching was also discussed in the interviews. Both Informant #2 and Informant #3 mentioned that the majority of pupils were muted and did not use the web camera in the conferences, which made it difficult to know who paid attention and were present.

5.3.6 Summary of Results: Experiences with ERT

Summary of Results: Experiences with ERT

Digital Learning Activities

- Live teaching and individual tasks were the most liked digital learning activities, followed by prerecorded videos. The qualitative data shows that teaching mostly was conducted by using those activities.
- Live teaching was liked because it resembled traditional teaching, while individual tasks and prerecorded videos provided the ability to adjust it to one's own pace. However, live teaching did involve challenges connected to pupils' presence and participation.
- Group tasks were not liked by pupils, because groups were often randomized and the communication worked poorly.
- Pupils mastered the activities and the activities worked for their intended use.
- The satisfaction with activities was quite different for pupils and teachers, as teachers to a higher extent were satisfied with which and how digital learning activities were used.
- The qualitative data shows that the different perceptions could result from limited feedback from pupils about how they wanted teachers to use digital learning activities.
- Both pupils and teachers agreed that weaker pupils struggled more during the school closures.

Digital Tools

- Canvas (the whole platform) and Canvas Video Conference were the most liked digital tools. Both pupils and teachers liked Canvas as they were familiar with it from before. It is Dandelion school's LMS.
- Canvas Video Conference was liked because it provided the opportunity for direct communication between pupils and teachers.
- Both pupils and teachers had experience with many tools before the school closures, but it is not known to what extent.
- Overall, pupils mastered the tools and the tools worked for their intended use.
- The satisfaction with tools were to some extent different, as a larger proportion of teachers were satisfied with how the tools were used.
- The qualitative data shows that the different perceptions could be because it varied between how teachers used the tools which made it confusing for the pupils. Pupils mentioned that not all teachers have enough competence/experience with the tools.
- Pupils received a lot of information at different places in different tools in the beginning.
- Pupils felt it was difficult to collaborate over video conferencing tools because of sound delay and that classmates had their cameras off, making it hard to know when to talk.

Continuation: Summary of Results

Learning Outcomes and Effects

- Pupils and teachers reported that live teaching and individual tasks were the digital learning activities that gave the best learning outcomes.
- The most frequent reason for choosing live teaching was that it was possible to ask questions and that it resembled regular teaching. Individual tasks gave better learning outcomes because they allowed pupils to work at their speed and structure the work as they like.
- The results show that pupils learned less during the school closures than they would in the normal school situation.
- The focus groups stated that stress and an increased workload had an impact on their learning outcomes.
- Another reason that they learned less was that they worked to reach minimum requirements and collaborated to finish tasks.
- Pupils also completed tasks just to finish them instead of learning from them. The interviews also discovered that it was an increased need for repetition when the pupils returned to school after a lockdown.
- The pupils in the focus groups said that how much they learned depended on the activities and tools they used, that teachers should have used what the pupils liked more. The teachers in the interviews further stated that they used different approaches in different subjects.

Digital Competence

- Pupils had little experience with digital activities prior to the school closures. Approximately 1/3 of pupils also stated that they had little experience with digital tools and that they did not know beforehand how to use them. This was also a theme in the focus groups, where the pupils explained that they did not quite know how everything worked in the beginning, but that they learned fast.
- Pupils reported that they to a low extent experienced challenges while using digital tools for school work. The majority of teachers were neutral to this statement.
- The results discovered that the ERT situation had affected the feeling towards the use of digital tools and resources, as one teacher became better and safer with the aids available.

Continuation: Summary of Results

Digital Follow-up

- Pupils experienced that they to a lower extent got the help they needed during the school closures. The majority of teachers were neutral to this question.
- The focus groups reported that pupils felt that they had to ask for help and that their teachers did not ask if they needed help. Further, if they asked for help, it took some time to get help. Some pupils were scared to ask for help.
- The focus groups stated that pupils that required extra help did not get the help they needed. The informants reported that different pupils handled the situation differently and that some pupils required more follow-up than others.
- It was, according to the focus groups, hard for pupils to stay present and to pay attention in digital teaching. In the interviews, the informants also mentioned this challenge, as the majority of pupils were muted and off-camera during conferences, which made it difficult to know who paid attention.
- The interviews discovered that two informants used the phone to call pupils they were responsible for and that they communicated through Canvas with the rest. The communication was at times challenging and one informant felt that it did not improve over time.

5.4 ERT and Digitalization of Education

This chapter presents the results from the research regarding RQ2, about how the experiences with ERT can influence the ongoing digitalization process in Norwegian schools. The results are based on how pupils and teachers perceive that the lessons learned from ERT can affect how ICT is used in the traditional teaching situation in the future. In addition, specific opinions of teachers about the digitalization process were in focus. First, some quantitative results from the questionnaire are introduced before qualitative results from the focus groups and interviews are described.

The questionnaires mainly focused on answering RQ1.1 and RQ1.2, but some of the questions were later recognized as useful for RQ2. These questions were aimed towards the future use of digital activities and digital tools after the school closures. In the questionnaires, the respondents were asked the questions presented in Table 5.7 for each activity/tool they had chosen as their most liked ones. Appendix F and Appendix G contain the full descriptive statistics for these questions.

| Mean of Means | | |
|---|--------|----------|
| Questions | Pupils | Teachers |
| Q8 = To what degree would you want to use activity* more, after the closures? | 3,51 | 4,02 |
| Q19 = To what degree would you want to use tool* more, after the closures? | 3,66 | 3,63 |
| <i>*activity and *tool were replaced with specific activities and tools.</i> | | |

Table 5.7: Descriptive Statistics - Future use of digital activities and digital tools

From Table 5.7, one can see that both questions have a mean close to 4, which means that the respondents to a high degree would want to use the activities and tools more after the closures. Figure 5.22 shows the mean answer for each specific activity, while Figure 5.23 shows the mean for each specific digital tool. The results in these figures were dependant on how many respondents chose the activity/tool, which in turn makes it critical to treat the results carefully. The activities/tools with a low amount of respondents can be found in Appendix F and Appendix G.

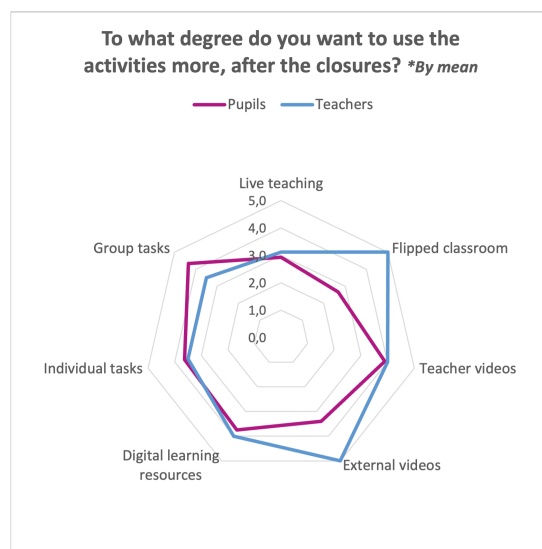


Figure 5.22: Q8

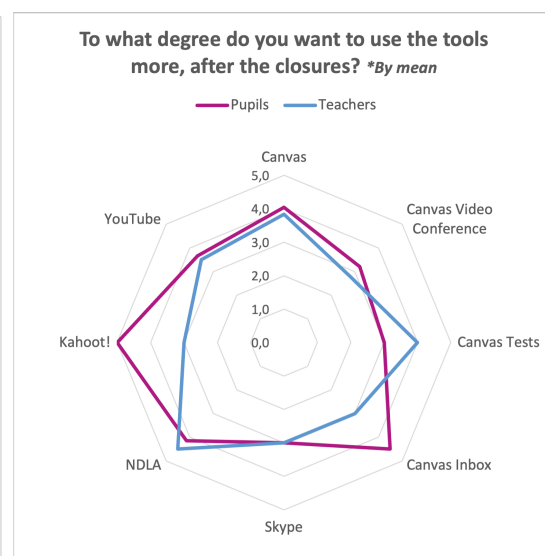


Figure 5.23: Q19

Figure 5.22 shows that teachers would want to use external videos and flipped classroom after the closures to a higher degree than pupils, while pupils would prefer to use group tasks to a higher degree in the future. For the digital tools, Figure 5.23 shows that teachers and pupils agree "to a high degree" that Canvas, YouTube, and NDLA should be used more after the closure. The figure also shows that they are quite neutral about whether Canvas Video Conference and Skype should be used more. The tools the teachers and pupils disagree about are Kahoot!, Canvas Inbox, and Canvas Test. Here, the pupils want to use Kahoot!, and Canvas Inbox after the closure to a higher degree than teachers, while teachers want to use Canvas Tests to a higher degree than the pupils.

Further, the questionnaire respondents were asked about an agreement statement. This statement was: "Pupils learned to use digital tools that they will find useful in the future". Figure 5.24 presents the results for this statement.

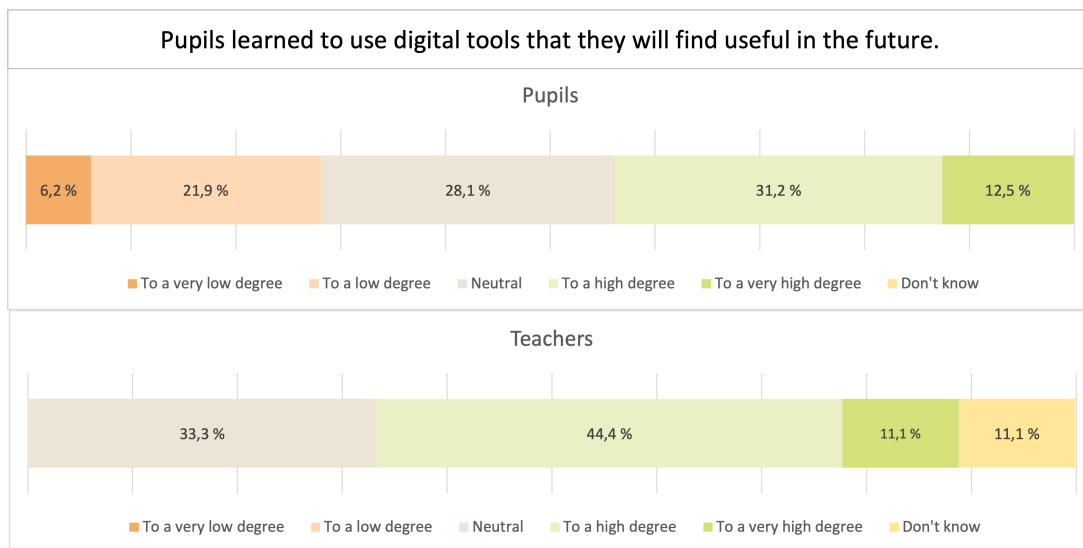


Figure 5.24: Pupils learning to use digital tools, pupils (n=32) and teachers (n=9)

The results in Figure 5.24 show that no teachers disagree. 44,4% of the teachers were neutral or answered "Don't know", and 55,5% of the teachers agreed that the pupils learned to use digital tools that will be useful in the future. The results from the pupils are more spread out. Here 43,7% of pupils agreed to the statement, 28,1% were neutral, and 28,1% disagreed.

Further, the respondents' opinions concerning digitalization and the use of ICT in education in the future were explored through the focus groups with pupils and interviews with teachers. Firstly, Informant #1 expressed that he/she hoped that they could learn from the sudden transition to ERT and that it could lead to some framework on how digital teaching could be done better:

"Maybe one can reflect on what worked and how one should do it as a school."

The informant also explained that the connection between learning and collaboration was crucial and difficult. Further, the informant stated that it should be focused more on accessing digital aids to facilitate it in the future. This was supported by Informant #3, who expressed that he/she missed courses where one could learn how to activate the pupils during live teaching, which was difficult during the school closures. However, Informant #3 stated that many had learned how to use certain digital tools in a better way as a result of ERT:

"We were given training videos through Canvas, so now everyone should know how to use it."

Further, Informant #3 firmly stated:

”The digital can never replace the teacher and the classroom.”

Nevertheless, it was clear that experiences with ERT affected the teachers’ mindset towards the use of ICT in the traditional teaching situation. Although both preferred classroom teaching, Informant #1 and #3 expressed that they had considered or would consider using live teaching as a supplement for pupils who were sick or had to stay home. Informant #3 explained this way:

”At one point, half of my class was at home while the other was in school. And then I tried to conduct a video conference live in the classroom so that the ones at home could participate. And the thought of that is genius because then one can stay at home if one feels sick without missing anything.”

Both focus groups agreed that live teaching over video could be a possible supplement to classroom teaching in the future, as Focus group #1 described:

”Live teaching is something I want more of. That we don’t have to go to school for every class, but that we can stay at home a bit too.”

Focus group #1 further stated that it could be easier to ask for tasks to do at home after the school closures, as teachers were more familiar with providing such tasks. Other digital activities that Informant #1 envisioned that he/she wanted to use more in the future were screencasts. Screencast was an activity that also pupils in Focus group #2 mentioned that their teachers had used more in the classroom and that they preferred. Considering digital tools, Informant #2 expressed that many learned to use something new due to ERT:

”I might think that being forced to use digital tools is good. I think that it is a good thing, that one is actually left with some sort of learning from this.”

Next, all informants in the interviews explained that teachers with little experience with digital tools became safer with the use of them throughout the school closures. All informants explained that this typically happened for teachers that were a bit older, as Informant #3 described:

”The part with internet and PC is not entirely new, but this (situation) has done something for the teachers that are older than me. It has generated some safety for many. So I absolutely think that some will use some more ‘fun’ things in their teaching to create variation.”

The pupils in Focus group #2 did, however, express that they did not think that their older teachers would be so eager to keep using digital teaching after the pandemic. This statement was supported by Informant #1:

”I think that there are still some that prefer to be in the classroom and to keep the control, but that might be the older part of the teachers.”

Chapter 6

Discussion

This chapter discusses the data gathered from this research, making it possible to answer the research questions. Chapter 6.1 discusses the results about how ICT was adopted at Dandelion school during the COVID-19 pandemic in light of the SAMR model (RQ1.1). Chapter 6.2 evaluates the findings related to how pupils and teachers experienced ERT using the CIPP model (RQ1.2). In Chapter 6.3, a comparison of pupils' and teachers' experiences are carried out (RQ1). Lastly, Chapter 6.4 discusses the findings about how ERT can influence the ongoing digitalization process in Norwegian schools (RQ2).

6.1 Evaluating the Adoption of ICT during the COVID-19 pandemic using the SAMR model

This chapter aims to answer RQ1.1, about how Norwegian upper secondary schools adopted ICT to maintain the teaching and learning during the COVID-19 pandemic. The discussion utilizes findings from both the related work and the results from this research. In this part of the research, it is important to remember that the main focus is on *which* and *how* digital tools were used for teaching, and not on the experiences connected to it.

RQ1.1: How did Norwegian upper secondary schools adopt ICT to maintain the teaching and learning during the school closures?

The results are discussed in light of the SAMR model. The SAMR model, elaborated in Chapter 2.3.1, was used to evaluate how the digital tools were adopted to conduct teaching and learning during ERT. The model made it possible to categorize the usage of the different digital tools in the four levels: substitution, augmentation, modification, and redefinition. As the COVID-19 pandemic was an extraordinary situation that led to extensive use of ERT (UNESCO, 2020b) and the focus of this part of the research was on the adoption of ICT, the model was used in a customized manner. Originally the model categorizes strategies for implementation of ICT according to the possibilities to enhance learning or harness ICT to transform learning and make new things possible in a traditional teaching situation (Best, 2015).

In this research, the model is used to create a categorization of which digital tools and learning activities that: substituted traditional teaching methods, enhanced the learning, or transformed parts of the teaching and learning during ERT. The adapted descriptions of the SAMR levels are presented in Table 6.1. The discussion will focus on the digital learning activities and tools mentioned used by Dandelion school. However, it will not address the extent to which the activities and tools were used.

| SAMR level | Description |
|-----------------|---|
| 4. Redefinition | The use of digital tools and activities that allows for the creation of completely new tasks that were not possible before and that transforms learning (Hamilton et al., 2016). |
| 3. Modification | The use of digital tools and activities that allows for significant task redesign (Hamilton et al., 2016). |
| 2. Augmentation | Digital tools and activities used as direct substitutes with some functional improvements (Hamilton et al., 2016). The digital learning activities and tools that brought positive changes to the teaching and learning situation are placed at this level. For example: the use of screencasts. |
| 1. Substitution | Digital tools and activities used as direct substitutes with no functional change (Hamilton et al., 2016). At this level, the digital learning activities that worked the same as in the traditional teaching situation, and the digital tools used to implement these activities were included. For example: The use of video conferencing tools to conduct live teaching. |

Table 6.1: Adapted level descriptions - SAMR model

The SAMR model implies that teachers should aim to teach using ICT and preferably at the highest levels (Hamilton et al., 2016). However, it is essential to remember that it is not always better with more advanced use of technology in teaching, as the effectiveness of any teaching activity or strategy depends on when and how it is used (Best, 2016; Hamilton et al., 2016). Introducing completely new types of activities during an extraordinary situation like ERT could work against its purpose of enhancing learning. Trust and Whalen (2020) found that teachers and schools were unprepared to transit to ERT and that they struggled to use digital tools. Related work also shows that teachers were overwhelmed with suggestions for digital tools and they were concerned that their unfamiliarity with them would create difficulties (Bubb and Jones, 2020). These findings indicate that it would not be useful to make the implementation of ICT more complex than it needed to be in an already difficult situation.

At Dandelion school, Canvas was used for almost all purposes related to teaching and learning, as it was their LMS. Findings from the related work, both from Norway and internationally, also support that teaching and learning during the school closures mainly consisted of the use of the school's LMS and video conferencing tools (Bubb and Jones, 2020; Langford and Damşa, 2020; Afonso et al., 2020; Giovannella et al., 2020; Shenoy et al., 2020; Bergdahl and Nouri, 2020; Niemi and Kousa, 2020). The video conferencing tools were used to conduct live teaching. Most teachers at Dandelion school used Canvas Video Conference, which is an integrated conferencing tool in Canvas. Some teachers, however, chose to use Skype or Zoom, which the related work also demonstrates were popular at other schools in Norway and internationally (Bergdahl and Nouri, 2020; Niemi and Kousa, 2020; Shenoy et al., 2020). Canvas Video Conference also had the functionality to divide pupils into break-out rooms for conducting group work during the lecture. This type of live teaching was considered to fit at the substitution level of the SAMR model. Both teachers and pupils from Dandelion school mentioned that this activity resembled classroom teaching. By conducting live teaching, the element that differed from the traditional teaching situation was that the class was not present in the same physical room. However, the teaching

and learning method itself was unchanged. The same applied to digital group work between pupils over video conferencing tools. The results further explain that tasks were handed in through Canvas. Hence, individual tasks were also deemed to fit at this level as the only change from the traditional teaching situation was that all tasks had to be handed in digitally.

To supplement the teaching, teachers at Dandelion school used external videos from YouTube, among others, and digital online resources like websites and quiz tools (i.e. Kahoot!, Quizlet Live). This finding was also supported in the related work considering both Norwegian schools and internationally (Bubb and Jones, 2020; Bergdahl and Nouri, 2020; Niemi and Kousa, 2020). The use of external videos explaining topics in a subject and the use of digital resources (i.e. websites, quizzes) for supplementing the teaching could be placed at the augmentation level of the SAMR model because it enhances learning. However, results from the research do not make it clear whether the activities were used to a larger or better extent during ERT. One of the interviewed teachers from Dandelion school mentioned that digital resources were used before ERT and findings in the related work support that Norwegian schools use digital resources in the traditional teaching situation (Fjørtoft et al., 2019). The activities were therefore considered to fit at the substitution level.

Other activities that were used by Dandelion school were prerecorded lectures and presentations (screen-casts). This was often PowerPoints with audio and/or video and it was used both by teachers and pupils. Prerecorded lectures are similar to flipped classroom, which is an activity that Norwegian schools used to some degree before the closure (Gilje et al., 2016). However, according to the results in this study, Dandelion school had not used this activity much prior to ERT. Hence, prerecorded lectures were considered to fit at the augmentation level in the SAMR model. According to the results, the positive aspects provided were the opportunity for pupils to watch the lecture at their own pace, several times, and when they had the time. Other positive aspects were that it could make the pupils the main focus in the actual school lectures, not the teachers and that it could vary the teaching.

The way Dandelion school renewed their use of PowerPoint is a new finding from this research, which the related work did not discuss. This implies that this implementation was not used much in Norwegian upper secondary schools. The renewal included using PowerPoint with an additional audio file so that pupils could conduct oral presentations from home without doing it live on a video conference. This way of conducting a presentation was also considered to bring something positive to the teaching and learning situation at Dandelion school and was therefore associated with the augmentation level of the SAMR model. Pupils from Dandelion school mentioned that this activity was implemented even when they had physical teaching after the first school closure, which implies that it brought something positive to the teaching and learning. It also made it possible for pupils, that for various reasons cannot attend school, to conduct presentations from home, and receive an assessment.

The majority of the digital learning activities conducted during ERT were deemed to fit at the substitution level as the digital tools only were used to provide a substitute for the physical activity. Only a couple of the learning activities can be considered to have had an enhanced effect on teaching and learning. None of the digital learning activities conducted during ERT were deemed to fit in the last two levels of the model: modification and redefinition. There was no use of digital tools that transformed the learning at Dandelion school, compared to how it was in the traditional teaching situation. This finding reflects what Fjørtoft (2020b) mentions about ICT mainly being used for delivering subject matter for pupils not to lose their educational offer during ERT. It was an emergency situation with a lack of time and capacity and it was an unfamiliar situation for the teachers (Bubb and Jones, 2020). These factors could both be reasons for using ICT to substitute the traditional teaching activities and not move up to higher levels in the model, which is natural in a demanding situation. Implementing ICT in a manner that enhances or transforms learning is a process that takes time, which they did not have available.

6.2 Evaluating ERT during the COVID-19 pandemic using the CIPP model

This part of the discussion evaluates how ERT was implemented at Dandelion school using the CIPP model, which was introduced in Chapter 2.3.2. CIPP stands for "Context, Input, Process, and Product" and each element is discussed in the following chapters. The evaluation will be based on how pupils and teachers at Dandelion school experienced teaching during the school closures due to COVID-19, which will answer RQ1.2.

RQ1.2: How did pupils and teachers experience the emergency remote teaching during the school closures?

6.2.1 Context: Goals, Needs, Background and History

The COVID-19 pandemic led to a defined context where teachers and pupils needed to maintain teaching and learning remotely from home, which made a context evaluation where one assesses needs and opportunities valuable (Stufflebeam and Coryn, 2014). In this research, the Context evaluation consists of an investigation of Dandelion school's background and history and the goals and needs that the school possessed during the COVID-19 school closures.

The COVID-19 pandemic context led to temporary goals and needs for the schools affected. The main goal for Norwegian schools during the school closures was to maintain teaching and learning, as it was crucial to make sure that the pupils did not lose their educational offer. The forced ERT was an entirely new situation for schools, and a teacher at Dandelion school described that the main goal for that school was in the beginning just to get some teaching arrangements out online on Canvas, to ensure that pupils had access to school (Fjørtoft, 2020b). This solution can be recognized as ERT through the definition by Hodges et al. (2020), which states that the main objective for ERT is to provide temporary access to teaching arrangements in a quick manner (Hodges et al., 2020). This finding also implies that the goals for Dandelion school were similar to the overall ERT mindset of "just getting something online".

Further, a teacher respondent in the questionnaires explained that the sudden shift to ERT led to a need for direct communication with pupils. Other studies found similar issues, where general communication was identified as a major need during the school closures (Albó et al., 2020; Bergdahl and Nouri, 2020). The results indicate that finding a way to communicate with pupils was prioritized when transitioning to ERT. Further, a need for sufficient hardware and software to conduct both communication and teaching emerged. Fjørtoft (2020b) found that teachers also needed to handle the technical aspects to understand the possibilities brought by digital activities and tools. The development of digital skills was, therefore, the priority during the school closures. To figure out how to conduct teaching remotely was another need that emerged during the school closures, which was identified through the related work, as Bubb and Jones (2020) found that teachers were overwhelmed by suggestions for digital resources. Albó et al. (2020) explain that many teachers had to focus on meeting only basic requirements to conduct ERT. A teacher at Dandelion school described capacity limitations caused by a difficult home situation, which Fjørtoft (2020b) also discovered. The home-office context with their own families at home created a demanding working environment for several Norwegian teachers.

An important aspect when discussing the context of the implementation of ERT was to explore what background and history the pupils and teachers had. These are critical parts of the context evaluation, as it says something about how well prepared Dandelion school was to implement ERT. Dandelion school is a typical Norwegian upper secondary school. One can, therefore, assume that the description of ICT

use in Norwegian schools before the pandemic (Chapter 2.2.2) applies to the school, as this description mainly was based on national surveys. The technology density Norway possesses places the country at a high international level (Krumsvik et al., 2013; Wastiau et al., 2013), which implies that Norwegians schools' foundation to perform digital teaching was solid when the pandemic hit. Related work further shows that the teaching and learning processes supported by digital technology are somewhat immature practices but in development in Norwegian schools (Gilje et al., 2016). The teachers' digital learning strategies and overall digital competence before the pandemic were also described as blended (Krumsvik et al., 2016).

Lastly, one considered the previous experience with remote teaching or digital solutions for ERT. The results showed that one teacher from Dandelion school had some experience with remote teaching for individual pupils that could not participate in school, but never in such a big scale as during the pandemic. This teacher was, however, one of many teachers. The other teachers did not mention any previous experience with remote teaching. These results reflect the findings in Federici and Vika (2020), which state that the majority of Norwegian teachers had little or no experience with ERT before the pandemic. A teacher in the questionnaire explained that the teachers did not have enough expertise with digital tools, in which a need for training in different tools emerged. The related work supports this explanation by showing that many teachers had their first meeting with digital activities and tools as video conferences, recordings, and navigating in digital resources during the transition to ERT (Fjørtoft, 2020b).

At Dandelion school, pupils described a challenging situation at the beginning of the school closures, as everything was completely new. This finding illustrates that pupils did not have previous experience with an educational context where they had to learn from home. Sanne et al. (2016) emphasize that the context where activities, resources, and tools are used decides how well they work. From the results, one can see that both teachers and pupils felt that pupils did not have experience with digital activities like live teaching and flipped classroom before the school closures, which also was mentioned explicitly by pupils in one of the focus groups. Fjørtoft et al. (2019) reflect this finding, as the report states that pupils mostly used their computers to write text, use spreadsheets, search for information, and other such activities before the pandemic. This study implies that the pupils have basic skills towards academic use of ICT, but at the same time that they have not been exposed to digital solutions for remote teaching situations before the school closures. Results show that both teachers and pupils had experience with many tools before the pandemic, but not to what extent. Fjørtoft et al. (2019) support this by saying that there has been a large increase in the use of digital resources and equipment in teaching over the past years. Nevertheless, the investigation of pupils' digital competence showed that most pupils stated that they knew how to use digital tools before the pandemic. However, some pupils did report that they had little experience with digital tools (31,%) and that they did not know how to use digital tools beforehand (25%). Several studies in the related work discuss the same, where it emerged that pupils did not have as good digital skills as one might have thought before the pandemic (Bergdahl and Nouri, 2020; Babinčáková and Bernard, 2020; Fjørtoft, 2020b).

| Context Element | Summary |
|-----------------|--|
| Goals | To maintain teaching and learning to ensure that pupils had access to school and just "get something online". |
| Needs | Sufficient hardware and software to conduct communication and teaching, in addition to develop skills and knowledge towards the use of it. |

| Continuation | |
|---------------------|--|
| Background | Norwegian schools have a high technology density, but the use of ICT in teaching was somewhat immature before the pandemic. |
| History | Very few teachers had previous experience with remote teaching. Both teachers and pupils had little experience with the use of digital activities and digital tools that could be used to conduct ERT. |

Table 6.2: Context element summary

6.2.2 Input: What resources were available to conduct ERT?

The Input evaluation is referred to as the evaluation of strategies, action plans, time, materials (software), and resources (physical and human) that Dandelion school possessed to be able to meet the goals and needs mentioned in the context evaluation and maintain teaching during the pandemic.

As described in Chapter 2.2, Norway has a digitalization strategy aimed at primary and secondary education (Kunnskapsdepartementet, 2017), and previous studies illustrate that there exist strategies for implementing ICT in education in Norwegian schools (Fjørtoft et al., 2019; Bakke, 2019; Krumsvik et al., 2013). According to this, one can assume that such strategies also apply to Dandelion school. However, these strategies considered greater use of ICT in general in education, but they did not contain plans on how to maintain teaching and learning during emergencies. The previous research in the related work has indicated a need for such plans (Faherty et al. 2019; O’sullivan et al. 2009; Olympia et al. 2005 in Bergdahl and Nouri, 2020). The results from the research on Dandelion school revealed that the school did not have any contingency plan at hand for an emergency like COVID-19. All the interviewed teachers mentioned the lack of such a plan. Results show that the teachers received information from the leadership at the school about what they were supposed to do when the school closed, according to one of the interviewed teachers at Dandelion school. The information initially involved posting subject matter like tasks and articles on Canvas. Later in the period, they were told to start using video conferences. The time available for implementing ERT is another aspect when discussing the input. As stated by Aguilera-Hermida (2020) in the related work, the ERT solution was a response to an immediate emergency. As Dandelion school did not have any strategies or action plans regarding what to do when such an emergency appeared, the school had to deal with the situation rapidly. The changes in the use of ICT at schools that were supposed to be introduced over a longer period had to happen over a few days (Kunnskapsdepartementet, 2017; Daniel, 2020).

As the time available was short, Dandelion school needed to pull through the crisis with the available resources (Bozkurt and Sharma, 2020). This aspect made it important to evaluate what physical (hardware and infrastructure), material (software), and human resources Dandelion school possessed. As identified in the related work, Norway, and thus Dandelion school, educates pupils in environments with great access to ICT and educational resources. Further, all teachers and pupils have access to their own laptops (Fjørtoft et al., 2019; Krumsvik et al., 2013; Gilje et al., 2016). However, one teacher at Dandelion school mentioned that some pupils at times had an unstable network at home. The related work also showed that the varying quality of pupils’ laptops affects the quality of the digital resources. These aspects were challenging for a small percentage of pupils (Federici and Vika, 2020). Federici and Vika (2020) further state that 98% of upper secondary schools had access to software for video-based communication

and teaching (Canvas, Teams, Skype, etc.). The results from the questionnaire reflect this finding, as the majority of the teachers and pupils from Dandelion school thought they had the digital tools they needed. However, one teacher commented in the questionnaire that he/she would like to have access to Microsoft Teams sooner and that it would be great if the pupils also had gotten access to this tool. The previous research and the results from this study agree that Norway had a solid material and physical foundation to perform digital teaching. Available tools that were used by Dandelion school are listed in Table 5.2 in Chapter 5.2.

The last aspect in the input element that was important to address was human resources. The human resources considered in this research were the teachers and the pupils. From the results, it was clear that both teachers and pupils had experience with Canvas. However, in the Context evaluation, the teachers' and pupils' lack of experience with ERT were discussed (see Table 6.2). Results demonstrate that the teachers did not have enough expertise with using video conferencing tools like Canvas Video Conference. One of the teachers mentioned in the interview that he/she had never used it before. Regardless, Gudmundsdottir and Hathaway (2020) states that the majority of teachers were positive and willing to do an extra effort in moving the education offer to digital platforms. How well it went still depended on the teachers' starting point. As mentioned in the context evaluation, the teachers' overall digital competence in Norway is blended. The focus groups described that how teaching was conducted and how much work they were given varied between teachers and subjects. Results further show that these differences could be connected to the age segments of teachers, as they felt they got different amounts of work from teachers at different ages. The teachers also recognized that the teachers' different use of digital tools could be because of differences in creativity and willingness to learn something new. Wikan and Molster (2011) state that both ICT confidence and ICT competence are necessary factors for the teachers to be willing to explore the possibilities of ICT. The pupils' digital competence discussed in the context evaluation demonstrated that pupils might not have as good digital skills as one had thought (Bergdahl and Nouri, 2020; Babinčáková and Bernard, 2020; Fjørtoft, 2020b), which could have affected how they handled learning in ERT.

| Input Element | Summary |
|-----------------------------|---|
| Strategies and action plans | No strategies or action plans for handling a situation as ERT. Needed to create a strategy along the way to ensure educational offer to the pupils. |
| Time | No time. ERT needed to be implemented over few days. |
| Physical (hardware) | All teachers and pupils have access on their own laptop. May vary slightly in quality, but mostly of good standard. |
| Material (software) | Upper secondary schools had access to software for video-based communication and teaching, and to other online resources. |
| Human resources | Teachers' digital competence, confidence, creativity, and willingness are factors that can affect how they exploit ICT for teaching during ERT. Pupils' digital skills can affect their learning. |

Table 6.3: Input element summary

6.2.3 Process: How was teaching implemented and experienced?

The Process element consists of an evaluation of the teaching and learning processes. In this research, the process element includes how teaching was conducted by using digital activities and digital tools and how pupils and teachers experienced it. The evaluation aims to investigate the actions one made to implement different teaching activities at Dandelion school and potential challenges encountered during the school closures. In addition, the information sharing process between pupils and teachers is included in this element, as it was a large part of the teaching implementation when everything had to happen digitally.

Chapter 6.1 discussed how ICT was adopted to maintain teaching and learning during the school closures. This was a good foundation to further discuss how the teaching processes were implemented and how this was experienced by pupils and teachers at Dandelion school. Federici and Vika (2020) found that the majority of teachers managed to maintain the teaching during the COVID-19 pandemic. How they maintained it was elaborated in the results, where the pupils at Dandelion school who participated in the focus groups explained that live teaching and tasks were typically how the teaching was conducted. Teachers in the interviews confirmed this by describing that the conduction of teaching mostly consisted of live teaching, screencasts/prerecorded videos, and tasks. The related work also demonstrate that these particular digital learning activities were used frequently during the school closures (Bergdahl and Nouri, 2020; Fjørtoft, 2020b; Giovannella et al., 2020; Sandvik et al., 2020). However, the results do show that one teacher decided to quit using live teaching after a while. The teacher then replaced the live session with screencasts and prerecorded videos.

The focus groups emphasized that how teaching was conducted at Dandelion school depended on the subjects and teachers, as it was great variations in the amount of work and the format of the work they were given. Teachers supported this statement in the interviews, as they described that they used different teaching methods in different subjects during the remote teaching. The distinction between teachers and subjects was recognized as a challenge before the pandemic as well, where it has been found that the use of ICT varies from teacher to teacher based on how well they master the use of digital teaching resources (Fjørtoft et al., 2019). As mentioned in the Input evaluation, ICT confidence and competence are crucial for the teachers to be willing to explore the possibilities within the use of ICT (Wikan and Molster, 2011). One can imagine that this was a challenge for teachers who had their first encounter with the use of digital activities and tools when the COVID-19 pandemic hit and forced school closures. Nevertheless, the results show that the use of activities evolved beyond live teaching and tasks throughout the pandemic period according to the focus groups, as the pupils were, for example, given the possibility to record their oral presentations at home by using PowerPoint and sound files. The explanation for this evolvement could be that teachers were made more aware of the possibilities provided by technology through being forced to use it in ERT (Spoel et al., 2020) and that the teachers gained a higher level of confidence towards the use of ICT (Albó et al., 2020; Fjørtoft, 2020a).

The previous paragraphs described *how* teaching was implemented. Further, experiences with the teaching were considered. The overall opinion found in the questionnaires was that pupils mastered the implemented digital learning activities and digital tools to a high degree. In addition, the activities and tools worked to a high degree to their intended use. Nevertheless, this was only an opinion of the totality of the ERT situation, which made it valuable to discuss the more specific activities and tools more in-depth.

The results indicated that many pupils and teachers agreed that they liked live teaching and individual tasks the best. The related work confirmed that pupils were satisfied with these activities (Sandvik et al., 2020). The results further elaborated more about *why* they liked these specific activities. Live teaching and individual tasks are activities that are quite similar to traditional teaching. The results reflect this as

pupils and teachers at Dandelion school stated that they liked live teaching the most because it resembled classroom teaching. In addition, pupils mentioned that it was more motivating when they were presented with the teaching material instead of having to learn it on their own. Fjørtoft (2020b) also describes that classroom teaching and individual work were already the most common learning activities before ERT. Individual work was well-liked by the pupils because it made it possible to adjust the pace to one's own needs. However, these findings do somewhat contradict what was known about teacher satisfaction with the activities in the related work, as teachers reported challenges connected to one-way communication and time-demanding work (Sandvik et al., 2020). An explanation for this contradiction could be that teachers liked the digital activities as isolated activities, making the pupils' presence and participation in live sessions the actual challenge.

As previously mentioned, one teacher at Dandelion school stopped using live teaching during the school closures. The reason was issues connected to pupils' presence and participation in the video conferences. The teacher stated that he/she had no idea who was present and that the lack of participation led to the teaching being a monologue. Fjørtoft (2020b) also found that the pupils' presence and participation in the digital teaching situation were challenging, as it was tiring to teach when only speaking to black screens and muted microphones. The reasons for pupils not participating in class could be many, but the teacher from Dandelion school explained that privacy concerns could affect how comfortable both teachers and pupils were with participating on camera and with a microphone. Privacy concerns were also a challenge mentioned in similar studies for higher education (Langford and Damşa, 2020), but it has not previously been mentioned in relation to upper secondary schools. Nevertheless, it was found in a previous study that pupils experienced a lack of patience and motivation during the school closures, which made it challenging for pupils to participate throughout long days in front of their computer (Bergdahl and Nouri, 2020). Pupils at Dandelion school confirmed this by explaining that it was difficult to concentrate at home and that it was easy to find something else to do instead of school work. However, one of the focus groups at Dandelion school proposed a solution to the pupil participation challenge. This solution was that the pupils should be asked to turn their cameras on during classes so that they could not cook food or sleep instead.

Further, prerecorded videos, both produced by teachers and externals, were well-liked digital activities that were frequently used as a substitution of or supplement to live teaching. Prerecorded videos are an example of asynchronous learning activities that provide flexibility for both pupils and teachers, which can save time and be helpful for pupils who benefit from repetition (Bergdahl and Nouri, 2020; Daniel, 2020). In the results, many pupils expressed that they liked videos produced by teachers and external videos, precisely because it made it possible to repeat topics and take breaks as they wanted to. Sandvik et al. (2020) found something similar, as pupils explained that prerecorded videos provided the opportunity to watch them whenever it suited them and to watch them multiple times. However, a disadvantage mentioned by one pupil was the lack of possibility to ask questions. This challenge was also frequently mentioned in similar studies (Bergdahl and Nouri, 2020; Marshall et al., 2020). Still, Daniel (2020) argues that participants do not need to communicate simultaneously in most aspects of teaching and that one should try to see past this specific challenge to take greater advantage of asynchronous learning activities.

Next, both teachers and pupils mentioned Canvas (the whole platform) as one of the tools they liked the most. Several pupils from Dandelion school stated that they liked it because it was pretty much the only thing that they used, while two other pupils explained that they liked it because it was familiar to them. It seems likely that both pupils and teachers were more comfortable using Canvas than other new tools, as it was their LMS. Further, Canvas Video Conference was also mentioned as a well-liked tool at Dandelion school, because it provided direct communication and because it was used frequently for live teaching. Canvas Video Conference is one of many video-conferencing tools, a group of tools that were the most popular to use during the school closures both in Norway and internationally (Afonso et al., 2020;

Bergdahl and Nouri, 2020; Bubb and Jones, 2020; Giovannella et al., 2020; Hjelsvold et al., 2020; Langford and Damşa, 2020; Lorås, 2020; Niemi and Kousa, 2020; Shenoy et al., 2020). The popularity of the video conferencing tools could explain why Canvas Video Conference was ranked as one of the most liked tools at Dandelion school during the school closures. Still, from the results, a mentioned disadvantage with Canvas Video Conference was that it was only possible for the pupils to see the teacher and not the rest of the class, which could be connected to the essential role that the school and teacher play for pupils' social community (Sandvik et al., 2020).

One can also see that a large part of pupils (about 1/3) at Dandelion school reported that they were not satisfied with how the digital activities were used and missed some activities in the remote teaching. This dissatisfaction indicates that the pupils might have encountered some more challenges during the school closures that they would have wanted to solve differently. A specific challenge towards the experiences with teaching at Dandelion school was that it was difficult to adjust the teaching to the different pupils' levels. As one teacher expressed, the experience was that the strongest pupils managed the best during homeschooling, while the weaker pupils struggled more than before. Mælan et al. (2021) found something similar, as findings indicate that low-achieving students did not know what the teacher wanted them to do to the same extent as high-achieving students. This could perhaps be connected to it being harder for teachers to interpret which pupils needed extra support during ERT than it normally was in the physical classroom (Fjørtoft, 2020b). The focus groups from Dandelion school agreed that weaker pupils struggled more and had a harder time learning things. An explanation for this challenge could be that teachers were more dependent on the pupils themselves contacting the teacher if they needed help during the school closures (Fjørtoft, 2020b), which the pupils at Dandelion school expressed that they often did not dare to do. These challenges will be elaborated in Chapter 6.3.

The information-sharing process was also a crucial part of ERT. The information-sharing at the beginning of ERT was experienced poorly by both focus groups at Dandelion school, as information was continuously posted in different places. The mixing of where to find information made it hard for the pupils at Dandelion school to have an overview of everything at all times. A possible explanation for the numerous ways of sharing information could be that teachers themselves were overwhelmed by all the possible ways of doing so (Bubb and Jones, 2020). The results show that Canvas was quite "messy" and confusing for the pupils at the beginning of ERT. This could be because Dandelion school switched LMS not long before the school closures, making the platform new for the teachers as well. As previously and frequently mentioned, teachers need to be confident and competent towards the tools they use (Wikan and Molster, 2011). The switching of LMS before the pandemic could therefore have limited the teachers' quality use of Canvas at the beginning of ERT. Trust and Whalen (2020) also found that teachers struggled with using tools that they were unprepared to use in an ERT setting. Some pupils at Dandelion school further explained that the information-sharing became better over time as teachers collaborate more, but not all informants agreed. Federici and Vika (2020) and Fjørtoft (2020b) identified an increased digital competence for the teachers due to ERT. This finding could explain why some pupils experienced an improvement in the use of ICT. One of the interviewed teachers at Dandelion school confirmed that the pupils were confused in the beginning and that he/she early decided to stick with one platform, which can be recognized as a measure identified through the teachers' own "trial and error" (Fjørtoft, 2020a). However, one teacher at Dandelion school explained that digital communication was somewhat difficult for the pupils throughout the pandemic period. They still got a lot of information and numerous e-mails, which created an information overload. One of the focus groups also illustrated that the information sharing was somewhat poor late in the pandemic period. They described that they had been told late one night to go to school the next day and then got the counter-message only a few hours later that they should stay home anyway. The results, therefore, indicate that the information sharing process involved some challenges throughout the school closures.

| Process Element | Summary |
|-----------------------------------|---|
| Implementation of teaching | Teaching was conducted by using live teaching, individual tasks, and screencasts/prerecorded videos. However, the amount and format of teaching depended on the teacher and subject. The use of digital activities and tools evolved throughout the pandemic period when teachers became more confident and competent with the use of ICT. |
| How was the teaching experienced? | Pupils and teachers liked to use live teaching and individual tasks, possibly because it reminded them of traditional teaching. Pupils enjoyed individual tasks because it let them work at their own pace. Prerecorded videos were also liked because they provided flexibility and repetition. Pupils and teachers liked to use the digital tool Canvas because it was familiar to them. Canvas Video Conference was also ranked high as one of the most liked ones, perhaps because video conferencing tools were popular tools in general. |
| Specific challenges with teaching | The teachers experienced some challenges with live teaching because of pupils' presence and participation. The pupils struggled with concentrating at home, as they found other things to do than to participate in class. Prerecorded videos had a disadvantage, which was that pupils could not ask questions. Canvas Video Conference lacked functionality that provided a sense of community, which was challenging for some pupils. It seemed like it was also challenging for teachers to adjust the teaching and provide help to the pupils that struggled more than others. |
| Information sharing | The information-sharing was poor in the beginning, as teachers posted information in different places. This issue made it difficult for pupils to get an overview of what they were going to do. It improved over time, as some teachers decided to use only one platform. The teachers also became more familiar with the tools they had at hand for information sharing. The general digital communication was still difficult, as the pupils experienced an information overload throughout the school closures. |

Table 6.4: Process element summary

6.2.4 Product: The quality and usefulness of teaching and learning

The Product evaluation refers to the quality and usefulness of the teaching and learning, which can be decomposed to attitudes, values, skills, and results. This element is often used to identify the outcomes and effectiveness of the educational program (Kellaghan and Stufflebeam, 2003), but is in this research used to get an overview of the teachers' and pupils' perception of learning outcomes and effects from ERT.

According to the results, both teachers and pupils from Dandelion school thought the pupils learned less during ERT compared to the traditional teaching situation. These were results from both the questionnaires, the focus groups, and the interviews. The related work supports this finding, as Daniel (2020) and Sandvik et al. (2020) state that many pupils had experienced that the COVID-19 school closures affected their learning outcome negatively. Bubb and Jones (2020) explain that the difference between the pupils learning outcomes has been greater than in the traditional teaching situation. Also, according to Fjørtoft (2020b), it was noticed that pupils that experienced challenges in the physical classroom also encountered difficulties with learning during ERT (Fjørtoft, 2020b). As discussed in the process evaluation, pupils who required extra help at Dandelion school did not get the help they needed, which could lead to low-achieving pupils being more uncertain of what they were supposed to learn during ERT compared to high-achieving pupils (Mælan et al., 2021). However, the study from Bergdahl and Nouri (2020) mentions that some pupils noticeably improved academically. It was suggested that some pupils experienced being more comfortable behind a screen, compared to an open and physical classroom (Bergdahl and Nouri, 2020). According to teachers and pupils at Dandelion school, the digital learning activities that gave the best learning outcome were live teaching and individual tasks. The results further show that the best-liked activities and the activities that teachers and pupils perceived that gave the best learning outcomes were closely correlated.

The research identified several factors that affected pupils' learning outcomes. The results and the related work both mentioned pupils' stress and concentration as potential factors. According to one of the focus groups, pupils were extremely stressed at the beginning of the period with digital teaching, which affected their learning outcome. One reason may be that ERT was a completely new situation they had never encountered before, as discussed in the context evaluation. However, they felt it got better after some time when they had gotten used to the situation. The pupils from the group did also mention that it was difficult to concentrate when working at home, as they were easily distracted. This finding was contradictory to what was found by Bergdahl and Nouri (2020), who found that pupils concentrated better at home because the distraction from classmates was absent. One reason that the pupils could not concentrate might be that the pupils did get distracted by other elements, like their phone or their family. Albó et al. (2020) suggest that a lower emphasis on the pedagogical effectiveness during the school closures also could affect the pupils' learning outcomes. This suggestion was supported by a teacher from Dandelion school, who stated that the pupils did not receive any in-depth learning when the teachers conducted remote teaching. According to the results, a difficult home-office situation often led some teachers only delivering a bare minimum teaching, which could result in only surface learning for the pupils.

Giovannella et al. (2020) state that the learning outcomes could be affected by limited follow-up during the pandemic period. As mentioned in the process evaluation, the digital follow-up was limited in Dandelion school as well. Teachers found it difficult to reveal who needed help as pupils themselves had to ask for help (Fjørtoft, 2020b), which could, in turn, affect the learning outcomes if pupils did not reach out to their teachers. Another interesting finding to discuss related to the learning outcome was the pupils' work effort. According to both the focus groups interviewed, it was easy to collaborate to decrease the workload by asking classmates to send finished assignments. This was supported by Fjørtoft (2020b), who discovered that teachers experienced that pupils cheated through sharing answers. Niemi and Kousa (2020) further describe that pupils were not able to deal with their lack of self-discipline and lost motivation. Two of the interviewed teachers from Dandelion school reported that it was always an uncertainty about the pupils' work effort. They felt they did not have control over how much the pupils learned at home, and one teacher envisioned that ERT could create a greater variation in the pupil group when one was to return to the traditional teaching situation. The teacher stated that this would lead to a lot of time spent on repeating what was already gone through in the digital teaching, which would result in more time spent on fewer parts of the curriculum. Pupils at Dandelion school explained that

the teachers did not go through the home assignments in class, which made it difficult for the pupils to understand and remember what they should have learned. This challenge could be another explanation for the need for repetition.

| Product Element | Summary |
|--|--|
| Perception on pupils' learning outcome | Both teachers and pupils agreed that pupils did not learn as much as in the traditional teaching situation. |
| Activities that gave best learning outcome | Live teaching and individual tasks. |
| Factors influencing pupils' learning outcome | Stress, concentration, no in-depth learning, teachers did not go through the assignments, pupil follow-up, pupils' work effort, and the need to repeat subject matter. |

Table 6.5: Process element summary

6.3 Comparing pupils’ and teachers’ experiences with ERT

The two previous chapters have discussed how ICT was adopted to maintain teaching and learning and how ERT was experienced by pupils and teachers during the school closures. The two chapters were used to answer RQ1.1 and RQ1.2, which was crucial to be able to answer RQ1 about how pupils and teachers experienced ERT differently.

RQ1: What are the differences between how Norwegian upper secondary school pupils and teachers experienced the adoption of ICT during emergency remote teaching due to the COVID-19 school closures?

RQ1.1 is answered in Chapter 6.1, where it was shown that the majority of adoption of ICT to conduct teaching happened at a substitution level at Dandelion school. This means that digital tools were used to provide i.e. live teaching as a substitute for physical activities that normally would have happened in the traditional classroom. Although a few digital activities had some enhancing effect on the teaching, the ICT was still mostly used to provide subject matter to ensure that pupils did not lose their education offer during the pandemic. To implement teaching at the remaining levels of the SAMR model requires time, time that one did not have when transitioning to ERT.

Chapter 6.2 answered RQ1.2 by describing the experiences with ERT at Dandelion school during the school closures. The CIPP evaluation discovered that the main goals and needs that emerged when the pandemic hit were to maintain teaching and learning in a way that ensured that pupils had access to school. Dandelion school then needed sufficient hardware and software to conduct communication and teaching and to just ”get something online”, but the teachers and pupils also needed to develop skills and knowledge towards the use of ICT. Dandelion school had the technology they needed to conduct ERT, but very few teachers and pupils had experience with it beforehand. Further, they did not have any strategies or action plans that could help them handle this situation, and the transition had to happen in a very short amount of time. They had access to the hardware and software that they needed, but the human resources were factors that could affect the implementation of ERT. Human resources meant the digital competence, confidence, and creativity of teachers, in addition to the pupils’ digital skills. Further, the implementation of teaching at Dandelion school happened mostly through live teaching, individual tasks, and screencasts/prerecorded videos. The use of digital learning activities evolved in line with the increasing digital confidence and competence of teachers throughout the pandemic period. The mentioned digital learning activities were also the most liked activities by both teachers and pupils, although some challenges were still reported. These challenges were typically connected to pupils’ participation and presence in live teaching, and the possibility to ask questions and getting help. The information-sharing implementation was also hard at the beginning for both pupils and teachers. Pupils had a hard time getting an overview of all the information as it was published in several different places. These challenges improved over time, again because teachers became more familiar with the tools they had at hand for information sharing. The general digital communication was still experienced as difficult by both pupils and teachers throughout the school closures. Finally, both pupils and teachers experienced that pupils learned less through ERT than they would in the traditional teaching situation. The digital learning activities they learned the most from were live teaching and individual tasks, but the pupils struggled with several factors like stress and concentration, that could have influenced their learning outcomes.

The experiences of pupils and teachers towards the use of ICT and ERT were carefully presented in the two previous parts to create a foundation for the comparison of pupils’ and teachers’ experiences. The comparison is conducted to answer RQ1, about the differences between how Norwegian upper secondary school pupils and teachers experienced the adoption of ICT during ERT. The main objective of this part

of the discussion is to investigate whether the pupils and teachers had the same perception of how the ERT situation was experienced. Nordahl et al. (2020) argue that pupils most likely have experienced the remote teaching differently than their teachers, as the pupils are often more subjective in descriptions of experiences than the teachers are. It was still decided to investigate the differences between pupils’ and teachers’ experiences to cover potential gaps encountered during the teaching and learning during the COVID-19 pandemic. The following chapter describes the different elements within ERT that pupils and teachers experienced differently, which should be addressed in the future to make ICT a necessary and natural part of future education.

6.3.1 Difference in satisfaction with digital learning activities and digital tools

The satisfaction with the digital activities and digital tools was considered to be a major component of the experiences with ERT. The majority of teachers in Dandelion school agreed that they had the digital activities and tools they needed during the closures and that they were satisfied with how the activities and tools were used. This also applied for a majority of Dandelion school’s pupils, but it can be seen that a somewhat large portion of pupils was not satisfied with what and how the digital activities and tools were used. This was one of the biggest differences in perceptions between pupils and teachers, and the qualitative findings showed many potential reasons for the pupils’ dissatisfaction.

For the dissatisfaction with activities, some pupils in the questionnaires connected it to the teachers’ implementation of activities and stated that it occurred because of poor performance by their teachers. This could be a result of what related work says about the teachers’ experience before the COVID-19 pandemic, as it was found that many had their first encounter with digital activities to conduct ERT when the pandemic hit (Fjørtoft, 2020b). The same study found that the rapid change from traditional teaching to an all-digital setting made it more critical for the teachers to develop digital skills to some extent, which reduced the time spent on reflecting on the digital didactic. A teacher at Dandelion school reported that pupils often had high expectations of digital teaching and that teachers were more satisfied with just learning something new, which was an element that related work had not mentioned before. Nevertheless, teachers only focusing on learning the practical use of ICT, rather than gaining competence in learning methods in digital environments, could have led to different levels of satisfaction within pupils and teachers (Fjørtoft, 2020b).

One knew that pupils struggled with engagement and concentration because of long hours in front of their computers (Bergdahl and Nouri, 2020). The qualitative results elaborated this finding, as pupils at Dandelion school reported that they were less satisfied because teachers did not utilize everything they could have to make it more interesting and engaging for the pupils to pay more attention. A teacher at Dandelion school explained that some teachers provided more creative ways of replacing pure live teaching sessions. The teacher felt that he/she sometimes did not do well enough when he/she saw that other colleagues were very creative. This result reflects what Bubb and Jones (2020) found about teachers experiencing that ”everyone else was doing something better and more modern”. This statement indicates that if the pupils had very creative and digitally competent teachers in one class, then they would be less satisfied with the teachers that had fewer experimental approaches towards the implementation of ERT in other subjects. Previous studies found that teachers who used ICT frequently in their practice before the pandemic had an easier transition to ERT, both for themselves and their pupils, while other teachers had to learn the remote teaching strategies while using them (Trust and Whalen, 2020). This finding could explain why the pupils had different experiences with different teachers.

Regarding the dissatisfaction towards the use of digital tools, the pupils at Dandelion school emphasized that there was also here a difference between the teachers in how they used the digital aids and that the

teachers had too little competence with the tools. This statement can be supported by findings from previous studies, where it was discovered that there was a wide spread in how teachers in Norwegian upper secondary schools exploited the potential of the tools during ERT (Sandvik et al., 2020). One teacher at Dandelion school agreed with this in the questionnaires and expressed that teachers did not know well enough how to use the digital tools they had available, which is a problem according to Sangeeta and Tandon (2020), as teachers who do not understand the usefulness of technology are not able to adopt ICT in a good way. The lack of expertise led to a use of digital tools that the pupils were not satisfied with, as pupils at Dandelion school expressed that the use of digital tools was "messy" and confusing at times. The pupils still described an improvement in the use of digital tools over time, which supports the results in previous studies that say that the teachers’ digital competence has increased as a result of the forced transition to ERT (Federici and Vika, 2020; Fjørtoft, 2020b).

Nevertheless, pupils at Dandelion school did recognize that it could be difficult for the teachers to adjust so that all pupils were satisfied at all times. One should also recognize the big difference between conducting digital practices in a physical classroom compared to ERT over a long period and that teachers needed time to adjust their approaches towards the use of digital activities (Fjørtoft, 2020b). The pupils were asked about what could help their teachers make this adjustment so that the satisfaction level of pupils increased. The pupils at Dandelion school then firmly stated that feedback from pupils should have been prioritized better during the school closures, about how the digital learning activities and tools should be implemented in ERT. The interviewed teachers from Dandelion school confirmed that they experienced little feedback, although they had different approaches to ask for it. Feedback from pupils is an aspect that can play a crucial part in framing activities that take place in school settings. The ERT situation was also a type of school setting, which means that pupils should have been included in the shaping of the digital learning activities rather than being passive recipients of them (Pollard and Tann, 1993 in Deaney et al., 2003). Pupils are able to explain what teaching approaches and contexts, hence digital learning activities and digital tools in ERT, that are helpful in their learning, and they are capable to be insightful and constructive when describing their experiences (Brown and McIntyre, 1993; Harris et al., 1995; McCallum et al., 2000; Rudduck and Flutter, 2000 in Deaney et al., 2003). However, these descriptions of experiences will not appear if pupils are not asked for feedback. Both focus groups at Dandelion school expressed that they had lots of feedback they wanted to give that could have changed how things were done, but that they did not dare to say anything because they were scared of the teachers’ reactions. This was considered to be a major issue, not only for the implementation of ERT but also towards the digitalization strategy. The strategy states that pupils and teachers should collaborate on and reflect on the choice of teaching aids and assignments (Kunnskapsdepartementet, 2017), which indicates that there should be just as much room for feedback from pupils as the experiences and opinions of teachers.

6.3.2 Group tasks/collaboration

Group collaboration was an activity teachers and pupils had different opinions about during ERT. According to the results, a much larger extent of teachers liked group tasks as an learning activity and perceived it as one that gave learning outcomes, compared with the pupils’ answers. The part of group tasks the pupils did not like much was collaborating over video conferences. The reasons were connected to the group composition, as the groups were typically randomized, which repeatedly resulted in quiet and awkward sessions. Although the pupils often connected the quiet and awkward digital rooms to randomized groups, they still did not think that it would have improved with friends either and stated that working physically would have been better. They explained that collaboration over video calls worked poorly for the pupils because it was hard to get a good flow in the conversation, because the sound was often delayed and because people had turned off their cameras which made it hard to know when one could speak. The teachers, however, had the perception that dividing pupils in break-out rooms for

collaborating during the lectures worked. One of the interviewed teachers mentioned that he/she thought the pupils liked it, while another teacher mentioned that group work was essential for the subject, and that forming colloquium groups around a project was useful for the pupils to learn. Similar studies show that group work and collaborative assignments were used to a low extent by schools in general during the school closures (Bergdahl and Nouri, 2020; Giovannella et al., 2020), as teachers found it challenging to facilitate pupils’ interaction and collaboration through the digital tools. Teachers at Dandelion school supported this finding, as they reported that they experienced very quiet pupils when they entered the digital rooms set up for group work.

The challenges with remote group collaboration should be addressed in the future, as pupils expressed before the pandemic that one of the things that they learned most from was to collaborate (Fjørtoft et al., 2019). It could be possible that the struggle with group work was connected to the pupils’ digital skills, as Fjørtoft (2020b) found that some teachers experienced that pupils struggled with using digital tools during ERT. In the related work, pupils expressed that they were pleased when they were able to collaborate during the school closures (Sandvik et al., 2020). This indicates that collaboration was something that pupils enjoyed when it worked. One of the focus groups at Dandelion school further explained that the ”raise hand” functionality worked well during video conferences, which could be a solution to the issues connected to group work and poor conversation flow.

6.3.3 Difference in experiences with digital follow-up

The next thing that pupils and teachers at Dandelion school experienced differently was the digital follow-up of pupils. The digital follow-up was in this research defined as digital actions and tools used to provide help and guidance during the COVID-19 pandemic. According to the results from the questionnaire, the majority of teachers were neutral about whether pupils got the help they needed from teachers during the school closures. The interviews further revealed that how much contact teachers had with their pupils depended on whether they were responsible for them or not. This reflects findings from Sandvik et al. (2020), where it was reported that almost one out of four had minor contact with their teacher during the ERT. This finding could explain why the teachers from Dandelion school were neutral to this question because they were able to help some pupils while losing contact with others at the same time. Similar studies support the latter, as some teachers experienced losing all contact with some pupils, despite persistent attempts by telephone, digital channels, and in some cases, physical contact (Fjørtoft, 2020b).

Nevertheless, almost 1/3 of pupils at Dandelion school experienced that they did not get the help they needed during the school closures, which is different from the teachers’ answers. This reflects the related work that says that a significant part of pupils in Norway did not experience good help (Sandvik et al., 2020). The focus groups explained that the reason was that their teachers did not ask them if they needed help and that they had to send a message themselves to ask for help. This was an obstacle for many pupils at Dandelion school who did not dare to ask their teachers for help during the school closures. The results did not explain why pupils were uncomfortable about asking for help, but it could be connected to them being afraid of the teacher’s reaction, as it has been previously found that pupils often can be uncertain of how the teacher might react (Cowie, 2005). The study conducted by Cowie (2005) states that pupils need to feel safe and comfortable to ask questions. The focus groups at Dandelion school also explained that a consequence of pupils not daring to ask for help was that pupils who required extra help did not get the help they needed. This challenge also appeared in Mælan et al. (2021), where the findings indicate that pupils experienced less digital follow-up, which further might influence the learning processes, especially for pupils who struggled with schoolwork beforehand. Further, the pupils at Dandelion school explained that if they did send a message asking for help, it could take several hours or until the next day before they got a reply from their teachers. Both focus groups agreed that the time it took to get help was difficult. The results from Dandelion school do, however, not say anything about when these messages

were sent to the teacher. From the related work, it is known that teachers got many requests outside school hours and that it became difficult to balance when to be online and offline (Fjørtoft, 2020b). This indicates that teachers sometimes worked at nights and weekends, which in turn could have created an expectation from pupils that the teachers should answer their messages asking for help at any time of the day.

A teacher at Dandelion school explained that both pupils and teachers could struggle with digital communication in general, as he/she experienced that it could take a while before anyone spoke in the video conferences. Teachers at Dandelion school further experienced that losing the physical meetings was an issue when it came to the follow-up processes, and it made it hard for the pupils to ask questions when they needed help. This is supported by Fjørtoft (2020b), who found that the digital follow-up lacked the possibility of body language and physical communication which could reveal that pupils are struggling with something in the traditional classroom. The fact that, according to results, pupils at Dandelion school rarely were present and participating by using their cameras and microphones did not make it easier for the teachers to interpret whether they needed help or not. The digital classroom was missing the informal contact between pupil and teacher, which it appears that they did not find a proper solution for at Dandelion school. Other schools also recognized this need for pupil support, but it was hard to implement in practice (Niemi and Kousa, 2020). The related work shows that Norwegian teachers tried to build and maintain a good community over the digital platforms, but that it was difficult because they lost the spontaneity they normally would have due to the contact with pupils always being planned (Fjørtoft, 2020b). Some teachers from Dandelion school tried to solve the digital follow-up issues by calling the pupils they were responsible for by phone, which was a solution that several others in the related work also tried (Federici and Vika, 2020; Fjørtoft, 2020b). The related work shows that a few teachers still struggled to keep in contact with some pupils. One pupil at Dandelion school also expressed that he/she experienced a lack of individual communication with teachers during the school closures, which indicates that not all teachers tried to solve the digital follow-up challenges to the same extent as others.

6.3.4 Pupils’ digital competence

The pupils’ and teachers’ perception of pupils’ digital skills and competence is another difference to discuss. From the results from Dandelion school, the largest proportion of teachers who answered the questionnaire was neutral when asked if pupils encountered challenges when using digital tools for school work. However, studies in the related work describe that teachers, both from Norway and internationally, felt that secondary school pupils are less skilled and competent in managing the technologies effortlessly for learning (Fjørtoft, 2020b; Bergdahl and Nouri, 2020; Babinčáková and Bernard, 2020). Fjørtoft (2020b) states that teachers experienced that pupils had trouble with actions like delivering assignments, opening hyperlinks and videos online, proper storage, navigation, and video conferences. The majority of pupils from Dandelion school answered that they did not have any challenges while using digital tools for school work during ERT. This was also supported in the focus group interviews. One pupil from Dandelion school mentioned that he/she did not quite know how everything worked in the beginning, like putting on the camera and such, but all participants in the group agreed that it improved quickly. The fact that the pupils at Dandelion school did not feel they met any technical difficulties during ERT is a positive aspect, as it establishes that this was not a factor that decreased their learning outcomes.

6.4 How can ERT influence the Digitalization of Norwegian schools?

This chapter explores how the ERT experiences can influence the digitalization process in Norwegian schools (RQ2). It is crucial to highlight that the COVID-19 pandemic is not over at the time of writing this report. One can not say anything about how ERT *has* influenced the use of ICT at this time, as it is impossible to predict the future. This discussion considers what teachers and pupils have learned during ERT, what they want to use more in the future, and how these lessons and wishes are related to the challenges of digitalization in Norwegian schools.

RQ2: What can be learned from the emergency remote teaching period that can influence the ongoing digitalization process in Norwegian schools?

Chapter 2.2 presented several challenges with the digitalization of Norwegian schools. The challenges were all connected to The Digital Triangle, which consists of the corners: predictable and reliable hardware, good and academic software, and competent teachers. All three corners of the triangle have to occur to achieve functional use of digital tools in the classroom (Spurkland and Blikstad-Balas, 2016). This discussion explores whether any lessons from ERT can mitigate some of the challenges that Chapter 2.2 presented. The following chapters addresses the three corners in The Digital Triangle.

6.4.1 Predictable and reliable hardware

As mentioned in Chapter 6.2, Norwegian schools, and thus Dandelion school, have great access to ICT and educational resources and all teachers and pupils have access to their own laptop (Fjørtoft et al., 2019; Krumsvik et al., 2013; Gilje et al., 2016; Federici and Vika, 2020). However, one teacher mentioned that some pupils at times had an unstable network at home. Unstable networks and varying quality of pupils' laptops are factors that can affect the quality of the digital resources, which could have been a challenge for a small percentage of pupils (Federici and Vika, 2020). The related work indicates that the majority of pupils and teachers in Norwegian upper secondary schools had access to predictable and reliable hardware during the school closures. Spurkland and Blikstad-Balas (2016) argue that predictable and reliable hardware is not a challenge in the digitalization process in Norwegian schools, as the issue is not the access to technology, but rather about what the teacher can do to make sure that the technology provides some value.

6.4.2 Good and academic software

This part covers both software and the use of software that pupils and teachers encountered experiences with during the school closures that one should learn from and listen to. Video conferencing tools were sometimes used to conduct group work during the school closures. In the comparison discussion (Chapter 6.3), it was clear that pupils at Dandelion school struggled to collaborate remotely using digital tools. The results indicate that some challenges were connected to the software or the use of it. In previous research, it has been found that there exist few situations where teachers provide actual training in digital working methods in the subjects or situations where the digital tools are used to redefine the teaching to utilize the digital potential (Spurkland and Blikstad-Balas, 2016). The challenge with group work seen in this research indicates that pupils have not gotten enough training in the digital collaboration methods before the pandemic, which made it more difficult to use it when they suddenly were forced to. Related work shows that digital tools can encourage collaboration in numerous ways, like shared resources, joint writing, communication, etc. Related work also emphasizes that using various strategies

should be applied to help pupils participate in discussions, especially when they do not have physical contact (Borge & Mercier, 2019; Damsa, 2014 in Langford and Damşa, 2020).

The ERT period did not only lead to challenges. Both teachers and pupils from Dandelion school mentioned some digital learning activities and digital tools they had encountered during the school closures that they wanted to use more in the future. Research from before the pandemic shows that teachers typically agree that digital aids have positive advantages for the teaching, in terms of making the teaching differentiating, varying, motivating, and exploring (Fjørtoft et al., 2019). The results show that teachers at Dandelion school wanted to use external prerecorded videos/screencasts and flipped classroom in the future. Similar studies mention flipped classroom as a solution that teachers envisioned to use more, in addition to video solutions, both for meetings and to record videos to use in teaching (Fjørtoft, 2020b). Delic and Riley (2020) state that ERT will make teachers discover that time can be saved through creating teaching videos that can be reused. Screencast was an activity that also pupils in the focus groups mentioned that their teachers had used more in the classroom and that they preferred. A pupil explained that they could deliver oral presentations through the use of screencast. This result reflects the findings in Fjørtoft (2020b), which say that teachers want increased use of digital homework through i.e., submission of text, sound recordings, and videos after the school closures. One pupil at Dandelion school further stated that live teaching was something he/she wanted more of in the future because then they wouldn't have to go to school for every class. In addition, some teachers argued that the ERT experiences could be used to find ways to adjust the traditional teaching situation for pupils that struggled with school refusal. The teachers stated that one should provide more flexible methods for the course of training for these pupils and that the solution could be partial digital teaching in certain subjects or periods of time (Fjørtoft, 2020b). Some teachers at Dandelion school had also considered this opportunity for sick pupils or pupils that had to stay home. They also considered continuing to use live teaching as a supplement for pupils.

Considering digital tools, it can be seen that teachers at Dandelion school replied that they were neutral or positive towards whether pupils learned to use digital tools that they would find useful in the future. The pupils' answers were more spread out, but the majority agreed or were neutral towards the statement. This indicates that both pupils and teachers envisioned using digital tools more in the future. The results show that they specifically feel that Canvas, YouTube, and NDLA should be used more after the closures. Further, the use of digital tools alone will probably not influence the digitalization process in any way. How well the use of software works depends a lot on the context they are used in, the teaching arrangements they are a part of, and the quality of teacher intervention (Sanne et al., 2016).

6.4.3 Competent teachers

A challenge with the digitalization of schools is that pupils are dependent on a competent teacher who is able to explain how digital tools work in an academic context (Spurkland and Blikstad-Balas, 2016) and that the teachers can make sure that the technology provides some value. This challenge is closely linked to one of the goals of the digitalization strategy for primary and secondary education in Norway. The part states that teachers should be able to lead the class' learning work and be confident in the choice of teaching aids and resources that contribute to the class and the pupils' learning outcomes (Kunnskapsdepartementet, 2017). As discussed in the related work, the teachers' digital learning strategies and overall digital competence were described as blended before the pandemic (Krumsvik et al., 2016). The related work, therefore, indicates that there exists a proportion of teachers that are not digitally skilled. Some reasons why teachers lack competence might be technophobia, lack of time, and that ICT steals focus from other teaching and development tasks (Mercader, 2020; Diku, 2019). According to the teachers, an unfortunate consequence of using ICT mentioned by teachers is that digitalization becomes a time thief (Diku, 2019).

In the related work, Fjørtoft (2020b) states that the extensive use of ICT during ERT led to a major boost for many teachers towards the development of digital skills. Competence development requires time, experience, and practice, and the teachers were forced to make room for it during the school closures. One of the teachers at Dandelion school reflected on the fact that they got forced to use digital tools. He/she concluded that it was a good thing and that what they learned was relevant. One of the other teachers mentioned that they had gotten videos explaining how to use Canvas which led to everyone now knowing how it works. In the study from Fjørtoft (2020b), teachers expressed that a lot of what they had learned during the school closures would be useful when transitioning back to the traditional teaching and that their pedagogical toolbox had expanded as a result of the ERT experiences. However, the pupils at Dandelion school mentioned that not all teachers would be eager to keep using digital teaching and tools after the pandemic. The pupils felt that some teachers preferred to be in the classroom and keep control, which they have with their traditional methods.

According to all the interviewed teachers from Dandelion School, the forced use of digital tools during the pandemic was positive. They experienced that it made teachers feel more comfortable and safer with the use of the tools, especially those who did not have much experience beforehand. Albó et al. (2020) and Fjørtoft (2020b) support this finding, as they found that teachers got a higher level of confidence towards the use of ICT during the pandemic. A high level of confidence is an important factor for the teachers to be willing to explore the possibilities of ICT (Wikan and Molster, 2011). Fjørtoft (2020b) additionally mentions that the teachers, after the pandemic, will have the prerequisites to participate in pedagogical and didactic reflections on the use of ICT in education at their school. This was also a wish from one of the teachers from Dandelion school, who expressed that he/she hoped that they could learn from ERT and that it could lead to some framework on how digital teaching could be done better at the school.

One big challenge encountered during ERT at Dandelion school was the teachers' digital follow-up on pupils, which connects with this corner in the digital triangle. This challenge was discussed in Chapter 6.3, where the results demonstrated that the follow-up of pupils did not work sufficiently during ERT. This aspect is critical to be aware of in the future when using ICT to a larger extent. If one decides to use elements from ERT in the future, then it implies that one will not have 100% physical attendance at all times. More remote teaching will increase the need for finding a solution regarding what should be done towards digital follow-up.

6.5 Limitations

This research was conducted as a case study, which is bound in time and place. Although the specific case was chosen because it was a typical instance of a Norwegian upper secondary school, the results still have limited transferability. This means that the findings cannot be directly transferred to any other Norwegian upper secondary school to get the same results about the implementation of ERT. Nevertheless, the results from this study contribute to a better understanding of how ERT could have been experienced differently by pupils and teachers in Norway and how the situation could influence the ongoing digitalization process in schools. This chapter will further provide an overview of what limitations have affected the research and mitigation strategies implemented to compensate for these limitations.

One limitation of the research is the number of participants in the data generation methods. The questionnaires were distributed to about 370 pupils and 65 teachers, but only 32 and 9 participated. The low sample size made it impossible to generalize the findings to the whole population that was of interest. The low sample size also decreased the transferability towards other Norwegian upper secondary schools. According to Israel (1992), a more appropriate sample would have been 189 pupils and 56 teachers. Many attempts were conducted to increase the response rate, but it proved itself difficult. Thus, one decided to conduct two additional data generation methods, focus groups with pupils and interviews with teachers. These data generation methods also received somewhat low participation, as it was difficult to get hold of pupils and teachers in an already demanding situation due to the COVID-19 pandemic. The main reason for using all three data generation methods was to obtain a *data triangulation*. The combination of three data generation methods could provide an overview of a pattern even if it is not possible to find significance in the separate methods (Miesing, 1991). The three methods in total made it possible to increase the validity of the study (Crowe et al., 2011).

A second limitation was how the questions were asked in the questionnaires. Questions towards specific digital learning activities and digital tools were only asked about the activities and tools the respondent chose as their "most liked ones". This resulted in many activities only having few respondents, which led to very high standard deviations in some of the questions. This means that the answers for these questions had a rather large average distance from the mean of the distribution (Salkind, 2017, p.81), which implies that the Likert-answers to these questions were somewhat spread out. The numbers for all these questions can be found in Appendices F, G, and H. These issues can be connected to the general low sample size, as this would probably not have been such an issue with a higher rate of respondents. These limitations were compensated through asking more questions about the findings in the focus groups and interviews to obtain the mentioned data triangulation.

A third limitation with the research considers Dandelion school's LMS, Canvas. Dandelion school was considered a typical case, but the use of Canvas is not considered typical as many upper secondary schools in Norway use other LMS (Ramboll, 2017). However, the platform is one of the official LMS nationally (Langford and Damşa, 2020), and it is also used internationally. Additionally, the study was not limited to questions, answers, and results related to this specific platform.

The customized use of the SAMR model to evaluate the adoption of ICT during ERT was also considered a limitation within this research study, as it is not problem-free. The way it is used causes some of the different learning methods to be placed at different levels than they would if the model was used in an original manner. However, the modification of the model was thoroughly described. Further, the model was used in a way making it possible to explain and understand which new use of ICT in teaching contributed to some positive changes that could be taken advantage of, and which use of ICT that only substituted traditional teaching methods.

Lastly, a limitation of the research was the timeline. The research was done during the COVID-19 pandemic, that is - the pandemic was not over when this was written. The timeline made it difficult to get an understanding of how these school closures have affected the final experiences of pupils and teachers. In addition, it made it very hard to interpret whether the ERT situation has influenced the digitalization process or not.

Chapter 7

Conclusion

This research has explored Norwegian upper secondary school pupils' and teachers' experiences towards the adoption of ICT during ERT due to the COVID-19 pandemic. The focus was on identifying potential differences in perceptions, in addition to investigating how the pandemic situation could influence the ongoing digitalization process in Norwegian schools. The research was based on the following research questions:

RQ1: What are the differences between how Norwegian upper secondary school pupils and teachers experienced the adoption of ICT during emergency remote teaching due to the COVID-19 school closures?

RQ1.1: How did Norwegian upper secondary schools adopt ICT to maintain the teaching and learning during the school closures?

RQ1.2: How did pupils and teachers experience the emergency remote teaching during the school closures?

RQ2: What can be learned from the emergency remote teaching that can influence the ongoing digitalization process in Norwegian schools?

This research aimed to investigate these research questions by conducting a case study with extensive data generation. Two questionnaires were conducted in a manner that made it possible to compare the views of pupils and teachers, which produced both quantitative and qualitative data that were analyzed. Focus groups with pupils were conducted, transcribed, and analyzed, which was also done for interviews with teachers. The use of three different data generation methods made it possible to triangulate the results to increase validity.

In order to answer the first research question, the two sub-research questions needed to be addressed. RQ1.1 was answered by obtaining a mapping of how ICT was adopted to maintain the teaching and learning during the school closures. This mapping was evaluated using the SAMR model, which demonstrated that the majority of digital tools used during ERT were considered to substitute the traditional teaching activities. This implies that ICT was mainly used to provide subject matter in a way that only replaced the physical elements in traditional teaching to ensure that pupils did not lose their educational offer during the pandemic. The higher levels of implementation in the SAMR model required time that teachers did not have when transitioning to ERT.

The second sub-research question (RQ1.2) was addressed by obtaining an overview of how pupils and teachers experienced ERT during the school closures by evaluating it using the CIPP model. The results showed that the goal was mainly to maintain teaching and learning. They also needed to ensure that the teachers developed skills and knowledge towards the use of ICT. The school had the technology they needed to conduct ERT, both in terms of hardware and software. However, one found that the human resources were factors that could affect the implementation of ERT, as teachers and pupils had little experience with how to conduct remote teaching. The teaching mostly happened through live teaching, individual tasks, and prerecorded videos during the school closures. These were activities that both

pupils and teachers agreed that they liked the most and gave most learning outcomes. The use of digital activities further improved when the teachers gained a better digital competence. Pupils and teachers still encountered some challenges. These were related to the pupils' presence and participation in live teaching, the possibility to ask questions and get help, or the communication and information sharing between pupils and teachers. Finally, both pupils and teachers experienced that pupils learned less during ERT than they normally would, which could be a result of pupils struggling with several factors like stress and concentration. The CIPP evaluation made it clear that pupils and teachers experienced that the teaching and learning were maintained, but it was not problem-free.

The first main research question was answered through a thorough review of the two sub-research questions. The main focus of this review was to investigate whether pupils and teachers had the same perception of the ERT situation. By reviewing the results from RQ1.1 and RQ1.2 carefully, it was discovered that there existed some differences in how the two groups experienced the ERT situation. The digitalization strategy states that pupils and teachers should collaborate and reflect on the choice of teaching aids and assignments. These results led to the conclusion that the differences in perceptions of how ERT was experienced should be addressed to accommodate the digitalization strategy.

The second research question was aimed at how the lessons learned during the ERT period can influence the ongoing digitalization process in Norwegian schools. The COVID-19 pandemic is not over at the time of writing this thesis. As it is impossible to predict the future, it is not possible to say how ERT *has* influenced the digitalization process at this time. It was still possible to investigate what pupils and teachers have learned so far in the pandemic period and how these lessons and wishes are related to the challenges of digitalization in Norwegian schools. The results obtained through the research were therefore discussed in light of The Digital Triangle.

This discussion revealed that most challenges were connected to pupils and teachers not having sufficient training in the use of ICT prior to the pandemic, and it further demonstrated that pupils and teachers had been exposed to ICT during the school closures that they found useful and wanted to use more in the future. Based on this discussion, one can conclude that what pupils and teachers have experienced and learned at this point in the pandemic period is closely connected to challenges regarding the corners *software* and *competent teachers* in The Digital Triangle. By addressing these lessons learned, one can perhaps mitigate the challenges connected to the digitalization process in Norwegian schools.

7.1 Recommendations for Future Work

Based on these conclusions, there are several aspects practitioners should consider addressing in future work. A larger and more extensive study of the differences connected to teachers' and pupils' experiences of ERT should be conducted. Such a study could lead to a better understanding of the implications of the results. The different perceptions discovered in this research were considered challenging, as there were aspects with the implementation of ERT where teachers and pupils disagreed. These results make it crucial to create a plan for how to solve these problems. Consequently, as the number of teachers and pupils that participated in this study was low, future research should do the same study in a larger population to determine the validity of the results presented in this research.

This research could only determine what pupils and teachers have experienced and learned from ERT at this point and how these lessons learned are connected to challenges within the digitalization process in Norwegian schools. However, the research could not answer how ERT *has* influenced this process. Further research is needed to explore the effects ERT has had on the digitalization process in Norwegian schools when the pandemic is over.

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Appendix A

NSD approval

Det innsendte meldeskjemaet med referansekode 842192 er nå vurdert av NSD.

Følgende vurdering er gitt:

Det er vår vurdering at behandlingen av personopplysninger i prosjektet vil være i samsvar med personvernlovgivningen så fremt den gjennomføres i tråd med det som er dokumentert i meldeskjemaet med vedlegg den 29.10.20. Behandlingen kan starte.

MELD VESENTLIGE ENDRINGER

Dersom det skjer vesentlige endringer i behandlingen av personopplysninger, kan det være nødvendig å melde dette til NSD ved å oppdatere meldeskjemaet. Før du melder inn en endring, oppfordrer vi deg til å lese om hvilke type endringer det er nødvendig å melde:

nsd.no/personvernombud/meld_prosjekt/meld_endringer.html

Du må vente på svar fra NSD før endringen gjennomføres.

TYPE OPPLYSNINGER OG VARIGHET

Prosjektet vil behandle alminnelige kategorier av personopplysninger frem til 01.06.2021.

LOVLIG GRUNNLAG

Prosjektet vil innhente samtykke fra de registrerte til behandlingen av personopplysninger. Vår vurdering er at prosjektet legger opp til et samtykke i samsvar med kravene i art. 4 og 7, ved at det er en frivillig, spesifikk, informert og utvetydig bekreftelse som kan dokumenteres, og som den registrerte kan trekke tilbake. Lovlig grunnlag for behandlingen vil dermed være den registrertes samtykke, jf. personvernforordningen art. 6 nr. 1 bokstav a.

PERSONVERNPRINSIPPER

NSD vurderer at den planlagte behandlingen av personopplysninger vil følge prinsippene i personvernforordningen om:

- lovlighet, rettferdighet og åpenhet (art. 5.1 a), ved at de registrerte får tilfredsstillende informasjon om og samtykker til behandlingen
- formålsbegrensning (art. 5.1 b), ved at personopplysninger samles inn for spesifikke, uttrykkelig angitte og berettigede formål, og ikke behandles til nye, uforenlige formål
- dataminimering (art. 5.1 c), ved at det kun behandles opplysninger som er adekvate, relevante og nødvendige for formålet med prosjektet
- lagringsbegrensning (art. 5.1 e), ved at personopplysningene ikke lagres lengre enn nødvendig for å oppfylle formålet

DE REGISTRERTES RETTIGHETER

Så lenge de registrerte kan identifiseres i datamaterialet vil de ha følgende rettigheter: åpenhet (art. 12), informasjon (art. 13), innsyn (art. 15), retting (art. 16), sletting (art. 17), begrensning (art. 18), underretning (art. 19), dataportabilitet (art. 20).

NSD vurderer at informasjonen om behandlingen som de registrerte vil motta oppfyller lovens krav til form og innhold, jf. art. 12.1 og art. 13.

Vi minner om at hvis en registrert tar kontakt om sine rettigheter, har behandlingsansvarlig institusjon plikt til å svare innen en måned.

FØLG DIN INSTITUSJONS RETNINGSLINJER

NSD legger til grunn at behandlingen oppfyller kravene i personvernforordningen om riktighet (art. 5.1 d), integritet og konfidensialitet (art. 5.1. f) og sikkerhet (art. 32).

Nettskjema er databehandler i prosjektet. NSD legger til grunn at behandlingen oppfyller kravene til bruk av databehandler, jf. art 28 og 29.

For å forsikre dere om at kravene oppfylles, må dere følge interne retningslinjer og/eller rådføre dere med behandlingsansvarlig institusjon.

OPPFØLGING AV PROSJEKTET

NSD vil følge opp ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet.

Lykke til med prosjektet!

Kontaktperson hos NSD: XXXXXXXXXX
Tlf. Personverntjenester: 55 58 21 17 (tast 1)

Appendix B

Concept Matrices

| Concept 1 | Concept 2 | Concept 3 | Concept 4 |
|-----------|---------------------|-----------------|-----------------------|
| Adopt | ICT | COVID-19 crisis | School |
| Use | Technological tools | COVID-19 | Teaching and learning |
| | Technology | Coronavirus | Norwegian school |
| | Digital tools | SARS-CoV-2 | |
| | | Pandemic | |

RQ1.1 - How did Norwegian upper secondary schools adopt ICT to maintain the teaching and learning during the school closures?

| Concept 1 | Concept 2 | Concept 3 |
|--------------|---------------------------------|-----------------|
| Experiences | Emergency remote teaching | COVID-19 crisis |
| Perspectives | Online teaching | COVID-19 |
| | Homeschooling | Coronavirus |
| | School Closures | SARS-CoV-2 |
| | Digital teaching | Pandemic |
| | Crisis-prompted remote teaching | |

RQ1.2 - How did pupils and teachers experience the emergency remote teaching during the school closures?

| Concept 1 | Concept 2 | Concept 3 | Concept 4 |
|-----------------------------------|-----------------|----------------|-----------------|
| Norwegian schools | Lessons learned | Technology | COVID-19 |
| Norwegian upper secondary schools | New competence | ICT | COVID-19 crisis |
| Norway | Mindset | Digitalization | Coronavirus |
| | Influence | | SARS-CoV-2 |
| | | | Pandemic |

RQ2 - What can be learned from the emergency remoteteaching that can influence the ongoing digitalization process in Norwegian schools?

| Concept 1 | Concept 2 | Concept 3 | Concept 4 |
|--------------------------|--------------------------|-------------------------|-----------|
| Adoption | ICT | Education | Norway |
| Adoption before COVID-19 | Technology in Learning | Learning | Norwegian |
| | E-learning | Schools | |
| | Educational technologies | Upper secondary schools | |
| | Technology | | |

Adoption of ICT in Norwegian school before COVID-19

Appendix C

Questionnaire Matrix

| # | Pupils' questionnaire | Teachers' questionnaire | RQ1.1 | RQ1.1 | RQ2 |
|--------------------------------------|--|---|-------|-------|-----|
| Digital learning activities | | | | | |
| Q1 | What digital learning activities did you like the best during the school closures? | What digital learning activities did you like the best during the school closures? | | x | |
| Q2 | Describe why you liked activity* the best. | Describe why you liked activity* the best. | | x | |
| Q3 | To what degree did you like to use activity*? | To what degree did you like to use activity*? | | x | |
| Q4 | To what degree did you have use for activity* during the school closures? | To what degree did you have use for activity* during the school closures? | | x | |
| Q5 | To what degree did you master activity*? | To what degree did your pupils master activity*? | | x | |
| Q6 | To what degree did activity* work for its use? | To what degree did activity* work for its use? | | x | |
| Q7 | To what degree was activity* useful for your learning during the school closures? | To what degree was activity* useful for your pupils' learning during the school closures? | | x | |
| Q8 | To what degree would you want to use activity* more, after the closures? | To what degree would you want to use activity* more, after the closures? | | x | x |
| Q9 | To what degree do you agree with the following statement: I am satisfied with how we used the digital learning activities during the school closures. | To what degree do you agree with the following statement: I am satisfied with how we used the digital learning activities during the school closures. | | x | |
| Q10 | To what degree do you agree with the following statement: I think we had the digital learning activities we needed during the school closures. | To what degree do you agree with the following statement: I think we had the digital learning activities we needed during the school closures. | | x | |
| Digital tools | | | | | |
| Q11 | What digital tools did you like the best during the school closures? | What digital tools did you like the best during the school closures? | x | | |
| Q12 | Why did you like tool* better than other tools? | Why did you like tool* better than other tools? | x | x | |
| Q13 | Describe how tool* was used. | Describe how tool* was used. | x | | |
| Q14 | To what degree did you like to use tool*? | To what degree did you like to use tool*? | x | | |
| Q15 | To what degree did you have use for tool* during the school closures? | To what degree did you have use for tool* during the school closures? | x | | |
| Q16 | To what degree did you master tool*? | To what degree did your pupils master tool*? | x | | |
| Q17 | To what degree did tool* work for its use? | To what degree did tool* work for its use? | x | | |
| Q18 | To what degree was tool* useful for your learning during the school closures? | To what degree was tool* useful for your pupils' learning during the school closures? | x | x | |
| Q19 | To what degree would you want to use tool* more, after the closures? | To what degree would you want to use tool* more, after the closures? | x | | x |
| Q20 | What digital tools were used to conduct the practical activities? | What digital tools were used to conduct the practical activities? | x | | |
| Q21 | To what degree did it work to conduct the practical activities by using the digital tools? | To what degree did it work to conduct the practical activities by using the digital tools? | x | | |
| Q22 | What digital tools were you already familiar with before the school closures? | What digital tools were you already familiar with before the school closures? | x | | |
| Q23 | To what degree do you agree with the following statement: I am satisfied with how we used the digital tools during the school closures. | To what degree do you agree with the following statement: I am satisfied with how we used the digital tools during the school closures. | x | x | |
| Q24 | To what degree do you agree with the following statement: I think we had the digital tools we needed during the school closures. | To what degree do you agree with the following statement: I think we had the digital tools we needed during the school closures. | x | x | |
| Learning outcomes and effects | | | | | |
| Q25 | What activities did you learn the most from during the school closures? | What activities did your pupils learn the most from during the school closures? | | x | |
| Q26 | Why did you learn much from activity*? | Why did your pupils learn much from activity*? | | x | |
| Q27 | To what degree do you agree with the following statement: I have learned just as much at digital homeschool as I would in the normal school situation. | To what degree do you agree with the following statement: My pupils have learned just as much at digital homeschool as they would in the normal school situation. | | x | |

| | | | | | |
|---|---|---|---|---|---|
| Q28 | To what degree do you agree with the following statement: I have learned more at digital homeschool than I would in the normal school situation. | To what degree do you agree with the following statement: My pupils have learned more at digital homeschool than they would in the normal school situation. | | x | |
| Q29 | To what degree do you agree with the following statement: I have learned to use digital tools that I think I will find useful in the future. | To what degree do you agree with the following statement: My pupils have learned to use digital tools that I think they will find useful in the future. | x | x | x |
| Pupils' digital competence | | | | | |
| Q30 | To what degree did you have experience with activity* prior to the school closures? | To what degree did your pupils have experience with activity* prior to the school closures? | | x | |
| Q31 | To what degree do you agree with the following statement: I had a lot of experience with digital tools prior to the school closure. | To what degree do you agree with the following statement: My pupils had a lot of experience with digital tools prior to the school closure. | x | x | |
| Q32 | To what degree do you agree with the following statement: I experienced challenges when I used digital tools for school work. | To what degree do you agree with the following statement: My pupils experienced challenges when they used digital tools for school work. | x | x | |
| Q33 | To what degree do you agree with the following statement: I knew on beforehand how to use the digital tools. | To what degree do you agree with the following statement: My pupils knew on beforehand how to use the digital tools. | x | x | |
| Q34 | To what degree do you agree with the following statement: I spent some time to understand how to use the digital tools. | To what degree do you agree with the following statement: My pupils spent some time to understand how to use the digital tools. | x | x | |
| Digital follow-up of pupils | | | | | |
| Q35 | To what degree did you get the help from teachers during the school closures? | To what degree were you able to help your pupils during the school closures? | | x | |
| Q36 | To what degree did you talk to your teacher about academic tasks during the school closures? | To what degree did you talk to your pupils about academic tasks during the school closures? | | x | |
| Q37 | To what degree did you talk to your teacher about other things during the school closures? | To what degree did you talk to your pupils about other things during the school closures? | | x | |
| Q38 | To what degree did you speak to classmates during the school closures? | To what degree were you able to ensure that your pupils spoke to classmates during the school closures? | | x | |
| Q39 | To what degree did you do what you were told during the school closures (homework, assignments, etc.)? | To what degree did your pupils do what they were told during the school closures (homework, assignments, etc.)? | | x | |
| Q40 | Where did you speak to your teacher during the school closures? | Where did you speak to your pupils during the school closures? | x | | |
| Q41 | Where did you speak to your classmates during the school closures? | Where did your pupils speak to classmates during the school closures? | x | | |
| Q42 | Where did you get help with academic tasks during the school closures? | Where did your pupils get help with academic tasks during the school closures? | x | | |
| Q43 | To what degree do you agree with the following statement: I got the help I needed from teachers during the school closures. | To what degree do you agree with the following statement: My pupils got the help they needed from teachers during the school closures. | x | x | |
| Q44 | To what degree do you agree with the following statement: I had to work a lot on my own during the school closures. | To what degree do you agree with the following statement: My pupils had to work a lot on their own during the school closures. | | x | |
| <i>Activities* = (Live teaching, Flipped classroom, Videos produced by teachers, External videos, Digital learning resources, Individual tasks, Group tasks, Other)</i> | | <i>Tools* = (Canvas, Canvas Video Conference, Canvas Discussions, Canvas Tests, Canvas Collaboration, Canvas Studio, Canvas Inbox, Skype, Microsoft Teams, NDLA, Kahoot!, YouTube, Google Drive, E-mail, Other)</i> | | | |

Appendix D

Focus Group Matrix

| RQ1.1: How did Norwegian upper secondary schools adopt ICT to maintain the teaching and learning during the school closures? | | RQ1.1 - adoption of digital tools/activities during ERT | RQ1.2 - experiences with ERT | Findings from the questionnaires |
|--|--|---|------------------------------|----------------------------------|
| RQ1.2: How did pupils and teachers experience the emergency remote teaching during the school closures? | | | | |
| Introduction - Some simple questions to start the interview | | | | |
| 1 | How have you experienced the school closures in general? Why? | | x | |
| 2 | How have the different subjects been like? Are there any differences? | | x | |
| 3 | How do you think things have evolved during the pandemic? | | x | |
| 4 | How do you feel about going back to the "normal" teaching situation? | | x | |
| 5 | Do you think that the digital homeschooling will affect the traditional teaching situation after the pandemic? | | | |
| 6 | How was digital tools and resources used to support teaching and learning before the crisis (before March 2020)? | x | | |
| 7 | Did you get the help you needed during the school closures? | | x | |
| 8 | Did the teacher ask you if you needed help, or did you have to ask the teacher yourself? | | | |
| 9 | Can you describe how a day during digital homeschool looked like for you? | | x | |
| 10 | If you were to have a perfect schoolday during homeschooling, what would it look like? | | | |
| 11 | How was your workload during the school closures? | | x | |
| 12 | How has your learning been during the school closures? (better/the same/worse) | | x | |
| 13 | Did the school and the teachers adjust the teaching activities to different pupils? How? | | x | |
| 14 | Did your teachers ask you about how you felt that the teaching should be conducted? Were you able to give feedback on the teaching processes? | | x | |
| 15 | What do you hope that your teachers have learned during this period with school closures? | | x | |
| 16 | Do you think that the Norwegian upper secondary school is more prepared to do something like this again, if we get another pandemic in 5 years, or do you think the same thing will happen over again? | | | |
| 17 | What do you think should be changed within the remote teaching, if there was to happen another pandemic in 5 years? | | | |
| Findings - Now we will discuss some of the findings from the questionnaires. | | | | |
| 18 | Pupils and teachers agree that individual tasks and live teaching are the two learning activities they like the most. Why do you think that is? | | x | x |
| 19 | For us, it seems that this implies that they are the most liked because they remind of traditional teaching. What do you think about that? | | | |

| | | | | |
|---|--|---|---|---|
| 20 | It has been seen that in the beginning of the pandemic, many pupils struggled with submissions, links, etc., and we are wondering about how this affected the stress level for pupils connected to other learning activities than "live" teaching? | x | x | x |
| 21 | Did you collaborate a lot with others during the school closures? How? | | x | x |
| 22 | How did you experience using technology to collaborate and communicate with others over the internet? | x | x | |
| 23 | How do you think that the digital communication has evolved over time? Has it become better/worse? | x | x | |
| 24 | What other activities did you like? Why? | | x | |
| 25 | Approximately 1/3 of the pupils were not satisfied with how the digital learning activities were conducted, and 1/4 were not satisfied with how the tools were used - while the teachers were more satisfied. Why do you think that is? | x | x | x |
| 26 | One teacher said that the strong pupils did good and were more satisfied during the pandemic, while weaker pupils struggled more, and were therefore less satisfied. What do you think about that? | | x | x |
| 27 | A group of pupils have expressed that the teaching was not conducted well enough. What do you think about that? | | x | x |
| 28 | It looks like the most liked activities and the activities that gives the best learning outcomes are closely connected. What do you think about that? | | x | x |
| 29 | From the questionnaire, it seems like Canvas has been used for almost everything, is that correct? What else have been used? How? | x | | x |
| 30 | Do you have any thoughts about something that you have used/done during the school closures that you want to bring back to the traditional teaching situation? (live lectures, videos, tools, etc.) | x | x | |
| In this focus group interview guide, some questions are based on the results from the questionnaires. | | | | |

Appendix E

Interview Guide

| | background information on interviewee | competencies with digital tools/activities and how digital tools/activities can strengthen pupils competencies | RQ1.1 - adoption of digital tools/activities during ERT | RQ1.2 - experiences with ERT | thoughts on digitization | questions to compare with pupil answers/and to discuss findings from QA | want to use more in the future |
|--|--|--|---|------------------------------|--------------------------|---|--------------------------------|
| RQ1.1: How did Norwegian upper secondary schools adopt ICT to maintain the teaching and learning during the school closures? | | | | | | | |
| RQ1.2: How did pupils and teachers experience the emergency remote teaching during the school closures? | | | | | | | |
| RQ2: What can be learned from the emergency remote teaching that can influence the on-going digitization process in Norwegian schools? | | | | | | | |
| Introduction - To start the interview, I will ask you some questions about your background | | | | | | | |
| 1 | For how long have you been a teacher? | X | | | | | |
| 2 | What school year do you teach the most? VG1/VG2/VG3? | X | | | | | |
| 3 | What study programs do you teach the most? Specialization in General Studies/Media and Communication/vocational education? | X | | | | | |
| 4 | What subjects do you teach? | X | | | | | |
| 5 | Do you have any education within ICT? Have you done any training courses? | X | | | | | |
| Pre-covid - Thank you! Now I will proceed with questions about the time prior to COVID. | | | | | | | |
| 6 | Would you say that you had a good competence with digital tools and digital learning activities before the pandemic emerged in Norway in March last year? | | X | | | | |
| 7 | How did you use digital tools and resources to support your teaching and the pupils' learning before the crisis (before March 2020)? | X | | | | | |
| 8 | Did you have experience with homeschooling/ digital live-teaching before the school closures? | X | X | | | | |
| 9 | Did your school/the teachers have a plan for how to conduct such digital emergency remote teaching? | X | | | | | |
| During-covid - Thank you for your answers. Further, I will ask questions related to your experience with the sudden digital homeschool. Both about the transition, and also about how it evolved. | | | | | | | |
| 10 | The first time you were asked to transit to digital remote teaching (ERT), what challenges arose? <i>If many: Which ones were the biggest challenges?</i> | | | | X | | |
| 11 | What challenges decreased during the pandemic-period? | | | | | | |
| 12 | What challenges persisted during the pandemic-period? | | | | | | |
| 13 | How did you conduct your teaching and how did you communicate with your pupils? (live-teaching, group projects, assignments, individual tasks, pre-recorded videos, external videos, etc.) | | | | | | |
| 14 | <i>If appropriate:</i> From the questionnaire it can be seen that Canvas has been used for almost everything, is this correct in your case? | | | X | | | |

| | | | | | | | | |
|---|---|--|---|---|---|--|---|--|
| 15 | Was there any digital tools that you did not have enough experience with, that you needed time to learn when the schools closed? Which ones? (From the questionnaire it was seen that the teachers did not know how to use Canvas Tests and Canvas Video Conference, and several pupils responded that the teachers did not have enough competence when using the tools). | | X | | X | | | |
| 16 | Did the tools you used work in a way to "substitute" your traditional teaching (i.e. video conference substitutes teaching on the chalkboard)? Or did you use some tools in a way that renewed or improved some aspects? | | | X | | | | |
| 17 | Do you think that the teaching arrangements worked well? Why/why not? Did it improve over time? | | | | X | | | |
| 18 | Do you think the subjects you teach have any influence on how you were able to conduct the remote teaching? | | | | X | | | |
| 19 | Were the teachers good at communicating, helping each other and planning the teaching? (The pupils have experienced an increased workload and confusion on where information was posted) | | | | X | | | |
| Findings - Now we will discuss some of the findings from the questionnaires. | | | | | | | | |
| 20 | Pupils and teachers agree that individual tasks and live teaching are the two learning activities they like the most. Why do you think that is? | | | | X | | X | |
| 21 | For us, it seems that this implies that they are the most liked because they remind of traditional teaching. What do you think about that? | | | | | | | |
| 22 | Approximately 1/5 of the pupils were not satisfied with how the digital learning activities were conducted, and 1/4 were not satisfied with how the tools were used - while the teachers were more satisfied. Why do you think that is? | | | | X | | X | |
| 23 | Did you ask your pupils for feedback on how the conduction of homeschool worked? Or if they had any suggestions to how to improve it? Did you make it possible for them to give feedback easily? Anonymously? | | | | X | | X | |
| 24 | We have seen that several pupils express that group collaboration in video chat has been a waste of time when they were arranged in random groups, and that it ended up being uncomfortable and awkward, and that no one wanted to speak. Do you have any thoughts about that? | | | | X | | X | |
| 25 | Do you think that the Norwegian upper secondary school is more prepared to do something like this again, if we get another pandemic in 5 years, or do you think the same thing will happen over again? | | | | | | X | |
| Late-covid - div closing questions - Thank you for good answers. Now this interview is coming to an end, but I have a last group of questions. | | | | | | | | |

| | | | | | | | | |
|----|--|--|--|---|---|--|---|---|
| 26 | Do you feel that you have gotten an improved digital competence as a result of the pandemic, and that you have a better basis to assess which digital tools and activities can be used in the teaching for the pupils' learning outcomes? | | | x | | | | |
| 27 | What digital tools or digital activities did you start to use more as a result of the digital homeschool? Do you wish to continue using these after the pandemic? Which ones? | | | | | | | x |
| 28 | Should teachers be trained/be provided with training courses on how to handle such a situation if it was to happen again? Why/why not? | | | | x | | | |
| 29 | Have your relationship with digitization of schools changed as a result of the pandemic? How? | | | | | | x | |
| 30 | Do you think that this pandemic with it's sudden digital emergency remote teaching will influence the digitization of Norwegian schools? Or influence how teaching will be conducted after the pandemic is fully over? In that case, do you have any thoughts on how it will influence it? | | | | | | x | |
| 31 | What is the most important thing that you as a teacher have learned as a result of the digital emergency remote teaching? | | | | x | | | |

In this interview guide, inspiration has been gathered from: "Should Teachers be Trained in Emergency Remote Teaching? Lessons Learned from the COVID-19 Pandemic" (Trust and Whalen, 2020), "SMIL" (Krumsvik et al, 2013), results from the questionnaires and results from the focus groups. Some of the questions are also connected to the theoretical frameworks used in the research (substitution, redefinition etc., SAMR-model) (Hamilton et al, 2016)

Appendix F

Descriptive Statistics: Digital learning activities

| PUPILS | | | | | | |
|----------------------------|------|--------------------|------|--------------------|------|--------------------|
| | Q5 | | Q6 | | Q8 | |
| Activities | Mean | Standard deviation | Mean | Standard deviation | Mean | Standard deviation |
| Live teaching | 4.0 | 0.88 | 3.7 | 0.98 | 2.9 | 0.98 |
| Flipped classroom | 4.0 | 0.00 | 3.5 | 0.71 | 2.7 | 0.71 |
| Teacher videos | 4.2 | 0.63 | 4.5 | 0.53 | 3.9 | 0.53 |
| External videos | 4.1 | 0.99 | 4.1 | 0.88 | 3.4 | 0.88 |
| Digital learning resources | 4.0 | 0.00 | 4.0 | 0.00 | 3.8 | 0.00 |
| Individual tasks | 4.1 | 0.79 | 4.2 | 0.62 | 3.6 | 0.62 |
| Group tasks | 3.7 | 0.58 | 3.3 | 0.58 | 4.3 | 0.58 |
| Other activities | NaN | NaN | NaN | NaN | NaN | NaN |

| TEACHERS | | | | | | |
|----------------------------|------|--------------------|------|--------------------|------|--------------------|
| | Q5 | | Q6 | | Q8 | |
| Activities | Mean | Standard deviation | Mean | Standard deviation | Mean | Standard deviation |
| Live teaching | 3.6 | 0.52 | 3.8 | 0.52 | 3.1 | 0.52 |
| Flipped classroom | 4.0 | NaN | 4.0 | NaN | 5.0 | NaN |
| Teacher videos | 4.0 | NaN | 4.0 | NaN | 4.0 | NaN |
| External videos | 4.0 | NaN | 4.0 | NaN | 5.0 | NaN |
| Digital learning resources | 4.3 | 0.58 | 4.3 | 0.58 | 4.0 | 0.58 |
| Individual tasks | 3.7 | 0.52 | 3.7 | 0.52 | 3.5 | 0.52 |
| Group tasks | 4.0 | 1.15 | 4.3 | 1.15 | 3.5 | 1.15 |
| Other activities | NaN | NaN | NaN | NaN | NaN | NaN |

* Mean: NaN appears when there is no observations for this activity

* SD: NaN appears when there is only 1 observation, or 0 observations for this activity. Standard deviation does not exist.

Appendix G

Descriptive Statistics: Digital tools

| PUPILS | | | | | | |
|-------------------------|------|--------------------|------|--------------------|------|--------------------|
| | Q16 | | Q17 | | Q19 | |
| Activities | Mean | Standard deviation | Mean | Standard deviation | Mean | Standard deviation |
| Canvas | 4.48 | 0.67 | 4.13 | 0.69 | 4.05 | 0.95 |
| Canvas Video Conference | 4.32 | 0.75 | 4.26 | 0.73 | 3.21 | 1.23 |
| Canvas Discussions | 3.00 | NaN | 4.00 | NaN | 3.00 | NaN |
| Canvas Tests | 4.50 | 0.71 | 4.00 | 0.00 | 3.00 | 0.00 |
| Canvas Collaboration | 5.00 | NaN | 4.00 | NaN | 3.00 | NaN |
| Canvas Studio | NaN | NaN | NaN | NaN | NaN | NaN |
| Canvas Inbox | 4.75 | 0.50 | 4.75 | 0.50 | 4.50 | 0.58 |
| Skype | 4.00 | 1.00 | 3.67 | 1.15 | 3.00 | 1.73 |
| Microsoft Teams | NaN | NaN | NaN | NaN | NaN | NaN |
| NDLA | 4.14 | 0.69 | 4.00 | 0.58 | 4.14 | 0.90 |
| Kahoot! | 5.00 | NaN | 5.00 | NaN | 5.00 | NaN |
| YouTube | 4.33 | 0.82 | 4.33 | 0.82 | 3.67 | 1.37 |
| Google Drive | NaN | NaN | NaN | NaN | NaN | NaN |
| E-mail | NaN | NaN | NaN | NaN | NaN | NaN |

| TEACHERS | | | | | | |
|-------------------------|------|--------------------|------|--------------------|------|--------------------|
| | Q16 | | Q17 | | Q19 | |
| Activities | Mean | Standard deviation | Mean | Standard deviation | Mean | Standard deviation |
| Canvas | 4.00 | 0.63 | 4.00 | 0.00 | 3.8 | 1.17 |
| Canvas Video Conference | 4.20 | 0.84 | 4.00 | 0.71 | 2.8 | 0.45 |
| Canvas Discussions | NaN | NaN | NaN | NaN | NaN | NaN |
| Canvas Tests | 4.00 | 0.00 | 4.00 | 0.00 | 4.0 | 0.00 |
| Canvas Collaboration | NaN | NaN | NaN | NaN | NaN | NaN |
| Canvas Studio | NaN | NaN | NaN | NaN | NaN | NaN |
| Canvas Inbox | 4.00 | NaN | 4.00 | NaN | 3.0 | NaN |
| Skype | 1.00 | NaN | 3.00 | NaN | 3 | NaN |
| Microsoft Teams | 4.00 | 1.41 | 5.00 | 0.00 | 5 | 0.00 |
| NDLA | 3.00 | 0.00 | 4.50 | 0.71 | 4.5 | 0.71 |
| Kahoot! | 4.50 | 0.71 | 3.50 | 0.71 | 3 | 1.41 |
| YouTube | 4.50 | 0.71 | 4.00 | 0.00 | 3.5 | 0.71 |
| Google Drive | NaN | NaN | NaN | NaN | NaN | NaN |
| E-mail | NaN | NaN | NaN | NaN | NaN | NaN |

* Mean: NaN appears when there is no observations for this activity

* SD: NaN appears when there is only 1 observation, or 0 observations for this activity. Standard deviation does not exist.

Appendix H

Descriptive Statistics: Digital competence

| PUPILS | | |
|----------------------------|------|--------------------|
| Q30 | | |
| Activities | Mean | Standard deviation |
| Live teaching | 1.78 | 1.04 |
| Flipped classroom | 1.90 | 0.84 |
| Pre-recorded videos | 2.53 | 1.24 |
| Digital learning resources | 3.63 | 1.10 |

| TEACHERS | | |
|----------------------------|------|--------------------|
| Q30 | | |
| Activities | Mean | Standard deviation |
| Live teaching | 1.89 | 0.78 |
| Flipped classroom | 2.22 | 0.67 |
| Pre-recorded videos | 2.56 | 0.88 |
| Digital learning resources | 3.67 | 0.71 |

Appendix I

Consent forms

Consent form: Pupils' questionnaire

Vil du delta i forskningsprosjektet

“Learning from COVID-19 emergency remote teaching: A case study to compare pupil and teacher experiences” ?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å undersøke erfaringer rundt bruk av teknologi i undervisning under COVID-19 pandemien. I dette skrevet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Formålet med prosjektet er å undersøke læreres og elevers erfaringer rundt bruk av teknologiske verktøy under COVID-19 pandemien. Vi ønsker å finne ut hvordan lærere og elever tok i bruk teknologi for å gjennomføre den digitale undervisningen under COVID-19 pandemien og erfaringer rundt dette. Vi vil også finne ut i hvilken grad det man lært under pandemien har påvirket/kan påvirke digitaliseringen av norske skoler.

Prosjektet gjennomføres i forbindelse med en masteroppgave ved Institutt for datateknologi og informatikk ved Norges teknisk-naturvitenskapelige universitet (NTNU) Trondheim.

Hvem er ansvarlig for forskningsprosjektet?

Institutt for datateknologi og informatikk ved NTNU er ansvarlig for prosjektet.

Veiledere for prosjektet er professor Monica Divitini og stipendiat Madeleine Lorås, og forskerne/studentene som skal gjennomføre prosjektet er Miriam Størseth Lillebo og Julie Adele Solum-Sjaavaag.

Hvorfor får du spørsmål om å delta?

Du får spørsmål å delta da du er lærer ved en videregående skole som har takket ja til å være med i prosjektet. Alle lærere og elever (VG2 og VG3) ved denne videregående skolen vil få spørsmål om å delta i vårt forskningsprosjekt.

Hva innebærer det for deg å delta?

Hvis du velger å delta i prosjektet, innebærer det at du fyller ut et spørreskjema

- Spørreskjemaet vil ta deg ca. 15 minutter å gjennomføre.
- Skjemaet inneholder spørsmål om hvordan man som elev opplevde bruken av ulike digitale verktøy/aktiviteter for undervisning/læring under nedstengingen, hvilke verktøy som ble brukt til hva og hvordan de ble brukt. Svarene dine vil bli registrert elektronisk.

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil kun bruke opplysningene om deg til formålene vi har fortalt om i dette skrevet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.

- De som vil ha tilgang til opplysningene er veiledere for prosjektet, professor Monica Divitini og stipendiat Madeleine Lorås, og studenter Miriam Størseth Lillebo og Julie Adele Solum-Sjaavaag.
- Leverandøren for spørreskjemaet er Nettskjema. NTNU har databehandleravtale med UiO for bruk av Nettskjema.
- Besvarelsene på spørreskjemaene vil være anonyme.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?

Opplysningene anonymiseres fra prosjektstart og slettes ved prosjektslutt, som etter planen er 01.juni 2021.

Dine rettigheter

Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke personopplysninger som er registrert om deg, og å få utlevert en kopi av opplysningene,

Consent form: Pupils' questionnaire

- å få rettet personopplysninger om deg,
- å få slettet personopplysninger om deg, og
- å sende klage til Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg?

Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra NTNU / Institutt for datateknologi og informatikk har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?

Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:

- Institutt for datateknologi og informatikk ved NTNU ved:
 - Student: Julie Adele Solum-Sjaavaag (994 27 898, julieso@stud.ntnu.no)
 - Student: Miriam Størseth Lillebo (986 84 528, miriamsl@stud.ntnu.no)
 - Veileder: Monica Divitini (divitini@ntnu.no)
 - Veileder: Madeleine Lorås (madeleine.loras@ntnu.no)

Hvis du har noen spørsmål om behandlingen, kan du ta kontakt med personvernombud for undersøkelsen:

- Personvernombud for NTNU, Thomas Helgesen, på epost (personvernombud@ntnu.no) eller på telefon: 930 79 038

Hvis du har spørsmål knyttet til NSD sin vurdering av prosjektet, kan du ta kontakt med:

- NSD – Norsk senter for forskningsdata AS på e-post (personverntjenester@nsd.no) eller på telefon: 55 58 21 17.

Med vennlig hilsen,

Miriam Størseth Lillebo
(Forsker/student)
Julie Adele Solum-Sjaavaag
(Forsker/student)

Monica Divitini
(Professor/veileder)
Madeleine Lorås
(Stipendiat/veileder)

Samtykkeerklæring

Samtykke for å delta vil vi samle inn elektronisk i spørreskjemaet. I skjemaet vil vi ha en avkrysningsboks med "jeg samtykker til å delta i spørreskjema og at mine opplysninger behandles frem til prosjektet er avsluttet".

Vil du delta i forskningsprosjektet

“Learning from COVID-19 emergency remote teaching: A case study to compare pupil and teacher experiences”?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å undersøke erfaringer rundt bruk av teknologi for undervisning under COVID-19 pandemien. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

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Hvorfor får du spørsmål om å delta?

Du får spørsmål å delta da du er lærer ved en videregående skole som har takket ja til å være med i prosjektet. Alle lærere og elever (VG2 og VG3) ved denne videregående skolen vil få spørsmål om å delta i vårt forskningsprosjekt.

Hva innebærer det for deg å delta?

Hvis du velger å delta i prosjektet, innebærer det at du fyller ut et spørreskjema.

- Spørreskjemaet vil ta deg ca. 15 minutter å gjennomføre.
- Skjemaet inneholder spørsmål om hvordan man som lærer opplevde bruken av ulike digitale verktøy/aktiviteter for undervisning/læring under nedstengingen, hvilke verktøy som ble brukt til hva og hvordan de ble brukt. Svarene dine vil bli registrert elektronisk.

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil kun bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.

- De som vil ha tilgang til opplysningene er veiledere for prosjektet, professor Monica Divitini og stipendiat Madeleine Lorås, og studenter Miriam Størseth Lillebo og Julie Adele Solum-Sjaavaag.
- Leverandøren for spørreskjemaet er Nettskjema. NTNU har databehandleravtale med UiO for bruk av Nettskjema.
- Besvarelsene på spørreskjemaene vil være anonyme.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?

Opplysningene anonymiseres fra prosjektstart og slettes ved prosjektslutt, som etter planen er 01.juni 2021.

Dine rettigheter

Så lenge du kan identifiseres i datamaterialet, har du rett til:

Consent form: Teachers' questionnaire

- innsyn i hvilke personopplysninger som er registrert om deg, og å få utlevert en kopi av opplysningene,
- å få rettet personopplysninger om deg,
- å få slettet personopplysninger om deg, og
- å sende klage til Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg?

Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra NTNU / Institutt for datateknologi og informatikk har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?

Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:

- Institutt for datateknologi og informatikk ved NTNU ved:
 - Student: Julie Adele Solum-Sjaavaag (994 27 898, julieso@stud.ntnu.no)
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Hvis du har spørsmål knyttet til NSD sin vurdering av prosjektet, kan du ta kontakt med:

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Med vennlig hilsen,

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(Forsker/student)
Julie Adele Solum-Sjaavaag
(Forsker/student)

Monica Divitini
(Professor/veileder)
Madeleine Lorås
(Stipendiat/veileder)

Samtykkeerklæring

Samtykke for å delta vil vi samle inn elektronisk i spørreskjemaet. I skjemaet vil vi ha en avkrysningsboks med “jeg samtykker til å delta i spørreskjema og at mine opplysninger behandles frem til prosjektet er avsluttet”.

Vil du delta i forskningsprosjektet

“Learning from COVID-19 emergency remote teaching: A case study to compare pupil and teacher experiences”?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å undersøke erfaringer rundt bruk av teknologi for undervisning under COVID-19 pandemien. I dette skrevet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Formålet med prosjektet er å undersøke læreres og elevers erfaringer rundt bruk av teknologiske verktøy under COVID-19 pandemien. Vi ønsker å finne ut hvordan lærere og elever tok i bruk teknologi for å gjennomføre den digitale undervisningen under COVID-19 pandemien og erfaringer rundt dette. Vi vil også finne ut i hvilken grad det man lært under pandemien har påvirket/kan påvirke digitaliseringen av norske skoler.

Prosjektet gjennomføres i forbindelse med en masteroppgave ved Institutt for datateknologi og informatikk ved Norges teknisk-naturvitenskapelige universitet (NTNU) Trondheim.

Hvem er ansvarlig for forskningsprosjektet?

Institutt for datateknologi og informatikk ved NTNU er ansvarlig for prosjektet.

Veiledere for prosjektet er professor Monica Divitini og stipendiat Madeleine Lorås, og forskerne/studentene som skal gjennomføre prosjektet er Miriam Størseth Lillebo og Julie Adele Solum-Sjaavaag.

Hvorfor får du spørsmål om å delta?

Du får spørsmål å delta da du er lærer ved en videregående skole som har takket ja til å være med i prosjektet. Alle lærere og elever (VG2 og VG3) ved denne videregående skolen vil få spørsmål om å delta i vårt forskningsprosjekt.

Hva innebærer det for deg å delta?

Hvis du velger å delta i prosjektet, innebærer det at du deltar i et fokusgruppeintervju.

- Intervjuet vil ta ca. 1 time.
- Intervjuet vil inneholde spørsmål om hvordan du som elev opplevde den digitale undervisningen, og om du kjenner deg igjen i svar/utsagn vi har fått i spørreundersøkelsen vår tilhørende forskningsprosjektet.
- Intervjuet vil bli tatt opp med lydopptak dersom du samtykker til det.

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil kun bruke opplysningene om deg til formålene vi har fortalt om i dette skrevet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.

- De som vil ha tilgang til opplysningene er veiledere for prosjektet, professor Monica Divitini og stipendiat Madeleine Lorås, og studenter Miriam Størseth Lillebo og Julie Adele Solum-Sjaavaag.
- Intervjuene vil enten bli tatt opp på en lydopptaker tilhørende NTNU eller via Nettskjema-Diktafon. NTNU har databehandleravtale med UiO for bruk av Nettskjema.
- Vi vil anonymisere intervjuene når de blir transkribert. Etter intervjuet er transkribert vil lydfilen slettes.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?

Lydopptakene vil slettes underveis i prosjektperioden når intervjuene har blitt transkribert. Alt av personopplysninger vil slettes ved prosjektslutt, som etter planen er 01.juni 2021.

Dine rettigheter

Consent form: Pupils' Focus Group Interview

Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke personopplysninger som er registrert om deg, og å få utlevert en kopi av opplysningene,
- å få rettet personopplysninger om deg,
- å få slettet personopplysninger om deg, og
- å sende klage til Datatilsynet om behandlingen av dine personopplysninger.

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Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet “Learning from COVID-19 emergency remote teaching: A case study to compare pupil and teacher experiences”, og har fått anledning til å stille spørsmål. Jeg samtykker til:

- å delta i fokusgruppeintervju
- at intervjuet blir tatt opp med lydopptaker

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet

(Signert av prosjektdeltaker, dato)

Vil du delta i forskningsprosjektet

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Hva innebærer det for deg å delta?

Hvis du velger å delta i prosjektet, innebærer det at du deltar i et intervju.

- Intervjuet vil ta ca. 30 minutter.
- Intervjuet vil inneholde spørsmål om dine erfaringer som lærer med digital undervisning under COVID-19 pandemien. Hvordan det ble gjennomført, hvordan du opplevde det og hva du vil ta med deg videre.
- Intervjuet vil bli tatt opp med lydopptak dersom du samtykker til det.

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