UNIVERSITY OF AGDER

Patterns of use: Technology in primary schools

Looks into how teachers use technology, why they decide to use technology, and any influences this has in a classroom.

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This master's thesis is carried out as a part of the education at the University of Agder and is therefore approved as a part of this education. However, this does not imply that the University answers for the methods that are used or the conclusions that are drawn.

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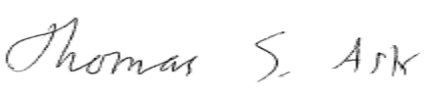
Preface

We are two master students studying Information Systems at University of Agder Kristiansand. Both of us have a deep interest in technology and using different types of technology each day, both in private and in a work environment. Our interest in types of technology was one of the reasons why we wanted to write this thesis. We looked at the equipment and systems available at our university, this opened up questions about how this was in lower education levels. In one of our earlier subjects, we interviewed primary and secondary school to find out what technology they used in their classroom teaching, and found that they used everything from mobile phones to SMART boards. After these findings, we wanted to see how the use of technology would influence a classroom teaching. This report follows an interpretative research approach where the data collection is done by qualitative method with semi-structured interviews and observations. For analysing data, we took inspiration from grounded theory, using open- , axial- and selective coding.

Working with this thesis have been informative and interesting. We have learned that it is not possible to have a perfect plan for how things should be done, as obstacles occur along the road. Luckily, it was nothing worse than some minor time delay, and writing down text that we in the end did not include. There have also been a rather steep learning curve, as we did not have previous experience with interpretative research or grounded theory. This was a challenge, but something that we believe we solved nicely.

We want to thank all the people that have made this thesis possible. A special thanks to all four teachers that we have been in contact with, observed and interviewed. They have all taken time out from their already busy schedule, opened their doors and welcoming us in. We are forever grateful, and hope with this paper to give something back to them and the schools. Big thanks to the headmasters and ICT contacts at all the schools for allowing us access to both school and the teachers. We want to thank our ICT contact person from Kristiansand municipality for all the information you have provided and giving us a better understanding about how the whole system from top to bottom works. Last but not least, we are very grateful for all the guidance we have gotten from Øystein Sæbø, helping us with hard decisions and choices and giving good advices.



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Summary

In this study we wanted to look at what types of patterns of use we could find when looking at available technology in the primary schools in Kristiansand. An ICT manager in the municipality was first contacted to obtain existing data that was available in these areas. Our first thought was to look at what type of technology was available in schools in Kristiansand, but following an evaluation of the information collected from the ICT manager we instead chose to look at the use patterns. A good bit of the existing research focuses on older pupils, and this made it more it interesting for us to look at how patterns of use prevailed in primary schools. We ended up formulating our research question like this: *What are the potential patterns of use for modern technology in primary schools?*

During this thesis we have learned that why teachers use technology, and how it effects the classroom teaching is part of what creates patterns. Patterns of use varies from class to class and from the type of equipment available. There are many different factors that influence how and when a teacher can use technology, but it can be a great tool to enhance the classroom teaching. Patterns we have seen are amongst many the possibility to let pupils interact with a SMART board to solve tasks and present material in front of a class. The use of iPads to learn material in new and exciting ways and working on computers to learn a basic for what will become important later in life. The possibilities are almost endless; a lot of it comes down to having a motivated teacher and a school that is committed to technology so that they get the right equipment.

We have worked on this study with an interpretative research approach, using qualitative method as the bases for collection and handling data. We performed two interviews and one observation with each teacher; one interview before the observation and one after. Inspired by grounded theory we used an open-minded interview approach, transcribing after every interview to facilitate a choice of changing or updating one or more questions for the next interview. Observation was carried out using overt participant observation techniques, including us in the classrooms and getting the data first hand. Inspired by grounded theory we used open coding, axial coding and selective coding to sort and analyse the data collected from the interviews and observations.

We talked to and observed four teachers at different schools to find a pattern on how they used technology in classroom teaching. Our selection of teachers was based on whether they used technology on a day-to-day basis. We wanted to observe and experience technology that was actively in use and ended up with schools that we knew had a high technology usage with teachers that used technology in their classroom teaching. Our group of teachers all had different backgrounds and work experience, making them a diverse sample. SMART board, iPad, laptop and PC were the most used technology.

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1. Introduction

Information technology pervades modern life. The definition of information technology is anything related to computing technology such as networking, hardware, software, the internet and people working with these technologies(Techterms.com, 2015). It is in every home, every workplaces, restaurants, cars, and in schools. Statistisk sentralbyrå (2014) have conducted a media use survey every year on who has technology available in their home, this includes laptops, PC, iPad and mobile phones. In 2014, 95% of all households had one or more of these types of technology available in their home. After the introduction of "Kunnskapsløftet 2006" (2006) the first place many of us will come across technology is in school, (other than for just play and fun).

This states that digital competence is becoming more important and both primary and secondary schools shall integrate digital tools in all school subjects. This has led to schools investing in costly equipment like SMART boards, laptops, new computer labs and tablets. Research is being done in this field to make sure that the schools are heading in the right direction.

The goal with this thesis is to learn more about what patterns of use that exist with today's technology in primary schools. This goal and the following research questions were developed in later stages in this paper as we got closer to a concrete term. During our case study into technology in schools, we are going to answer this specific research question:

What are the patterns of use for modern technology in primary schools?

"Pattern of use" in our research means that we are looking for the links between human and technology, and how it is used in a classroom teaching. Any modern equipment that the schools have available and the way the teachers decide to use it. In order to get a complete understanding about use we have the following sub-research questions.

- Why do teachers use modern technology in primary schools?
- How does modern technology influence classroom teaching in primary schools?

In orders to find patterns of use we need teachers that decide to use technology in a classroom teaching. An important factor behind the use will be their reasoning for using technology, or the other way around, not using technology. After we have established why they use technology the second part will be to see how this influences the classroom teaching. Different patterns of use might influence the classroom differently, there can be good and bad uses. The last question will enable us to determine the good ways to use technology, the way it influences the classroom teaching in the right way. Together, these two sub-research questions will be the key in solving our main research question.

In this thesis, our research is going to look at what patterns of use that exist when it comes to available technology in primary schools in Kristiansand, if technology have any effect if the teachers do not have the right experience or knowledge to use it efficiently, also looking at what influence the use of technology. Maybe it is instructions from school management,

outside pressure like requirements from UDIR or parents, or is there a personal motivation and interest behind the use? Finally, we look at how modern technology influence the classroom teaching. Everything from the teacher's perspective.

Undervisningsdirektoratet (2015a) now referred to as UDIR is a branch of the government in Norway that creates and implements rules for education in kindergartens, primary- and secondary schools; implementing the rules, regulations and requirements that kindergartens, schools and teachers have to abide by in Norway in an educational setting. They provides exams other tests for both primary- and secondary schools in Norway. UDIR provides a training and skill development plan for newly graduated teacher, helping them to get up to par.

Our reason for going with the primary schools and the younger pupils is to see how well the requirements from UDIR are handled, and how the teachers are able to use technology with this age group. It is likely that any challenges that will occur with this age group will be different in the later stage at school, and it is interesting to see how they prepare the pupils for what is to come.

1.1 Motivation

The government is committed to implementing technology in Norwegian schools and more and more research takes place every year based on this topic. A report that inspired us to work in this field is the SMILE report (Krumsvik, Egelandsdal, Sarastuen, Jones, & Eikeland, 2013). In this report we get an understanding on what type of educational benefits effective ICT-usage can give. The representation of both subjective and objective views in the report gives us a great substance for our research. The SMILE report was a huge project on technology in Norwegian high schools, and there has been good progress in this area. Another report that has inspired us to work in this field is "IKT i skulen - Kva, kven, korleis og kvifor?" (Bratvold & Kyrkjebø, 2011)

A common pattern in this kind of research is to focus on digital competence, to see how this effects the use of technology. This is an important factor as shown in the SMIL report:

«Skoleledere som lykkes med sin digitale satsning har ledelsesstrategier som ikke bare favner om medier, men både medier og metode sømløst integrert gjennom velfunderte kompetansehevingstiltak. Lærere som lykkes med sin pedagogiske IKT-bruk kjennetegnes ved at de har en høy digital kompetanse, har gode klasseledelsesevner, de mestrer digital underveisvurdering og evner å tilpasse undervisningen sin i en stadig mer digitalisert skolehverdag.»(Krumsvik et al., 2013, p. 4)

Part of what motivates us about this thesis is to find out other important factors besides digital competence that can influence how technology is used in classrooms teaching. Is it likely that just having an ICT skilled teacher is not necessary enough to make the pupils pass any requirements, but that there will be many different elements that all work together?

With the chosen research questions, this thesis looks into what other factors there might be and this is something that is important to learn more about.

An important factor we want to look at when it comes to technology is not only why the schools should use it but also how it interacts with traditional learning. There can be plenty of research into best methods to implement, best technology to use, digital competence amongst teachers, but we also need research into why they should use technology. Useful patterns that can come from this paper can help make sure other teachers see a benefit in using technology, and will see how technology can benefit their classroom teachings.

With both of us having a background in technological usage, we wanted to learn more how modern technology fits into a classroom. With a wide term in mind “technology in Norwegian schools”, our search for more information was on the way. After reading many research papers it finally hit us that there were some areas of this wide idea that we wanted to take a deeper look at, culminating with the three research questions stated in the last chapter. With specifying and making the study more specific, we can collect data that are more direct from interviews and observations. It is very exciting to do research into a field that are changing all the time, technology is getting faster, easier to use and includes more possibilities for people using it. The invention of new technology is happening every day, making technology a big part in the communities. Municipalities and schools both tries to keep up with the changes in the marked, trying to give their teachers and pupils the best tools to do their job. (ICT contact)

2. Relevant background research

The backbone of this case study is based on existing research that helped us define our research questions and approach. This chapter focuses on data that will help form the study in order to answer the research questions. With the first sub-research question, looking into why teachers use technology some background data can make this easier to learn more about. Second looking into how technology influences the classroom teaching is connected with why teachers decide to use. We took out parts of what digital competence is defined as to see how this would relate to what our questions will show. There is also information related to how much computers there is per pupil in school. Finally, there is important data from "Utdanningsdirektoratet", which we present in this chapter and will be discussed more in detail later in this paper. There is a rather big spike in research taking place after 2006, understandable enough as this was when the government decided to give IT a major position in the basic subjects.

During the research, we have come across several different ways of defining exactly what digital competence is, and how it has changed in recent years. When we look at digital competence, it will be different for the pupils, and for the teachers. The teachers needs to be able to use digital competence in an educational setting, and many view this as the most important skill. It does not really matter how superior his or her technology skills compare to the pupils if they do not know how to use it "the right way".
One way to define digital competence with teachers goes like this:

«Digital kompetanse er læraren sin evne til å bruke IKT fagleg med eit godt pedagogisk-didaktisk IKT-skjøn og å vere bevisst på kva dette har å seie for læringsstrategiane og danningsaspekta til elevane» (Krumsvik, 2007, p. 68)

UDIR defines digital competence as the skill, knowledge, creativity and attitude needed to use digital media for learning and mastering in a knowledge based society. (Forsknings- og kompetansenettverk for I.T. i utdanning, 2005)

As well as with digital competence it has a digital separation that evolves with time. The changes happen when basic information shifts from generation to generation. The generation born today are used to having technology around them from the very beginning. The generation before were not in the same situation.

«*Etter hvert som stadig flere får tilgang til IKT, dreier ikke digitale skiller seg primært om tilgang til teknologi, men om elever og voksnes bruk og mestring av teknologi.*»(Egeberg et al., 2013, p. 53)

We have looked at numbers collected from Grunnskulens informasjonssystemer (GS) (Utdanningsdirektoratet, 2013b) found in Montitor skole 2013(Egeberg et al., 2013, p. 55) shows numbers of computers available per student between 2007 and 2013. In elementary schools, the numbers of pupils per computer has changed from 4,5 to 3,3. In secondary school the numbers have changed from 3,4 students per computer to 2,2. If we look at

elementary and secondary schools combined the numbers are 3,5 students per computer to 2,5 student per computer in 2013. These numbers shows us a bigger availability, which again should make the premise for using technology in the classroom higher.

A report "Board or Bored"(Egeberg & Wølner, 2011) written in 2011 says that in 2010 the number of SMART board present in Norwegian classrooms were at 39%. It is safe to assume that this number has gone up in these five years, and it matches our findings with a SMART board present at every classroom. One of the big delivers behind SMART board(2015) says that they have per 2014 delivered 37 000 interactive boards to Norwegian schools. This is quite the impressive number, and shows how important it is that teachers know why to use it, and how this can affect the classroom teaching.

2.1 Requirements and tests from Utdanningsdirektoratet

One of the parts of the Norwegian government is Utdanningsdirektoratet (Directorate of Education) hereby known as UDIR. They have an important role to play when it comes to technology in schools, as they are responsible for the development of kindergarten, primary and secondary education(Utdanningsdirektoratet, 2015a). For this paper, there is two important elements from UDIR that can be connected to the use of technology in primary schools.

The first is a list worked out from Iktplan.no, a service from "Senter for IKT I utdanningen".

"Iktplan.no er en tjeneste fra Senter for IKT i utdanningen. Planen er bygd på rammeverket K06, og er et forslag til minimumsgjennomgang av digitale ferdigheter i grunnskolen."(Senter for IKT i utdanningen)

This site was originally developed by Drammen municipality, but was later shared with others, before "Senter for IKT I utdanningen" took it over august 2013. We used this site to check what the requirements are, that is, what the teachers need to teach their pupils. Following is a list of requirements for second year, fourth year and seventh year, loosely translated to English.

Requirements after finishing second year:

- The pupils should be able to use a web browser and recognize a search field
- The pupils should be able to produce a simple and connected text
- The pupils should be able to send digital messages
- The pupils should know what a username and password is

Requirements after finishing fourth year:

- The pupils should be able to search and find relevant information
- The pupils should be to produce different connected texts
- The pupils should be able to send e-mail
- The pupils should be able to use spreadsheets to organize information in the shape of texts and number
- The pupils should be able to recognize characteristics on digital bullying

- The pupils should know what kind of personal information that can be published online

Requirements after finishing seven year

- The pupils should be able to do targeted searchers in different search engines and digital media.
- The pupils should be able to determine credibility on web pages with the framework TONE.
- The pupils should be able to produce and edit structured texts with chained content.
- The pupils should be able to present text and numbers in different kind of diagrams.
- The pupils should be able to use collaboration tools and present own work in digital media.
- The pupils should know what kind of personal information that can be published about others.

During our research, we will find out how much teachers knows about this list, if they follow it during their teaching, and if they agree with it. This will lead to learning how the requirements from UDIR influences the teachers and schools. If the teachers think the list is important and something that the pupils need to learn, this might motivate them to use technology. Same with how technology influences the classroom teaching as you would need certain specific ways of working to pass these requirements. This list is also the foundation for implementing ICT in a classroom teaching.

The second element that might have an impact in the use of technology is a national mapping test on digital skills that takes place in fourth grade. This test measures:

"Kartleggingsprøven måler i hvilken grad elevenes digitale ferdigheter er i samsvar med kompetansemålene i læreplanen, der digitale ferdigheter er integrert i alle fag. Dette innebærer at kartleggingsprøven er en prøve i digitale ferdigheter som grunnleggende ferdighet i alle fag.»(Utdanningsdirektoratet, 2014, p. 4)

This test enables the schools to test the digital skills of the pupils, and it gives valuable feedbacks to the teachers on how they are doing. Kristiansand municipality have made this test mandatory, and the result is not public information. The results give teachers and schools the ability to see the areas where pupils need more training to get up to par(Utdanningsdirektoratet, 2015b). This is clearly stated in Kristiansand municipality`s information booklet "*Felles system for kartleggingspraksis i grunnskolen*» (Oppvekst Pedagogisk senter, 2010)

Data from ICLS (International Computer and Information Literacy study) shows that Norwegian schools are among the best when it comes to digital skill. The test is from November 2014 and was for ninth grade. Main findings from this report are:

"*Norske elever presterer godt over det internasjonale gjennomsnittet på den digitale prøven, og Norge befinner seg blant de høyt presterende landene i undersøkelsen.*

- *Norske jenter skårer signifikant bedre enn guttene på prøven, noe som er i tråd med den internasjonale trenden i studien.*
- *8 % av elevene bruker datamaskin daglig på skolen, mens 52 % rapporterer om ukentlig databruk*
- *Elevene rapporterer om beskjeden IKT-bruk i skolefagene*
- *75 % av norske elever benytter daglig datamaskin hjemme*
- *Elevenes sosioøkonomiske bakgrunn har betydning for deres prestasjoner på den digitale prøven» (Ottestad & Universitetet i Oslo Institutt for lærerutdanning og skoleforskning, 2014, p. 7)*

Even with the result being from a grade higher up then our focus it is interesting to see the numbers. This data will be helpful when considering how well the teachers and pupils interact with technology at primary schools.

All this literature is important for us while developing the interview guide and deciding what to look after during observation. Digital competence is important, and something that will be taken into account while looking into why teachers use technology. UDIR as a resource is important as they have both requirements for different classes and a national test at fourth grade. This will be used to learn how important this is for the teachers, and if it is part of deciding how technology is used.

3. Research approach

In this chapter, we present our chosen research approach and theories used for our case study. For the chosen research questions it is necessary to go deep into details into the material, case study consisting of interview and observation gives us this opportunity. In order to find the right amount of data for this theme we needed to go into details on both technology in itself and the human perspective. Interpretative research approach was chosen for this factor, combining qualitative methodology with interviews and observations to collect data. For the analysing of the massive amounts of data that would be collected we decided to take inspiration from grounded theory as this also goes well with qualitative methodology, and is well used for analysing the data. This also gave us the opportunity to work with analysing after every interview in order to make changes to our approach to get an even deeper understanding into technology at primary school level.

3.1 Qualitative method

In the early stages of this project, we were still considering what methodology would suit our research the best. We had not finalised a concrete theme, but had different ideas. In order to determine a more precise field within technology in schools, we had an interview with the ICT contact at the local municipality. For this interview, we developed a small interview guide based on existing knowledge collected from earlier research papers, reports and the interview with the ICT contact, and ran a semi-structured interview. This interview type is useful as it allows the interviewee to talk a bit freely about topics he/she finds most interesting and it gave us a lot of valuable feedback and ideas.

With the theme, “patterns of use” in place we looked into what kind of research approach that would give us the best answers. There is huge amounts of potential data to collect when it comes to patterns of use, especially with the sub questions regarding why technology is used and what the effects might be. From looking at similar studies a pattern appeared, observations turned out to be a simple, yet effective way to get “real life data”. Observation alone would not be enough, but combine this with some interviews and our approach landed on a qualitative methodology. This also integrated well with how grounded theory works with the qualitative method. In order to answer why technology is used interviews with the teacher was the best approach for our research, getting information directly from the users and find out what triggers the teacher to use technology and at the same time get an better understanding what type of educational and personal knowledge they have. The first interview should answer why they use it and observations should answer how they use it. The second interview was a “reflecting interview” based on the first interview and our observation of the classroom teaching, using the second interview to discuss our findings from observation, and to wrap everything up with each participating teacher.

Interview – observation – interview were tightly linked together from start to end, with a different main focus on each step. Having three source points at the same school and the

same class helped us get better validity since we were able to connect the data from each step together.

As we want to understand why teachers use technology, how this effects teaching, and what patterns exist in technology, qualitative research gives us precise data that we can both use, and link up with existing research. In the book "Research design : qualitative, quantitative, and mixed methods approaches" (2014) Creswell talks about how different method approaches used in research. This quote tells us that when we as researcher look at data collected our perception of the data is not 100 percent bias, all our education and experience will have an effect on the result of the findings.

"Thus, qualitative researchers seek to understand the context or setting of the participants through visiting this context and gathering information personally. They also interpret what they find, an interpretation shaped by the researcher's own experiences and background." (Creswell, 2014, p. 9)

Having this at mind the researcher have better opportunity to avoid interference in the data and present a more representative data from their collection.

With inspiration from grounded theory every interview and observation was analysed in turn. Thanks to this approach, the interview guides went through small changes from teacher to teacher, but we made sure that we entered every interview and observation with an open-minded approach. Grounded theory originally say that you would have a complete blank mind when doing research, coming from an ICT background and having experience with the use we think this is unlikely, but that it is still possible to conduct research open-minded and rather take advantage of existing knowledge and research.

For our interviews, we followed a semi-structured interview approach with open-ended questions.

"Semi-structured interviews are designed to have a number of interviewer questions prepared in advance, but such questions are designed to be sufficiently open that the subsequent questions of the interviewer cannot be planned in advance but must be improvised in a careful and theorized way" (Wengraf, 2001, p. 5)

This approach allowed us to follow the same basic structure for each interview with a premade guide, but also having the opportunity to discuss what the interviewee said.

Observation is one of the ways for a researcher to observe and see who the participant acts in their day-to-day environment, giving the researcher, in our case, a way to look at how the teachers use technology in their classroom teachings. Being a part of the participants' environment is also one of the things that can make them relaxed and it is more likely that they will act and react as they normally do. In our research, the goal was look at how the teachers used technology in the classroom teachings and being overt would help us collect

the most reliable data. The reason for conducting the first interviewing before doing an observation was to release possible tensions between participant and researcher.

For the observations, we used a technic called Overt Participant Observation(OPO) (MARSHALL, 1998). In OPO, the researcher is involved by being open with the group that they are going to study. In other words, before joining a group the researcher is likely to inform the group's members about what the purpose of the research is, it`s scope, and how long the research will last and more. When conducting the observation we observed the environment, took pictures and made notes on things that may have any implications on our findings. The reason to collect a variety of data is to get the best possible validity at the end of this experiment.

The second interview was to see to get the teachers point of view on the observation. Using this interview to find out how the teachers looked at their own capabilities', giving us an insight into how they see their own work. With this data would be better suited to make conclusions based on their way of looking at things, linking parallels between how they see their own work and link it to our findings.

3.2 Interviews and observation

For the initial interview, we created an interview approach where the focus is on the teacher as a person, his or her experience with technology both personal and any potential training from either work or education. This interview also contains questions that look into why technology is used in the first place and how the teacher uses it. The goal is to link the findings to the observations to see if there is a match. By having an introduction interview where we get a better understanding of how the teacher thinks we can make preconceptions and ideas on how to best conduct the observation and what type of technology they will use.

For each observation, we would walk around, take notes and see how the technology fits into the classroom. Any patterns discovered from the initial interview would try to be looked for during observation. There was also a focus on potential challenges that we could see occur, especially if it had been mentioned during the first interview.

For the reflection interview, we took the connection that started with the first interview, kept going through observations and ended up in an up close and more personal talk with the teacher. Another part of this interview was feedback on how they thought that the previous observed class went and how they utilized the available technology during class. We went through every connection we had found between the first interview and the observation, shared ideas and thoughts, and managed to close up each research process in a calm and clear way. This way of collecting data is what QRM lists as a subjective method.

Our case study is primary school and this includes first to sixth grade. When using OPO the group is informed about the scope, what the purpose of the research is and how long it will take. Problems with using this type of observation can lead to corrupted data if the subject

changes the way that they act to make a better impression on us, influencing on the findings. To counteract this problem we have conducted two interviews one before and one after the observation to get a better understanding on how the teacher behaves. We see that the age of the students can have a favourable factor for our research. The age of the pupils varies from 6years to 11years of age; from personal experience, we believe that they are impressionable at this age, they have a better tolerance and openness to new people in their classroom than older people would. We think that when the pupils are used to being schooled one way they tend to want that way of teaching from the teacher. The pupils will act like themselves and not deviate much from how they usually act. This all depend on the teachers` ability to control the class.

3.3 Interpretative research

The bases of our research is an interpretative approach. We have chosen this approach for our research, as we want to understand and learn about patterns of use when it comes to technology in primary schools. With the following questions where we are trying to uncover both why teachers use technology, and how this effects classroom teaching we need details and personal experiences from the teachers. In "Studying Information Technology in Organizations: Research Approaches and Assumptions" written by Orlikowski and Baroudi they want to stimulate reflection on the implication of the research approach a researcher employs when investigating a system information phenomena, motivating a more reflective adoption of adoption from a diverse perspective. (Orlikowski & Baroudi, 1991). This quote tells us that while doing interpretative studies people create and associate their own subjective and intersubjective meanings as they interact with the world around them.

"Interpretative studies assume that people create and associate their own subjective and intersubjective meanings as they interact with the world around them. Interpretative researchers thus attempt to understand phenomena through accessing the meaning that participants assign to them"(Orlikowski & Baroudi, 1991)

With the existing research in the first chapter, we have followed Walshams approach as we build the case study on some basic understanding into technology at schools:

"Interpretive methods of research starts from the position that our knowledge of reality, including the domain of human action, is a social construction by human actors and that this applies equally to researches" (Walsham, 1993, p. 5)

In a paper from 1995, Walsham makes the distinction between an "outside researcher" and an "involved researcher"(Walsham, 2006). Our approach is mostly as outside researcher since we are doing interviews, but with the observation followed by the reflection interview, we will also become a bit involved with the research. This is useful for what we are trying to discover as it gives more details into the patterns observed, and opens up for more discussion around this with the teacher. Walsham argues that closed involvement is good for in-depth access to people, issue and data.

"It enables observation or participation in action, rather than merely accessing opinions as is the case in an interview-only study."(Walsham, 2006)

The human factor will be very important when it comes to our case study. Even if the focus is on technology, the human factor is a key factor to make sure that technology actually has a role in schools. This type of technology and quality plays a part, but if our focus only looked into those things, our approach choice would have been different altogether. There can be modern schools with good technology, which might lack the potential good patterns to use it. Our need to understand the way to use it, why they use it, and what effects this has, and for this, an interpretative approach should be valuable.

3.4 Inspiration from "Grounded Theory"

As briefly mentioned in the introduction our research process is inspired from a grounded theory approach. In our findings is where grounded theory come in to play, using open coding, axial coding and selective coding to sort, organise and present data into more manageable category sections. Purpose behind grounded theory is *"the discovery of theory from data" (Glaser & Strauss, 1967, p. 1)*. Anselm Strauss and Barney Glaser first developed this theory in 1967. As the theory is getting old we have seen different angles and approaches to how to perform grounded theory, but they all follow the basic principle.

The inspiration we gather from "grounded theory" is how to collect and analyse our findings.

"*In grounded theory, data are collected by a variety of means. The most frequently collected types are interviews and observations" (Corbin & Strauss, 2015, p. 7)*

This approach is the same as what we did in order to collect our data; interview with teachers, and observation in the classroom. This qualitative method of collecting data suits our research questions since they do not only aim to find patterns, but to understand the reasoning behind those patterns. To understand why they chose the technology, and the effects this gives.

When it comes to analysing the data, we followed the "constant comparisons" process.

"In doing constant comparisons, data are broken down into manageable pieces with each piece compared for similarities and differences. Data that are similar in nature (referring to something conceptually similar but not necessarily a repeat of the same action or incident) are grouped together under the same conceptual heading. Through further analysis, concepts are grouped together by the researcher to form categories (sometimes referred to as themes)." (Corbin & Strauss, 2015, p. 7)

With this approach, every interview was transcribed and analysed directly afterwards, and from every observation a report was written and findings analysed. This also led to changes in the interview guides from teacher to teacher. The second interview for every teacher had some similar questions, but they are also built on data collected in the observations. Thanks

to this approach we could make changes to our questions and observations in case we would discover that potential important data where missing from the early stages.

In its original form, grounded theory states that:

"As a general rule the researcher should make sure that their prior – often expert – knowledge of the field does not lead them to preformulated hypothesis that their research then seeks to verify – or otherwise. Such preconceived theoretical ideas could hinder the emergence of ideas that should be firmly rooted in the data in the first instance"(Urquhart, Lehmann, & Myers, 2010, p. 359)

We have not followed this approach completely, but have tried to enter every interview and observation with an open-mind, rather than an empty-mind. The existing research presented during the introduction is not linked directly to any potential findings from the research questions, but they helped give us a small overview of typical themes and valuable data in this field. *"We are all biased by our own background, knowledge and prejudices to see things in certain ways and not others"(Walsham, 2006, p. 321)*. As it is with qualitative research we should not expect everyone to get the exact same result, researches will have different background and different approaches to a case study.

3.5 How data is analysed

This stage follows inspiration from a Grounded Theory approach. In order to validate the data they have been coded in three different stages. These are

- Open coding
- Axial coding
- Selective coding

This method is adapted from a research paper written by Wolfswinkel, Furtmueller & Wilderom(2013) about how to use grounded theory as a method for rigorously reviewing literature.

"The aim of using a Grounded Theory approach to literature reviewing is to reach a thorough and theoretically relevant analysis of a topic"(Wolfswinkel et al., 2013, p. 46)

As the data collected is wide and complex, we needed strong guidelines and a solid approach while going through and analysing it. From Wolfswinkel paper, we have used stage 4 in the "Five-Stage grounded theory method". This approach is commonly used when you have qualitative research rooted in grounded theory in order to extract genuine value from the study.

While using Grounded Theory for this part of the study we were able to link it up towards our approach to conducting interviews and observation earlier on. Having an open-mind for the interviews, we wanted to continue with this while looking over all the data. As we

transcribed and read over findings from a Grounded Theory perspective, it was natural to continue this path while doing the link between findings and research questions. The research questions are kept in focus while going through the data gathered from a technological approach. We looked into why teachers chose to use technology, and how the pupils reacted. As well as any data when it comes to how technology and traditional teaching work together after the class is introduced to technology.

In our open coding the goal is to get a better understanding of how the collected data binds together. Another important part is finding out about the connection between the data and our research questions. After this, the data from open coding would be categorised, translating the data into a more understandable format for future analysis. Our sub-research questions are the foundation to answer the main research question and by making them the focus of the analysis, we will create the best way to structure the findings.

Axial coding is where the open coding's are put into subcategories. Subcategories builds the basic for the main categories in selective coding. During the first stage many open coding's have been found and placed under each research question. They are placed under subcategories to create a better understanding of them.

The last stage of analysing data is selective coding. This is the stage where we put all the data together and create main categories in order to answer our research questions. Every category will have a direct link to the research questions as we added more data for each category during the analyses.

3.6 Framework

The work with our research approach is summarised in this framework which shows the process from start to end. Our use of this framework was to give a graphical structure to all the different stages of our approach for collect, handling and utilising data.

The framework for this research starts with some existing research and an interview we conducted early in our process. We looked at some existing research from a genre perspective where we focused very generally on some key elements when it comes to ICT in Norwegian schools. The research presented during chapter 2 will also be used during our discussion to see if our findings are connected to the basic understanding we have about technology in schools. This research was also combined with an interview with the ICT contact in the local municipality, in order to determine a concrete research term.

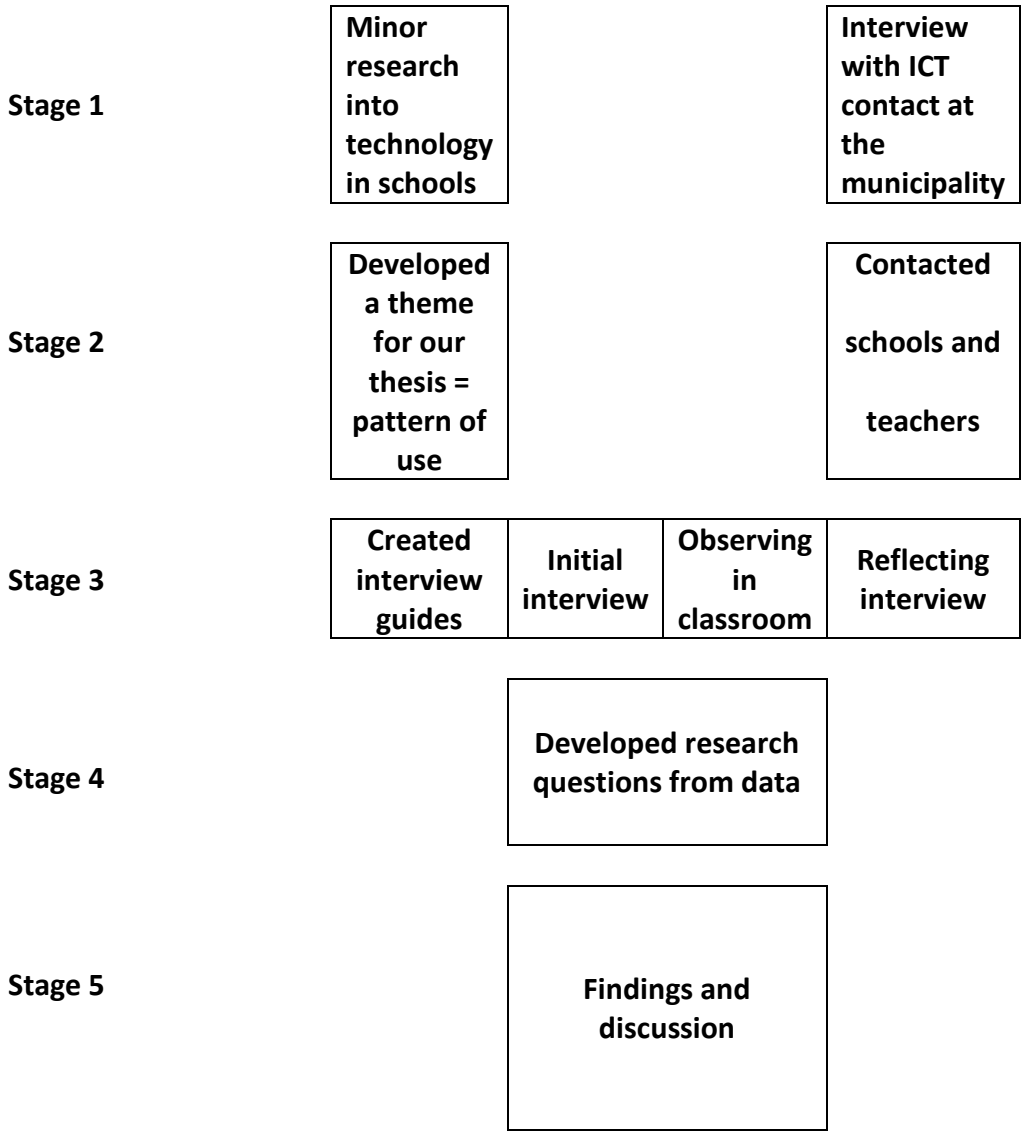

Figure 1 - Framework

As soon as we had an idea on what to look for we started contacting schools that we got the impression used technology in some sense. These schools were picked out by going through all the webpages of primary schools to look for any mention about ICT. In order to make sure we would get findings about patterns of use it was necessary to find schools and teachers who used some form of technology daily. If we only waned to look at the case from what possible patterns exist, we could maybe have gone to any school, but the observation part required actual use of technology to give us valuable data. Even though this kind of approach makes some schools non-relevant for us, this research might end up being valuable to schools that have not fully embraced technology into their schools. It could end up helping them realise more what is needed to find patterns of use at their school.

With teachers in place, a mail was sent to everyone informing them about the research process, and to make sure that they were ok with this approach. In order to create a report that is based on as much real data as possible we were clear on the fact that we would want to observe as normal day to day teaching as possible. It would not fully answer the theme in our thesis if every observation just consisted of a special class made for us.

After each teacher had participated in the two interviews and the observation, we would go through all the data gathered, analyse this, and from there look into any potential changes to the interview guide before our next teacher, as shown in stage three. With the grounded theory approach to analysing data this had to be done after every interview. Every interview will be recorded and transcribed to make the analyse process a bit easier.

While working on the transcribed data we used this too further elaborate our research questions related to patterns of use and created a link between those questions, existing research, findings and discussion. The last stage in our framework presents how we analysed the data from the interviews and observations. Discussion shows the analysed data linked up with existing research and this is where the research questions found during stage four are answered in detail.

4. Case description

For this case, we reached out to primary schools in Kristiansand to see if anyone was interested in participating. Our criteria was schools that had some form of technology available, the more the better. In order to get reliable data for our research questions the teachers need to have the option to use technology. Following this, the interviews had to be with teachers that had experience using technology, so we could learn more about why they use it. For the second research question, all the observations had to have use of technology so we could see how this influenced the classroom teaching. For the observation we did confirm that it was a typical day for both the teacher and the pupils as we wanted to see the daily use, and just not something special made up for us. First contact was by phone to the principal at each school, which then put us in contact with the head of IT. From there the IT contact asked the teaching staff if anyone was interested in joining, and gave the names back to us. Next step was to send out an information mail detailing how the collecting of data would occur, how long it was likely to take, and the purpose for the data. Teachers agreed to the initial plan and meetings were arranged.

The schools in this case study are all schools that are investing or recently have invested more into modern technology. They are all primary schools in Kristiansand, Vest-Agder. We used the schools own websites to read up on any information related to ICT to see if this was in focus before reaching out. As the goal is to learn about patterns of use there would not be much point going to schools that do not have any patterns to show. The teachers we have contacted are all teachers that feel confident in using technology, and that will be able to give us what we need to answer our research questions.

In our research, we expected to find some type of technology in schools, and this list is what we think is the most likely types of technology available.

- SMART board
- Laptops
- Computers
- Tablets

Expecting to find SMART board in some classrooms and find computers available either in PC or laptop form. Tablets is something that we do not expect to find much of, especially in a first grade class.

In this study we have three teachers representing the first grade and one teacher for the fifth grade. There is an average on 21 pupils per class, and a good mix between boys and girls. Our teachers experience goes from young teachers with only a few years of teaching practice to the more experienced ones with several years in the teaching profession. This helped in giving us valuable insight into how newly educated look at technology versus the experiences ones.
Finally, the case study consist of three steps for each teacher, as explained in the previous chapter.

5. Findings

This chapter contains the analysed data from our research. As presented earlier this stage consist of three steps that leads to the results. The data collected during interviews and observations is put into four main categories, which are linked up to the research questions in different ways. This model shows the connection between main research question, the two sub-research questions and the categories teacher, regulations, technology and classroom.

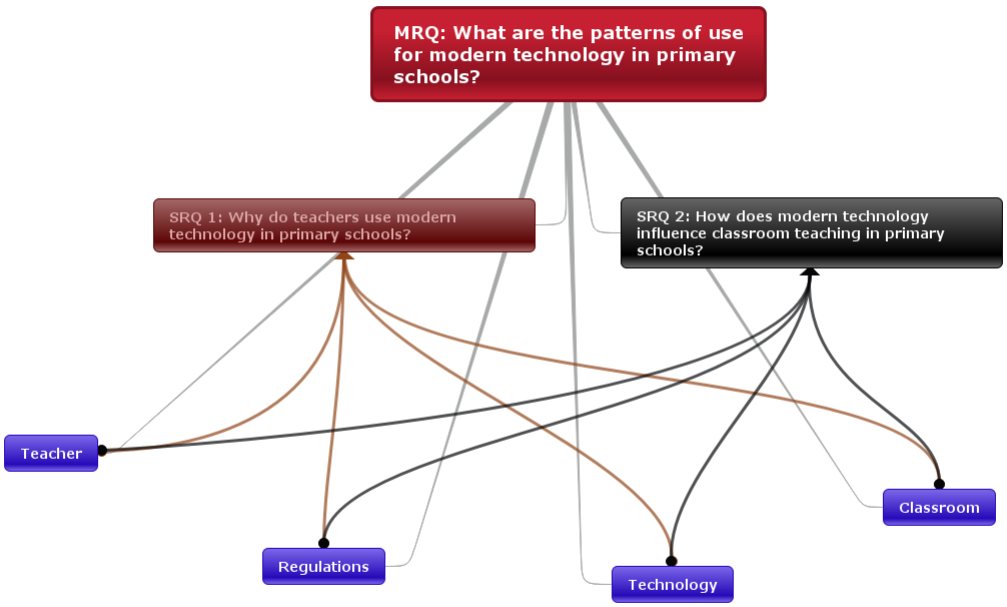

Figure 2 – Connection Model between research questions and analysed data

Explanation to the boxes:
Red: Main research question
Brown: First Sub-Research questions to main research question
Blue: Second Sub-Research question to main research question

Explanation to the links:
Red: Interaction between main categories and first Sub-Research question
Green: Interaction between main categories and second Sub-Research question
Grey: Links the main categories to the main research question

Teacher was a natural choice and something that is relevant for all of our research questions. The teacher will have a central role to play in the behaviour and usage of technology in the classroom including how the teacher chooses to interact with the technology and how this effects the pupils.

Technology is a category as it is an important part of this study. All the data from findings will in one way or another have a link to technology considering the type of questions asked and the type of school we observed. With the teachers using different kinds of technology, the equipment will be placed in this category, in order to make the structure more clear.

Classroom is an important finding because there can be different variables that will have an impact on our study. First, you have the gender and age of pupils, the technology available and how many teachers the class would usually have. Other factors discovered from findings is the variation in digital skill amongst pupil and class setup. Whether they work alone or in-group might also have an impact on how the technology influences the classroom teaching.

Finally, the last category we used to structure our findings and link them to the questions refers mainly to reasons behind schools investment in technology. There is an expectation from "Utdanningsdirektoratet" that schools have to teach their pupils certain things when it comes to technology, and there is a national test on digital skills in 4th grade. These findings concern the teacher, the classroom, and the pupils.

How we discovered these four main categories will be explained in the following chapters. For selective coding, the categories will have more detail and summarize our most important findings.

5.1 Open coding

When doing the open coding we have read all the data time after time to find similarities that provided a summary of what was happening in the data.

After looking at the collected data with open coding, we uncovered many results that will help in answering the research questions in this thesis. This data is presented using two tables, one for each sub-research question. The tables consist of four elements, which starts explaining how the analysed data is important. This table makes the foundation for the later stages in findings.

First of all the table starts with direct quotes from the teachers to help form an understanding for each open code. The data in open code is key elements abstracted from the interviews and observations to answer research questions. From the data in open code, the next step in this table is to add properties to this data. Properties shows functionality to the open code to explain how this can be important in answering the research questions. Finally, the last part of open coding is adding in example of participants words to better

establish the value to the data in open code. The data in this tables is collected from interviews and observations.

These open codes are data that have been visible and important from every interview and observation. It builds the basic for the rest of this chapter, and it helps in answering our research question.

SMART board is an important open code because every teacher used it on a daily basis, and the way they used it was similar for all. The reasons behind using SMART board was also quite similar for every teacher, it made the teaching easier and the kids paid attention. They could show videos, play music, and has access to different educational sites. Having a SMART board available in the classroom was a good motivation for using technology.

An interesting discovery was the broad use of iPads in the observations. Every teacher had iPads available, and even though the amount of use varied, the way they used it was similar in every school. Teachers told us that they used iPads both as a way to mix up the teaching, help out pupils with special needs and as a "carrot on a stick". They could use the iPads as a reward, and take it away as a punishment. It could be used in more or less every subject, but it was maths, English and Norwegian that struck out as the subjects where a iPad really was a valuable tool. The use of iPad depended on good applications, and finding these could sometimes be a struggle and take some time. All teachers agreed that it was well worth it. All the different ways that iPads can add value to a classroom makes it a great reason for why teachers would decide to use this form of technology.

Laptops or personal computers is another important open code as the teachers' points out they are important tools for their pupils to learn more about. Understanding the value and learning why computers are still important, as a tool for the future was something that motivated the teachers to use it. Two of the teachers did not to do computer practice themselves, but they knew what the pupils would practice on, and that it was important. Computers could also be used a reward for when pupils finished their designated tasks early. The use of SMART board, iPads and computers leads us to the next open code.

UDIR as an open code is important because it is part of the reasons why teachers use technology. All the teachers saw the value in having these guidelines and requirements to follow, it made it easier to see the value of technology. Along with requirements, there is also a national test at fourth grade that the teachers work towards. Having this makes it important to learn the pupils about technology, and counts in when teachers consider why they use technology.

Something that all the teachers agreed on, and is thereby added as a open code is the commitment by the school. This is important because it works as a motivation for the teachers to use technology. A school that brings inn new and exciting technological equipment makes it easier for teachers to starting using it. They tell us that slow and barely working technology will not be used, so this can be seen as quite the important step. All the

teachers could decide quite freely how they wanted to use technology, they were not limited by strict guidelines. For the fifth grade the teacher had put up a guidelines and rules when it came to the use of Internet to prevent cyberbullying. She felt it was very important that the school had clear rules so that the pupils did not abuse the possibilities.

Along with commitment by school comes another important open code. Software availability and usability. Teachers told us that there are so many possibilities with the technology in classroom teaching. This potential is a great motivator for using technology as it makes it possible to create different tasks and mix up the classroom teaching. It makes it easier to help pupils that are falling behind because they can give them more specific tasks. This also works the other way around. Applications to for example an iPad have different difficulty levels where pupils themselves can "play" on their level.

Last important open code for the first research question is Internet. Teachers tell us that without a stable and fast connection it is harder to get the full potential from technology. During observation there did not seem to be any problems with this for the patterns they used that day.

Sub-Research question one: *Why use modern technology in primary schools?*
Open coding for SRQ 1

Table 1 - SRQ 1

Quotes from interviews	Open code	Properties	Examples of participations´ words
«SMART boarden den bruker jeg som et hjelpemiddel, det har erstatta ganske mye av tavla som jeg brukte. Men den er jo et instrument som kan brukes mye videre grad enn tavla.»	SMART board in the classroom	Comfortable using it Class interaction Getting focus from the whole class Used everyday	Easy to use Focus from class Whole class inclusion View videos Play music Educational sites
«Når det gjelder iPad`er så har vi brukt mest 2 spesielle programmer, noe som heter QuickMath og det er et matematikk program med de fire regne artene (…)Bookcreator (…)Disse	iPad in the classroom	Tool for learning Fun for the kids Easy to use Lots of software	Fun for the pupils Educational tool Focused use Easy to understand

to programmene har vi brukt mest. Men vi har også brukt de til å søke, så vi bruker det. Men det å skrive de oppgavene det er kjempe fint for da lærer de seg å sette inn bilder, finner bilder og tekster.»			Good programs Different software Differentiated learning
«Vi bruker den til å søke på søkemotorer for å finne ut av forskjellige oppgaver som de skal lage. De lager PowerPoint og de bruker regneark, grafisk framstilling når vi holder på med det.» *«Så har vi bærbare PC`er til å ta ut grupper om vi trenger det (…)»*	Laptop in the classroom	Tool for learning Accessing internet for searching Using software to enhance learning experience Divide the class into groups as needed	Word PowerPoint Searching tool Presentation Flexible Time consuming Station teaching
«Bruker PC-en til å lage powerpointer og så viser vi det på storskjerm. For jeg syns at en pc er et viktigere arbeidsverktøy enn en iPad derfor så er det fokuset på en datamaskin, som blir arbeidsverktøyet til barna senere.» *«(…)de har lært seg å logge på med brukernavn og passord på FEIDE.(…) lært å bruker Word, komme seg inn der og endre skrift type, størrelse.»*	PC in classroom or computer lab at school	Tool for learning Accessing internet for searching Using software to enhance learning experience	Preparation Common work tool Knowledge databases Searching Early finisher activity Reward activity
«På fjerde trinn så har vi en digital kartlegging som alle fjerdeklassinger skal igjennom. Det er på landsbasis, får vi beskjed	The role of UDIR	Guidelines for technological understanding at each class level	Need to know A digital world Responsibility

om at det er sånn og sånn er det, og den testen må alle ta. Nå er det målene fra syvende trinn som vi jobber mot.»		Giving pupils a basic computer understand	Testing Grades
«(…) har vi jo en sånn dataplan for undervisning på skolen som vi har blitt enige om.» *«Vi står jo fritt til å bruke det sånn som vi vil, men de ønsker jo et fokus på det, det gjør de jo. Det er jo fordi det er en digital verden. Elevene må jo lære, og da har jo vi en ansvar for å lære de (…)»*	Commitment by the schools	Availability of different types of technology	Guiding Clear rules Helping Committed
«(…)da har vi igjen brukt de appene som er til MatteMagisk, læreverket som vi har. For da kan jeg få differensiert det til elevene slik at de som har behov for litt større utfordringer, de kan få det og de som ikke vil ha det kan holde seg på et nivå som de syntes er kjekt.»	Software availability and usability	Lot of different software available Not a lot of programs for all subjects at the first grade	Lot of software Availability Quality Subjects Usability
«Så bruker jeg LOKUS og knyttet opp imot matte verket og norsk verket som vi har. Og en del YouTube og skrive programmet.»	Internet	Is a tool to be used by the teacher and pupil Used to access external software and educational programs/sites Connecting technology to each other	YouTube LOKUS Norwegian Math Accessibility

Our findings on SMART board is that teachers used SMART board daily to show videos, play music and use interactive sites and programs in their classroom teachings. Using this tool as a focus point in the classroom. All pupils kept focusing on what happened on the SMART board. Most of the teachers used LOKUS, a site with educational programs, to get the pupils to interact with the SMART board, either in front of the rest of the class or as group of pupils solving tasks. From our observations, it was obvious that using the SMART board mostly was an easy task for them.

From our findings, iPad is a tool used in the classroom teachings to show videos and images, play sounds and present curriculum in a fun way for the pupils. Pupils have the chance to interact with the software, making them a part of how the software would behave. iPad was one of the tools where teachers could install software that would be prudent for every pupil in their class, different software for a pupil that had a disability or worked on another level of the curriculum. All of the teachers think that iPad is here to stay.

From observations and interviews, teachers told us that laptop and PC are used to accessing information on the internet, working on projects and make graphical presentations that pupils can to present to class. During computer lab sessions, the pupils work with basic software like Microsoft Word and Excel. They practice basic functionally in different kind of software, suited for their skill level and progress according to the requirements given from UDIR. Teachers tell us that already in first class they give the pupils their own username and password to practice login at different services like FEIDE.

In one of the observations, there was a pupil with a hearing disability and the teacher had to use microphone every lesson. Speakers placed around the classroom connected to this microphone, using the microphone as a “talking object” when they talked in “lyttekroken” another name for this is “samlingskrok” Figure 4 - Samlingskrok.

The way the class is set-up turned out to be important when it came to the use of technology. Teachers would either let the pupils work alone or in groups, creating different scenarios for how the technology influence the classroom teaching. Our observation showed that teamwork could be a productive thing and it could have a bad influence on the learning environment. The use of certain technology would sometimes raise the noise level in the class, but as the teachers put it this was “educational noise” and therefore not a problem.

Our findings on time usage was that teachers had to work long hours to prepare for the use of technology. They told us that they sometimes worked many hours to search and find the right software to use on both SMART board and iPad. They talked about the need for a site where they could share tips and ideas with other like-minded people, making it easier for both them and others to find and utilize different software available.

Internet is one of the tools that teachers found useful when connecting to LOKUS, Zeppelin and other educational site. Playing songs, playing internet and accessing the LAN and sites available by the municipality in Kristiansand. Teachers told us that without internet whey would have more difficulties connecting with all the pupils when teaching the curriculum.

From our research different challenges came up, old and broken technology could be a problem. When a teacher always used a technology and it suddenly did not work anymore this made it a challenge, and they needed to change the lesson plan. If they lost access to the internet lead to a big change in the lesson structure and they needed to always have a backup idea for these cases. This type of challenges did not happen often so it was only a challenge for a short time span. Teacher told us that they needed more training into how to use technology and how to find and use the different software available.

Our research found that teachers play a central role in the teaching environment, giving the teachers different roles they played in the classroom. A teacher could be a guide for the pupils, helping them with finding the right way to do their tasks, an educator teaching the pupils and be a supervisor controlling that the pupils did what they should in the classroom.

Sub-Research question two: *How does modern technology influence the classroom teaching in primary school?*
Open coding for SRQ 2

Table 2 - SRQ 2

Quotes from interviews	Open Coding	Properties	Examples of participations´ words
«Så høyrer vi mye musikk på SMART boarden, går innpå youtube, masse engelske sanger som ligger der, så er veldig greit å berre gå inn og søke, veldig lettvint sånn sett, så ser vi og i forhold til bokstavlæring så ser me bokstavkongen på youtube, og lesekorpset på nrk skole.» *«Så bruker jeg LOKUS og knyttet opp imot matte verket og norsk verket som vi har. Og en del YouTube og skrive programmet.»*	SMART board	Interactive representations of learning Interacting with different data sources	Daily Download Date information Weather View video Play music Easy to use Focus from class Including the class

«For da kan jeg få differensiert det til elevene slik at de som har behov for litt større utfordringer, de kan få det og de som ikke vil ha det kan holde seg på et nivå som de syntes er kjekt. Samtidig så kan de få lært mer.» *«Også er jo iPad eller nettbrett da noe som, det er jo kommet for å bli, så man må bli kjent med det, de som kanskje ikke har det hjemme må få lov til å bli kjent med det på skolen.»*	iPad	Sound, video and interaction between pupil and iPad Easy to learn for the pupils Making it fun to work with educational curriculum	Sound Images Video Educational fun Engaging Learning Here to stay
«Vi bruker de når vi for eksempel skriver oppgaver. Hvis de skal skrive tekster og prosjektoppgaver som vi skal lage. Vi bruker den til å søke på søkemotorer for å finne ut av forskjellige oppgaver som de skal lage. De lager PowerPoint og de bruker regneark, grafisk framstilling når vi holder på med det.»	Laptop	Accessing new information by searching Easy to make and present new information collected Easy to move around	Tasks Projects Searching Presentation Graphics Calculate
«(…) på datarommet. Der de har lært seg å logge på med brukernavn og passord på FEIDE. De har lært å bruker Word, komme seg inn der og endre skrift type, størrelse.» *«Det, de øver nok litt hjemme og for de syntes det er veldig gøy, men det har de jo så mye*	PC	Accessing new information by searching Make curriculum based work	Computer lab FEIDE Word Font Having fun Preparation for later Basic training

igjen for seinere. Jeg syns det er veldig bra at de får den her grunnleggende treninga nå.»			
«Ja det er en elev som har høreapparat. Så det er på grunn av han. Så kan jeg jo bare skru opp lyden og sånn. Det er ofte jeg trenger å gjøre sånn, men det er veldig støtte for elevene det å ha mikrofonen i lyttekroken så sender jeg rundt mikrofonen til de, så den har den som har mikrofonen får prate.»	Other Technology	Microphones and speakers used to help hearing impaired pupil Interaction with pupils in a different way	Hearing aid Microphones Speakers Control class Only speak when having the talking object
«Der vi deler gruppa i to, så det er halv gruppe på en time hver på datarommet.» *«Elevene syntes det er veldig gøy med stasjoner og de er jo veldig motiverte for det. Og så er det noen ting som er gøyere en annet, det er jo SMART board og iPad som er det gøye når de kommer på de stasjonene. Det er jo det som motiverer de hele tiden egentlig.»* *«Eller så er det stasjonsundervisning, så bruker vi både SMART board og iPad, og då er det jo masse programmer som ligger der.»*	Class setup	Class are divided into groups Whole class using SMART board Two and two working to gather on one device	Groups in stations Individual work Work in pair Team work Fun Learning
«Vi har Laptop tilgjengelig men det bruker jeg ikke når jeg har hel gruppe.	Class size	The size of the class has its impact on what they are able to do	Divide class Noise

Men vi har data 1 gang i uka. Der vi deler gruppa i to, så det er halv gruppe på en time hver på datarommet.» *«(…) hadde jeg jo bare 16 PC`er og har jo 23 elever. Så jeg måtte dele i grupper (…)»*			Digital skills Sharing technology Station teaching One or more teachers
«Så jeg prøver, feiler og trykker. Ja, men det funker greit, men det tar tid.» *«(…) SharePoint, det og kunne få delt litt der, men den er nå litt tungvint.»* *«(..) det er alle de gode programmene som ligger ute som man ikke vet så mye om, som man da må bruke tid på å finne ut av selv.»*	Time usage	Lot of work is done before the lesson When SMARTboard, iPad or computers do not work Teacher needs to install software	Work hours Home hours Preparations Research possibilities Sharing tips
«Også plutselig kommer det jo nye ting, finner man nye ting. Det er jo en milliard apper der ute som man kan bruke. Kanskje mer og mer tilpasset skole og. Det er jo et forholdsvis nytt marked.» *«(…) det ligger jo masse sånne tips ute på nettet, men vi har ikke noe sånn utarbeida noe plan eller anbefalinger her på skolen enda.»*	Software	Availability and usability gives better education	Many programs For everyone Easy to use Fun Educational
«Vi bruker mye LOKUS på SMART board, det er jo di læreverka vi har, Zeppelin og mattemagisk.»	Internet	Accessing programs available online Connecting to search pages	LOKUS Zeppelin Educational tools

«(…) man har jo tilgang til internett, spill, alt mulig.»			Songs Videos Searches
«Når vi sitter og skriver på det nede i klasserommet så må vi opp på biblioteket for å hente det vi skriver ut.» *«(…) plutselig så får du «maskinen og systemet er koblet ut», de har ikke blitt ladet ordentlig noen maskiner.»* *«Du vet du, jeg har prøvd meg fram, men jeg er aldri redd for å prøve. Det er sånn jeg har lært da.»* *«Og de utfordringene selv om IPAD har begynt å lekke litt inn i skolen som gjør at det tekniske som tid å pålogging kan gjøre at det går litt treigt, de er vekke med den teknologien. Likevel så er det en utfordringa der.»*	Challenges	Understanding the technology Need training courses Easier accessible equipment Faulty equipment	Knowhow Access Old technology Broken Charged battery Knowledge Training
«Det må være å ha tydelig beskjed på hva som skal gjøres, at de vet hva som skal gjøres. Hjelpe de der de er, på sitt nivå. *Hjelpe de der de er, med det de trenger. At det er trygt, at det ikke blir sånn skummelt, at det er en litt naturlig del av*	Teachers role	Guiding the pupils Educational fun Teaching structure	Teacher Guide Helping hand Supervisor Educated

hverdagen, av en skolehverdag. *Litt av alt egentlig, så mye som mulig. Det blir jo litt å stå i midten å ha, jeg må jo ha oversikt uansett hvor jeg er, men så må jeg jo gå rundt til de forskjellige gruppene. Det å bruke den fornuftig, vi må ikke glemme å lese, vi må ikke glemme å fortelle selv.»*			

5.2 Axial coding

When trying to make sense of the initial findings some common denominators started appearing from the open coding. The teacher's education and ICT knowledge stood out early as important findings and were therefore added as categories. To know what the teacher knows and how much they understand about technology seems to be part of how much it is used. This is important when looking at the research questions. Another element that appeared was challenges, and how much time teachers have to spare on technology considering how much it requires. This also goes along with what type of software they use and how do they use it?

Regulations and guidelines help in making sure that technology finds its place in the classroom. Some elements are more important when it comes to creating the foundation for why and how the teachers should use technology. During our interviews we learned that UDIRs rules have a profound impact on the school, teacher and, on the pupils education. Schools have to make changes to abide by the rules given by UDIR, teachers get new technology and guidelines on what is expected from them in an educational lesson plan and the pupils are expected to have a basic knowledge. Teachers need to "test" the digital skills of the pupils to make sure they pass the given requirements and do not fall too far behind. Schools have now made a commitment to this and want to better themselves by making guidelines and buying technology for a better learning experience for pupils.

In the classroom, there are different ways for the teacher to conduct their teaching. The teacher must all the time try to find the most productive class setup while using technology. In cases where there is not enough technology for everyone, we will use iPad as an example, the pupils need to be able to share, meaning working together in groups. Some pupils will have other needs from the technology because they may have hearing problems, problem with reading or problem with their sight, these are challenges the teachers can face and need to be able to accommodate with the right software or even technology present in the classroom. When looking at the software used on iPad, SMART board or laptop it is important that it is easy for the user to understand how it works. With an intricate and complex software, it can be a hindrance and have an opposite effect on the user experience. In the cases where a system is to complex, the teachers have to use more of their time to explain or guide their pupils on how to use the systems.

There is more than one type of technology available in the different schools. SMART board, iPad, laptop, PC and microphones with speakers are the different technologies that have been used during observed lessons. In class, SMART boards were used to show videos, play music, work on educational webpages and to make the pupils interact with different programs. Educational programs on the iPad give the ability for the pupils to interact with sound and touch capability, giving them more ways to learn. Laptop and PC are more or less used for the same things; writing in word, making presentations in PowerPoint, searching for information on the internet and giving the pupils an insight into programs they need to know for future education. The biggest difference between the laptop and PC is the ability to move

laptops around and the battery time available on same. Other technology found were microphones and speakers to help pupils with a hearing impairment, helping them obtain all the information presented in the lessons.

With internet, all the different types of technology can access programs, educational webpages, search engines and other net related features.

This creates the subcategories. These subcategories will form the foundation for the last part of our analysis, which is the selective coding part. All of these categories contain important data that shows what teachers said related to the research questions. The subcategories are so divided under each sub-research question as the data gathered has different value for each question. From axial coding, there now exist a clearer understanding of teacher's reason to use technology, followed by how this influences classroom teaching, and what the patterns are.

Subcategories that are relevant when it comes to why teachers use modern technology in primary schools:

- Commitment by school
- Requirements given from parties like UDIR
- SMART board
- iPad
- Laptop
- PC
- Education
- ICT Knowledge
- Software
- Internet

Subcategories that are relevant when it comes to how technology influences classroom teaching in primary schools:

- SMART board
- iPad
- Laptop
- PC
- Software
- Class setup
- Class size
- Pupils
- Time usage
- Challenges with technology
- Program / Software
- Teachers role
- Internet

- Other Technology

The next step is to organize all the subcategories and find out if there is any common denominators among them. This is what we are going to do in the selective coding part of our research.

5.3 Selective coding

Selective coding is where every subcategories is placed under a main category. This will be showed with list during this final part of the analysing. Some subcategories in one or more main categories, depending on how they influence the main category. The main categories are the one that add the most value when answering the research questions, and the data obtained during analysing lies under these.

Sifting through the different categories found in the axial coding part, we started thinking what all these had in common and how could they all contribute to answer our research questions. First thing we found was teacher how education, ICT knowledge and different challenges effected the choices and behaviour of the teachers. Second was regulations, putting UDIR and the school as mutual beneficiaries when looking at rules, guidelines and regulations. Third was classroom, where class setup, class size and pupils are important benefactors to how technology is used in the classroom. Fourth was technology, a collection of all the types of technology we encountered in our research.

As presented first in this chapter the four main categories are:

- Teacher
- Regulations
- Classroom
- Technology

5.3.1 Teacher

The teacher is the main denominator but there are different sources that influence how they act and react to the technology in the classroom. Education and ICT knowledge is the teachers' knowledge base. Time usage, quality of equipment and type of software are some of the challenges they encounter when working with technology. This all has a role in defining why teachers decide to use technology. The schools in our case study all had good equipment and the software worked as intended, most of the time. This makes it easier to use technology. Teachers told us that the state of the equipment available is important for deciding to use technology.

The teacher is the central figures in our research, a connection between technology and the class. From deciding the type of technology to use, the patterns of use that gives the most value and setting limits on how much use are important decisions during a day. The

educational background of the teacher can have an effect on how they handle the type of technology available at the school. Only one of the teachers in our research had prior education in the use of technology, however, this education is not necessarily representative of today`s modern technology. If we look at the ICT understanding of the teachers in our research, we find that they have more or less worked on their own to learn and keep themselves up to date.

The teachers understanding on how they use the technology can influence the "pattern of use". ICT understanding can have its impact on how the teacher thinks acts and chooses software. Teachers have vast verities of software available to choose from and can be a challenge for the teachers when they get to the point of choosing the right program. The teacher needs to take the students' knowledge base and their level of understanding into consideration. Choosing the right software can be a crucial step to get a good education.

Another factor that can have an impact on whether teachers decide to use technology or not is how much time they need to make everything work. Old, slow and faulty technology can have a negative effect on teachers and pupils and can make them less motivated to use it. Getting everything to work together can at times be a challenge and we need to look at this aspect as a contributing factor for a positive or negative effect. Having the right flow in the classroom is an important part of the teaching environment.

These subcategories from axial coding belong under teacher:

- Education
- ICT Knowledge
- Time usage
- Software
- Challenges

They belong under teacher because they all influence how teacher as a category answers our research questions. Every teacher in our case study had his or her reasons for using technology. They come from different backgrounds, different sex and age and they teach different classes. One of the teachers started on an ICT related education before switching to teachers, the rest all had the same background. They all have an interest and a huge motivation for using technology, and they shared a wish of learning more about the possibilities. Time usage, program or software and potential challenges are all things that the teacher need to take into account every day, and are parts of the use of technology. Together these factors are important when it comes to using technology, and how it influences the classroom teaching.

5.3.2 Regulations

Regulations are the representation of rules and regulations from the top of the chain to the bottom. The chain includes four parts; government, municipally, school and the teachers. Regulations are important for our research questions because they can work as a motivation for schools to invest into technology, and they will influence how technology is used. We

introduced requirements from UDIR and a test at 4th grade during chapter two and from analysing data these factors have proven to be important. Schools that work within a region that have made the test in 4th grade mandatory will need to work towards making sure their pupils pass the digital test. Once the technology is up and running they need teachers that know how to use it and the requirements from UDIR is a valuable guideline for this. All the teachers in our case study talked about the requirements in a good way saying that it is handy to have some guidelines to follow.

Like explained during case description all the schools we visited are investing into technology, some more than others, but they are all working towards it. The amount they get from the Kristiansand municipality does not go a long way in its own, and it can be a tough decision to invest into technology. The teachers we talked to were all happy with the schools commitment in using technology, only thing they wanted was more room for training.

These subcategories from axial coding belong under regulations:

- UDIR
- Commitment by the school

From the interviews, it became clear that UDIR plays an important role when it comes to the use of technology in primary schools. All the teachers knew about the requirements and they all mentioned the test in 4th grade as important to prepare for. Having guidelines to follow makes it easier to prepare the class, as the teachers know why the technology is important. This leads to how UDIR influences the impact technology has in the classroom. The pupils need to pass the requirements and there is specific ways of work to do that. When it comes to commitment by school, teachers told us that it is of great value that their schools are investing money into technology. They get new and exciting equipment to work with which can enhance the classroom teaching. Every piece of technology and the quality of this will influence the classroom teaching.

5.3.3 Classroom

The category classroom is where we look at how the size of the class, the teachers' role, software and the internet play its parts in the classroom. Classroom is a representation on how the class do they work, how the environment behave and how the use of technology relate to work tasks. Teachers tell us that giving the pupils a good work environment is important when using technology as an educational tool. The size of the class can give a new set of challenges for the teacher. If the class is too large and the amount of technological tools are too low, it forces the teacher to divide the class into smaller groups of 2-3 or into two groups that will get different work and swap during the next lesson. The teachers' role can play a great part in the flow and success of the lessons when using technology. Having the teacher guiding the pupils on how to work the technology, letting the pupils try to do the task themselves. Having control in the classroom and defining boundaries has a large impact for the learning experience and can give the pupils a better foundation for learning.

Using the right programs in class will motivate or demotivate the pupils to do their work. If the work they do is fun, they will be more motivated and learn better as long as they can do what they are supposed to. Programs that give feedback by playing videos, scoring or a verbal feedback have shown to be a good motivator in the classes we visited. Internet is something that a classroom today needs for accessing external sites, educational sites with programs, videos, songs and other material for use in the education. Internet is an important tool that effects how the technology can be used in the classroom.

From our findings, we could see that there is a difference in digital skill in class; this has an impact into patterns of use of technology. When you set up groups with two or three working together on the same iPad you need to make sure that they are on a similar level so they actually work together. Same goes for the SMART board, here it is best with groups where everyone is on a similar level. This adds to new challenges in a classroom. Some pupils might be used to both laptop and iPad from home, and will maybe have more experience. Teachers have told us after hearing from pupils that they have the same applications at home as in school. Mostly this is useful as it means they get more practice in, but can make a differentiation in the class.

These subcategories from axial coding belong under classroom:

- Class setup
- Class Size
- Pupil
- Teachers Role
- Program / Software
- Internet

All the teachers made it clear that many different factors influence how well technology fits into the classroom. The equipment these teachers use does not work just out of the box, and the way it can be used varies from classroom to classroom. All the teachers said that their role when technology enters the classroom is to guide the pupils in the right direction. Show them how it might be used and in later years show them not what to do. Internet adds for endless possibilities, the pupils need to be aware of the “power” behind this, but also the potential downsides. Teachers role is important, and this is part how technology influences the classroom teaching.

5.3.4 Technology

All the schools in our case study had the same technology. SMART board, iPad, Laptop or computer available in the classroom. All schools either had or had a computer lab under development. There was one pupil with a hearing impairment in one of the class so a microphone was used as a learning support.

SMART board offers many possibilities when it comes to use of technology and is one of the more important tools the teachers have in their arsenals. They tell us they use it for showing

videos, playing music and getting the class to interact with the different programs in front of the other pupils. Teachers tells us that the SMART board offers new and exciting ways for the pupils to learn the curriculum.

Anther technology that enhances the classroom teaching is iPads. Teachers tell us that iPads have great potential; it all comes down to the available applications. Finding the right applications to use in the different subjects, and making sure they work for different skill levels are important, but it can also be time consuming.

Teachers also mentioned the use laptop or computers, either in the classroom or at computer labs. They all said that it still has important value because there are tasks that you cannot do as well on an iPad. This mostly related to learning about Office programs like Microsoft Word, PowerPoint, Excel and so on. The use of this kind of software goes back to the requirements from UDIR. They need to work with the software in order to pass the right requirements for the different years.

One of the schools had earlier tried to have a computer lab with PCs; they had so much problems with it that they changed it to movable laptops. The problem they had was that sound or other things did not work perfectly on every PC when they wanted to use them. One of the teachers told us that it was like winning the lottery if everything worked. Teachers also told us that in the first grade it is not as important to be able to access the internet because most of the tasks the pupils are doing involve using pre-installed programs and doing tasks that do not require internet access.

These subcategories from axial coding belong under technology:

- SMART board
- iPad
- Laptop
- PC
- Other Technology
- Internet

Technology in primary schools is the core in this thesis. Finding schools that used SMART board, iPad and computers gave been very helpful in answering the research questions. Teachers having all this equipment available gave us important data to work on, and this is why they have been added as subcategories. Other technology like the use of microphone was an unexpected but nice surprise as it showed how technology offers solutions to a potential complex problem. The last subcategory is Internet; this is important as technology works better with a stable and fast connection up and running.

The most important finding in this category is the fact that technology enhances the classroom teaching. All the teachers in our case study were excited about the possibilities that technology offers, but also had restraints about overusing it. They could use technology as an reward, and take it away as an punishment. They could let pupils interact with the curriculum in new and exciting ways,

6. Discussion

During this chapter, we will break down each main category from findings, link it up to existing research and give specific move answers to our research questions. With all our findings analysed we have the right foundation for discussing this with relevant research and from there draw conclusions and make suggestions for future research in the same field.

We start it off with presenting the updated version of the model presented during findings. This model represents the findings from each step during the analyses, how this data is connected, and how it relates to the research questions. It is a graphical representation of how the analysed data links up with the research questions.

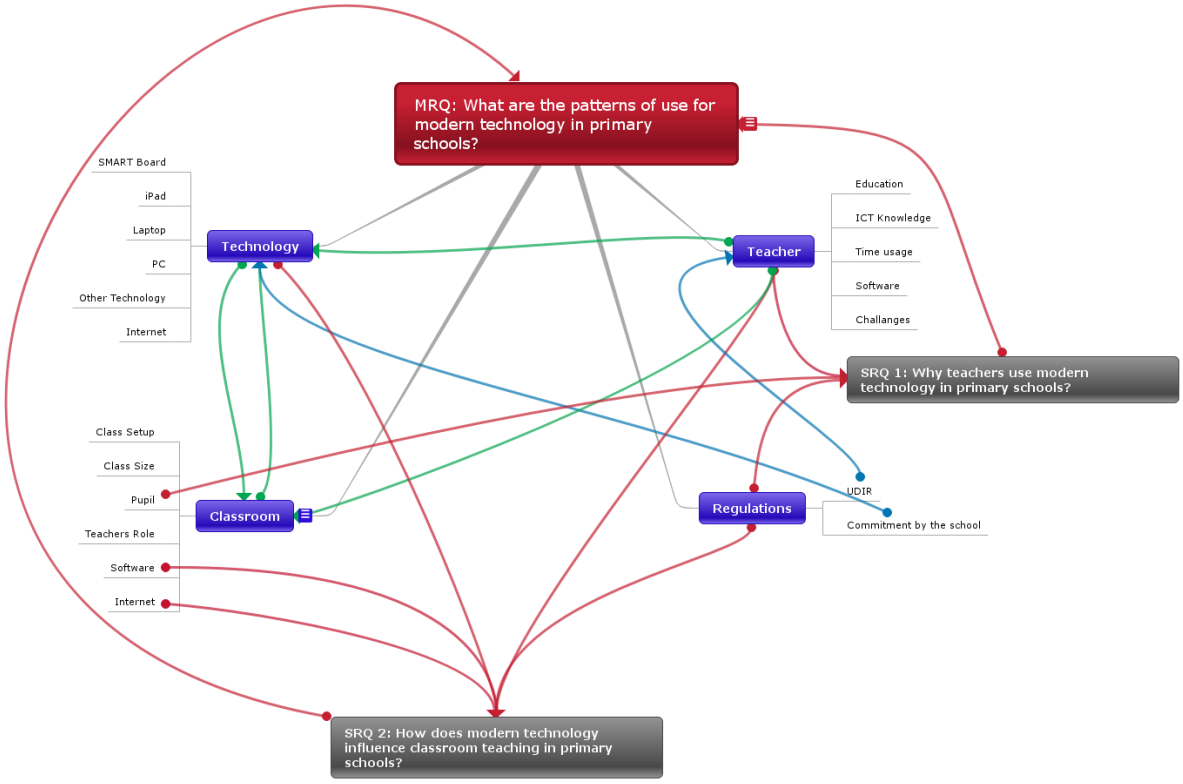

Figure 3 - Model for analysed and connected data

Explanation to the boxes:
Red: Main Research Question
Grey: Sub-Research Questions to main research question. The Sub-Research Questions helps in answering the main research question.
Blue: Main categories from the selective coding. Each main category has the subcategories from axial coding to add data.

Explanation to the links:
Red: Interaction with the research questions. Shows that the data found for answering the Sub-Research Questions also helps in answering in the main research questions. This also shows what subcategories and main categories that have direct impact on a Sub-Research Question.
Green: Interaction between main categories. Shows that main categories can influence each other.
Blue: Interaction between sub-categories and main categories. Show what subcategories can influence main categories.
Grey: Links the main categories to the main research question. Each main category is important in answering the main research question, as explained with these connections.

The model is relevant for this chapter as we now dig deeper into the sub-research questions. All the analysed data that are used for answering our research questions will be discussed with existing research and our own ideas and thoughts. Where the previous chapter contained facts from teachers and observations this chapter will take those facts and consider them for every possible angle.

6.1 SRQ 1: Why teachers use modern technology in primary schools?

For this part of the discussion, we look into why teachers should use modern technology in primary schools. It starts with looking into how teacher's education can be a factor, and then moves into topics that are related to their workplace. The information found in this part of the paper will be linked up with existing research, which covers more than just primary schools.

Two of our teachers had recently graduated from the University of Agder, and they told us that there was nothing preparing them for the use of technology in school during this education. In order to clarify these findings we looked at a typical teacher education for primary schools with some of the universities and high schools in Norway. We used a list given at utdanning.no(Senter for IKT i utdanningen, 2014) to find out who offers this education. As our research is done on primary schools we chose an education that focus on class from 1 – 7. Our research of this site showed us that none of the universities that we looked at had any technology or ICT educational courses. If this is because the schools do not have equipment or professors to train new primary school teachers is un-known, but shows that, our findings in the lack of education from our participants have a link. One of the teachers from our research told us that she studied at University of Agder, she got a verbal promise that they were going to be trained in SMART board. This never happened because no one could conduct the course for the teacher students.

We are able to confirm these findings with data from a report written in 2013 about, ICT in the teachers education:

"Vi observerer et stort mangfold i faglige tilnærminger og pedagogiske praksiser når det gjelder IKT ved lærestedene" (Tømte, Kårstein, & Olsen, 2013, p. 25)

ICT knowledge is not a priority in a teacher's education and is strange when looking at the guidelines given by UDIR. Teacher need to know how to teach pupils about the use of different programs and be able to use certain types of technology. This is why understanding a teacher's education and ICT knowledge leads to how they use technology in their classroom teachings. All schools from our research used SMART board and data collected from one of the biggest SMART board (Interactive Norway, 2015) distributes in Norway, this tells us that most of the schools in Norway have one or more SMART boards in their school. The reason why teachers do not have some part of ICT education in their study plan is hard to understand. How does this influence the way they use technology themselves? From our study, we uncovered that personal motivation and interest is a key factor behind their use of technology. All the teachers mentions that they are interested in technology in general, and how it can be used in the classroom. One of the teachers told us that he always liked to try out new technology from a personal perspective, and knew that if he did something wrong he would be able to fix it himself or get help from others. All leading back to how comfortable the teachers are with using technology, linking ICT knowledge and education to pattern of use.

All teachers told us that had to learn by themselves how technology worked when they got this introduced into the classroom. One of the teachers told she had a two-hour course where they explained the basis of the SMART board, but she had to learn the rest herself by trail an error. When they knew how to operate the SMART board they had to start on the task of finding the best software or sites for their classroom teaching.
In a report «iPad-prosjektet ved Myrene skole»*(Flaatten, 2013)* about how iPad was implemented and used in Myrene school. This report goes in to detail on how the students and teachers reacted and used their new iPad in the classroom teachings and how their way of working changed. One of their findings was how the teachers wanted more training in the use of iPad as an educational tool.

Most of the teachers from our research said that they would like a place where they and other teachers could share their experiences with each other. All the schools in our research had more than one 1stgrade class and they shared experiences with each other at the different schools. If a system connecting all the different schools in the municipality or even the country was something that they saw as a useful tool. This is also one more thing that would help teachers to change or better their technological pattern of use in their classroom teaching. www.delogbruk.no*(2015)* is one example of a site that could help the teachers reach this goal, they give teachers and other the possibility to share experience with other equilateral.

Like presented during findings all the schools we have visited during our case study are committed to technology in schools. Does a schools commitment work as a motivation into why teachers decide to use technology? For some teachers, definitely. A school that is

willing to invest into the right equipment can give the teachers the necessary push they need to implement technology to their classroom and teaching method. For others, it might not do any real change. The schools we visited did not force the technology on the teachers, it is still a free option to use, and as tempting as it might be to change this it is not likely that it would do any good. Technology needs to be used in the believe that it will do good, that it will have an positive impact in the classroom, that it is important for the pupils to learn, not because you would risk losing your job if you avoid it.

As presented during chapter 2, there exist a number of requirements to what pupils should know about technology after different classes. As part of our questions, we looked into if these requirements are a reason for using technology. While looking through our findings, the teachers' opinions about this comes forward, and we learned that it indeed does have an impact into why technology is used. Having some clear ideas of what they need to focus on while using technology seems to make their threshold for using technology lower. This clearly works as an extra reason or motivation to use technology. Teachers need the pupils to get used to it, to get comfortable with it, so that they will be able to learn the necessary parts each year.

A report from 2013, «Muligheter for bruk av iPad som hjelpemiddel for barn»(Thea Dihle, 2013) written by students at HIST (Høgskolen i Sør-Trøndelag) show us how the use of iPad can be used as an educational tool. How this can lead to a better understanding of the curriculum, playing and having fun can affect the outcome in the classroom teaching. How important it is to find the right type of programs to enhance the teaching experience down to each pupil in the class.

«Vi opplevde at barna vi møtte hadde ulike behov og derfor måtte kartlegges og vurderes individuelt for optimal læring.»(Thea Dihle, 2013, p. 7)

With iPad, teachers have the possibility to give the pupils different ways of learning any curriculum. Pupils with difficulties of hearing, reading or writing can get different programs to help them understand their curriculum and it can be a better learning experience for them. This all depends on how well the teacher knows the different programs they have available and their understanding of the technology.

Our research shows that teachers only have a basic understanding of the iPad and its use. The biggest challenge is findings programs that fits almost all, some pupils struggles with some part of the programs, when others find it to easy. Finding a solution to this problem can be a better understanding of what iPad have to offer. Teachers hoping for more coursing in the use of iPad and other technology. From the report about Myrene School(2013), they found that one central thing that kept accruing was the need for better training requested by the teachers.

SMART board is in some ways the keystone (or cornerstone) in the classrooms we observed. The teachers has found smart ways to use them, along with the more traditional ways of having presentation with PowerPoint or just simply displaying a task with using Word. In the fifth grade from our research, the teacher their told us that they had replaced the traditional white board and only have the SMART board available.

This quote from the report "Board or Bored"(2011) where they talk about how the interactive blackboard or SMART board is taking over the classrooms replacing the old blackboard they used before.

"Den interaktive tavlen ser ut til å erstatte den vanlige tavlen på mange måter fordi man kan undervise nesten på samme måte som tidligere. Elevene kan komme opp til tavlen for å presentere eller gjøre oppgaver. Det er også mulig for læreren å starte med en blank tavle og skrive på den etter hvert i løpet av timen, på samme måte som den tradisjonelle tavlen har vært brukt"(Egeberg & Wølner, 2011, p. 17)

SMART board gives them the same opportunities as the traditional blackboard; this is a reason why teachers can use SMART board as a modern technology.

From the first interview in this study, the ICT contact at Kristiansand municipality told us his views on the use of smart BOARD:

«Jeg tror at Smartboard har, bare for å ta den har vært en veldig positiv. Det har vært å få synlig teknologi inn i klasserommet det er så synlig at det nesten ikke går an å ignorere det. Og det handler igjen at det skapes da forventninger også i elevmassen om når at denne tavla til 25000-3500 kr så må de lære hvordan de skal bruke den. Så det har vært en god ting, kanskje det har ført til at barneskolelærerne hvert fall har tatt i bruk. I disse digitale tavlene så ligger det ofte sånne pedagogiske pakker, altså sånne aktuelle programmer» (ICT contact)

The ICT contact talks about SMART board as a positive and visible technology in the classroom, it is big and almost impossible to ignore. By implementing a big sized technology as a SMART board in the classroom, it can create an expectation from the pupils that everyone in the classroom get the possibility to learn how to use it. He tells us that by putting a SMART board in the classroom he hopes that this will trigger the teachers to learn about it. He will make technology available, but gives the teachers the choice to use it, more or less. This will help teachers to choose to start using SMART board in a classroom teaching.

Another aspect that can influence the reasons why teachers use modern technology is how much time they use for preparations like research into software, understanding how the technology works, new ways of using the technology as a beneficial part of the classroom teaching and how long it takes the teachers getting ready for a lesson. Teachers first need to get to know the technology, find out how it works and what it is capable of before they start using it. All teachers from our research told us that they had to use a lot of time finding software they could use in a teaching setting. One of the teachers told that this process is

something that can discourage some teachers from using some or all types of technology in their classroom teaching. From what the teachers in our research told us and what our observations gave us, it did not take long to have all technology ready before each lessons. With the SMART board simply being a board with a video canon connected to a computer as shown in this pamphlet (Interactive Norway, 2010) written by smartboard.no. Most of the teachers from our research kept the computer on at all times, only turning the video canon on at the beginning of the day and turning it off before going home each day. This way they could keep their programs running and be easy accessed every morning when they started a new lesson. To understand how this works can be a beneficial understanding for the teachers to understand, making it more appealing to use.

Regulations from UDIR states that all pupils in the fourth grade is going to be tested on their ICT knowledge, making it crucial for teachers to use technology in classroom teaching. Without technology, it would be hard for a teacher to enhance pupils ICT understanding and pupils would have a hard time passing this test. This is also an incentive for the teacher to use modern technology in a classroom teaching.

In order to develop digital skills amongst the pupils, technology needs to be given enough time and opportunities during a school year. In a report developed by Forsknings- og kompetansenettverk for IT i utdanning (ITU) named "ITU monitor : 2009 Skolens digitale tilstand"(2009) they look at the state of academic and pedagogical use in Norwegian primary- and secondary schools. In this report, they use three earlier reports from between 2003 - 2009 and give a foundation to show how ICT have changed since then. This quote tells us that to be able to use a computer both teachers and pupils have to develop their digital competence, where both time and opportunity to do it plays a crucial role.

"For at elever og lærere skal utvikle digital kompetanse er det en forutsetning at de har tid og mulighet til å bruke datamaskin. Norsk skole er på rett vei når det gjelder dekning av datamaskiner hos elevene, men enkelte skoler opplever at det ikke er nok maskinkapasitet eller god nok infrastruktur for å kunne oppfylle læringsmål»(Forsknings- og kompetansenettverk for IT i utdanning, 2009, p. 6)

They state that not all schools in Norway have the infrastructure needed to fulfill these goals. From our study, all classrooms had both the infrastructure and equipment to be able to fulfill goals set by UDIR to enhance digital competence. Most of the teachers in our case study felt that they had both the necessary infrastructure and time needed to make sure they would reach their goals. All the schools have designated computer labs (first school is in the process of setting one up). For the two first grade classes that we visited who already have this room ready, they use it for 1 hour each week to enhance their pupils' digital competence. The task they work on in the computer lab was tasks directly linked with the requirements given from UDIR.

The Norwegian company Aschehoug have developed a web portal named lokus.no(2015) with digital learning material for primary- and secondary school teaching can be found.

Aschehoug sell products that the teachers can access different products, products that teachers can used on SMART board, iPads and computers. The products have a focus on teaching, and many of them have the possibility to let pupils interact, they can play “games” and learn by doing. For the schools from our research they all had access to a package of programs licence provided by Kristiansand municipality. Our research found that all teachers used the same types of provided programs and gave them an ability to use tools, technology like SMART board, iPads and computers, in a fun and attractive way in their classroom teaching. This is a direct link between why a teacher would use technology in their classroom at all, giving them a broader ability to convey their curriculum.

6.2 SRQ 2: How does modern technology influence classroom teaching?

Modern technology can affect the classroom teaching in many different ways, depending on how it is used. Access to the internet, good software, having regulations to follow, how the teachers use the technology and how the pupils react to it. These are all points that needs to be considered while looking at the effects.

A research report “Klasserommets praksisformer etter Reform 97”(Klette & Universitetet i Oslo Pedagogisk, 2003) gives us an understanding on how classroom teaching is normally conducted in Norwegian schools. With a deeper understanding on how different practises influence the classroom learning.

Most of our research conducted within the first grade showed us that all classes used the same practises in the classroom. At the beginning of each lesson they started by sitting together in a what we call in Norwegian “samlingskrok” as shown in Figure 4 - Samlingskrok, is an sitting area with benches or chairs assign fixed seating’s for all pupils.

Figure 4 - Samlingskrok

This area was always located in front of a SMART board, giving teachers the ability to show information and not only tell their class about it. This makes it easier to present information by telling and showing it on their SMART board, using technology as a tool for presenting different information to everyone at once. Teachers told us that by using technology it was easier to keep the pupils focus, using it as an incentive for them to keep their minds on the task at hand. Pupils knew that if they were chosen, they would be able to go up to the SMART board and use it in front of the class. This incentive showed to be strong in the first grade, even in the fifth grade this incentive made the class work quietly, organized and productive. Some would think if this is a right way of utilizing technology in class, but we think that the effect of a quiet, organized and productive class speaks for itself. It is important to keep in mind that not all days are the same and problems may occur, but on the bases of our research, use of SMART board helps keep focus on the lesson.

In the classroom, using different practices can yield to their own effect on how the lesson will turn out. The way a teacher divide the class into groups or give separate tasks to be solve. In the report, "Klasserommets praksisformer etter Reform 97"(2003) Klette talks about what the normal work practices in Norwegian schools are, talking about work sessions, individual work or group work. Some activities are more fun related, working in both the classroom and outdoors.

«Småskoletrinnet er kjennetegnet av aktiv og relativt systematisk bruk av de ulike fysiske læringssonene. Helklasseaktiviteter som gjennomgang av et tema, formidling av nytt fagstoff og spørsmål – svar sekvenser skjedde stort sett i samlingskrok eller sofakrok. Arbeidsøkter, individuelt eller i gruppe, ble lagt til arbeidsbordene, mens ulike typer mer lekpregede aktiviteter var lagt til aktivitetskrokene, eventuelt tilliggende uteareal.»(Klette & Universitetet i Oslo Pedagogisk, 2003, p. 45)

First, the lessons always started with information in the "samlingskrok" then they often were divided into groups. All our observations showed that group work was one of the most used form of practises. Two or more children working together on the same device, solving the task as a team. Most of the time this worked like a charm, but if one child in the group had a stronger personality or could not focus this effected the rest of the group, sometimes even other groups.

«Noen lærere har elevenes fulle oppmerksomhet, mens andre strever med å gjennomføre undervisningen. De fleste lærere opplever en kombinasjon av begge deler; noen timer er rolige, mens andre er fulle av støy og uro. Noen lærere har høy toleranse for uro og støy og opplever det som «kunnskapsstøy» når elevene prater i timene, samarbeider om oppgaver og stiller spørsmål. En annen lærer vil oppleve den samme situasjonen som problematisk og utmattende.»(Duesund, Stray, & Bjørnestad, 2014, p. 149)

When pupils use technology, it can lead to a higher noise level in the classroom. Even if this noise occur, it is often defined as educational noise. It is important not to make this flourish into something that can interrupt the workflow in the classroom. The way pupils behave can

deviate at times and this is when a determent teacher should step in and take control. By disarming any situation before it can escalate into something that can influence the class in any way. First grade teachers often have a higher tolerance for educational noise then in the fifth grade, depending on the teacher's ability to control the class. Children in the fifth grade have more experience in the classroom and what is expected, making them act in a more mature way.

Therefore, to have a successful work environment you need a teacher that can control the classroom. This shows us that technology on itself is not a winning factor, but a combination between controlling, planning and use of technology in the right way are all linked together.

With this in mind, the results from our research shows that the noise level in the classroom varied from almost nothing to high educational noise. Independent work or working in groups with an iPad showed us that higher level of noise was present when they worked in groups than individually.

We found direct links between software and the effect it has on the classroom teaching. Features like interaction, reading and listening are examples on what technology and software can offer the pupils. These links provides the pupils another ways to work with educational data, giving more pupils the chance to learn the learning material.
In the book "New Achievements in Technology Education and Development" (2010)edited by Safeeullah Soomro, it mentions courseware as the educational software and how it interacts with pupils.

"It is possible to find courseware addressed to students of all the ages: from primary school students to university students. Normally, due to their aim, these products present information and establish a sort of dialogue with students, asking questions and giving immediate feedback. Through the time such type of products have been expanded adding topics, knowledge improvements and in many cases have been organized in order to be used during entire courses and integrated in the curricula."(Soomro, 2010, p. 313)

Software should be intuitive, easy to use and fun for the pupils to use, giving them an incentive to work with the data provided. If the software setup is hard to understand or use it can have a reverse effect on the pupils. In addition, if it is too easy it can have a contradictory effect. The first thing a person see when turning on any type of technology is the software's representation of the technology, giving the user access to the technologies capabilities. Any restrictions in the technology will reflect on what the software is able to do.

Children in the first grade are very impressionable making the way pupils are able to interact with the technology very important. For the pupils to be able to use more than one of their senses like touching, hearing and reading are key point. In some cases even, give pupil with certain restraints a software that fits their needs, changing the everyday experience into a fun learning environment, making them strive and want to learn.

Functions that are available via software can make technology more fun when pupils are able to move around images, texts and sounds and make their own representation of how they interpret the curriculum, than present it in to the class. All these possibilities give pupils more room for growth, making it more fun to work with the material they are learning. The software is the source that make it all workable for the pupils, not the technology alone.

In our research we followed a fifth grade class when they were using Book Creator(Red Jumper Limited, 2015), a program for iPads, delivered via iTunes, which they can use to make their own representation of, in this case, Ancient Greece. They collected images, wrote texts, made videos, and put all collected data together into a personal representation of the curriculum. During the work-process, pupils were talking to each other about how to locate images and what text they had found on the internet. The classroom was very quiet; the occasional chatter between pupils only interrupted the silence. At the end of this session, a couple of pupils was able to present what they had made, this happened in front of the whole class. All pupils in this class knew about this chance and it gave them something to strive for, a kind of reward. The whole process encourage the pupils to be creative, opening the possibility to have their own independent interpretation of the curriculum. During one of our interviews, we asked the teacher in this class if she would be able to do this without the technology, and the answer was not unexpected. She said that it was possible to do this type of work with paper and scissors, but it would take much longer to complete and the noise level would be higher.

Another example from our research shows how a short videos and popups in the software could trigger the pupils in the first grade to make the right choices within the program. One of the tasks the pupil had to do was using a SMART board to solve math problems. If they made the right answers, a cartoon video popped up, playing a short video of a robot, space man or a princess, and they just loved it every time. This only happened if they got the right answers, triggering them to make the right choices as many times as possible, giving them an incentive to know the curriculum at hand. Just by showing a 5 sec cartoon video made a huge difference in the learning experience for the 6-year-old children. By utilizing the technologies functions, it triggered the user to learn.

One teacher told us that when the internet access was slow or was down they had to use other ways of conveying the curriculum, internet was a crucial part of the day-to-day usage of technology in the classroom. All SMART board used in our research have a direct connection to Kristiansand municipality LAN with access to the internet. LAN(E-Commerce, 2002) is an acronym for Local Area Network, this is a network confined to a group of clients or a type of organization, these schools all technology are connected to Kristiansand municipality`s network. Without direct LAN access they would not be able to use much of the software, most of it needs to be able to access internet in some way. They have the ability to access sites like Youtube, LOTUS and other external sources makes it abundantly clear that without internet, this would not be possible. Pupils can search the internet for information, upload projects to the apple cloud and look at images, these are all features that most of the pupils use. Two of the interviewee told us that they thought that the

internet speed was slow, wanting a faster connection to the internet. Having to wait a long time for the programs to load, in some cases it took so long that the children in the class started losing focus.

With internet access, ethical dilemmas can occur when looking at how the technology is used. Internet is in itself is not controlled and pupils and teachers can access almost any type of data on it. This puts a pressure on teachers to inform and uphold a set of rules that pupils need to abide by.

«Når vi skal tilby Internett til barn og unge, er det viktig at vi er klar over og tar hensyn til den dobbeltheten som ligger i dette mediet. På den ene siden kan "verden online" gi barn opplevelser som både er morsomme og lærerike, og som kanskje kan bidra til å gjøre skolen og læringssituasjonen bedre. På den andre siden kan det nye mediet plassere barn i utrygge og lite ønskelige situasjoner.» (Hauge, Hagedal, & Nasjonalt, 2000, p. 7)

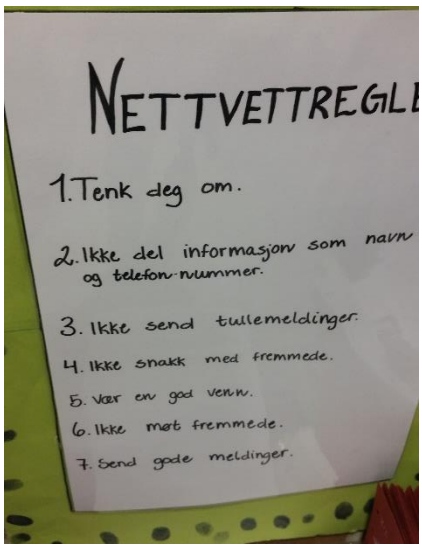

Figure 5 - Nettvettregler

When the teacher make internet available to pupils it can have its drawbacks, but with a set of rules they can giving their pupils to telling them how to behave on the internet, only give internet access to those that agree to the rules provided. If a pupil do not abide by these rules, that pupil will lose their right to access the internet or even use the technology for a period. In one of our observations we found a list of rules that all the pupils had to oblige to before they could use any type of technology to access the internet. Figure 5 - Nettvettregler shows a set of rules that this class had to agree to before getting access to the internet. Every pupil had put their thumbprint on this rule set, making it a more personal and important contract between everyone. The pupils got a paper of these rules that they would take home and make the parents and pupil to read through, signing it together and delivering it back to the teacher before getting access. Pupils even told the teacher if they saw anyone braking these rules. This teacher did this because she wanted the pupils to see how important the using the internet can be when used in a good way and not abuse. The essence of the rules are about thinking before doing thing on the internet and not sharing personal information like phone numbers and name to strangers, to be a good friend, only send positive massages and not to talk to anyone they do not know. This is information a child often get from their parents on how act in the real world, but these rules also applies when using the internet.

These rules are something that all teachers have to use in all the schools in Kristiansand, in cases of bullying on the internet, these rules will be a guideline on how the school want the pupils to interact with each other. In a thesis written by Lisbeth Haugerud(Haugerud, 2011) she found that 64,7% of the pupils say they use the internet at school almost every day, 92,1% use internet at home almost every day. Internet bullying often happened in the

afternoon (5%) and in the evening (5%), only 0.7% of internet bullying happened at school. This show us that internet is a big part of a person's life, making schools a good place to include these rules into their teaching. The low results of internet bullying at school can be a direct effect of the rules pupils have their.

Internet have many applications that effect the technology and its use in primary schools, from the ability to access sites and programs to effect pupils and their way of using it.

Regulations from the government, UDIR, have made the use of technology in the classroom a central part of the educational learning. Pupils have to have a base knowledge on how to use different programs and features, all listed in on www.iktplan.no(2015). This opened up a need for technology in the classroom. With the new guidelines, the municipalities received money from the government to upgrade schools in the area with technology and infrastructure. Opening a new field of possibilities and new challenges. Every school had to make their own rules to fit the new technology. By training the teachers, getting them up to par became a new challenge that the schools now had to address, making a direct impact on how the technology would influence the classroom teaching. If the teacher only have a spotted understanding of how the technology work, it will be a hard thing to implement into the teaching, and pupils are the ones suffering at the end. Rules and regulations show a direct effect on how the use of technology in a classroom teaching. At the bottom line, knowledge of the technology effect how efficient the pupils are able to use it and what they can learn from it.

The ability to use technology in the classroom have opened up for bigger diversities of possibilities to schools, teachers and pupils. This open new ways of learning and making, the day-to-day education more diverse and interesting, putting more pressure on the teacher to keep up with the technological advances.

6.3. What are the patterns of use for modern technology in primary schools?

Why teachers use technology, and how it effects the classroom teaching is part of what creates patterns. Without good reasons to use technology, and if there is no positive effect from technology, we cannot expect any use and thereby no patterns. So, when both of these things are established, what patterns have we learned exist?

Ways to use SMART board in primary school:

- Present data, tasks, online search results, pictures, videos
- Pupils can present their work
- Pupils can Interact with software, easy example
- Useful web pages and programs developed by companies, available via licence

Easy put the SMART board is simply a computer so any patterns that exist on a computer can exist with the SMART board. The potential lies in software that let pupils interact, and software that captures the attention of the class.

Ways to use computer in primary school:

- Practice how to log in, learning the value of username and password
- Learning the value of internet as a tool for obtaining knowledge
- Learning to use the programs that will be important in later stages of school, typical "Office programs".
- Use LMS like itslearning to send private messages to each other, or mails to the teacher for easier communication.

Ways to use iPad in primary school:

- The possibility to create products thanks to applications
- Practice many different skills thanks to applications
- Sharing data collected over a cloud solution
- Use iPad like you would use a computer to search for data online

The use of iPads in school is on the rise in Norway, and we have looked into other projects to see what they have to say. In Bærum municipality three secondary schools all started on a rather large iPad project uncovering similar results to what we found. Even if this is from a secondary school the findings are still relevant as the possibilities behind a iPad is the same everywhere.

"Det har blitt enklere å organisere lærestoffet og det er lettere å finne svar på ting de lurer på faglig ved at de har lett tilgang til Internett. Det er lett å dele erfaringer med ulike løsninger med 57 hverandre når alle har hver sin iPad.»(Kongsgården, 2014, pp. 56-57)

Another project was also in Bærum municipality, but this time on a first class. We can also here find similar experiences and patterns of use:

"Användningen av lärplattor i det dagliga arbetet är både självklart och utvecklande. Elevernas möjligheter att själv hitta en nivå som är utmanande men ändå möjlig att klara av, framför allt i matematik, skapar ett aktivt och delvis elevstyrt lärande. I norsk och engelsk används lärplattor för att förstärka den traditionella undervisningen men också med nya arbetsmetoder och ett pedagogiskt nytänkande." (Östling, 2014, p. 3)

From our first sub-research question, we learned that UDIR plays an important role when it comes to why teachers decide to use technology. This is linked up with the teacher's digital competence, interest into technology and last but not least the personal motivation. In order for the teacher to be able to use technology, the right equipment is a crucial factor, slow or faulty equipment will not be used. Finding the right software contributes to a better chance for success. Having colleagues that you can share your experiences with is highly appreciated, it makes it easier to learn more about what works, and on the other hand, does not work.

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From the second sub-research question, we learned that technology could have a number of different effects on classroom teaching. Keeping the focus from the pupils are one of them, using SMART board to entertain and interact with the pupils have been an important discovery. How the teacher used it to keep the educational focus of the class by giving them the incentive that they had the ability to go up in front of the class and interact with the SMART board. Using SMART board this way gave both teachers and pupils a better work environment. Lack of iPad units forced the teacher to divide the class into groups, 2 or more in a group working together. This is also a pattern of use, teamwork and sharing the technology, making room for a different way of learning. The quality of the software used enticed and triggered the user to work on the technology. Software having more than one difficulty level to accommodate different needs, making it usable for a bigger percent of the class.

7. Conclusion

As we now have discussed our research questions in detail from our own findings and existing research we can finally draw a conclusion. It has become clear that it exist many potential patterns, but that the use follows quite clear instructions and are partly decided by a few key elements:

- The teacher's digital competence
- The teacher's interest and motivation
- The technology available and the quality of this equipment
- Requirements from UDIR
- National test at 4th grade
- Class size and setup
- Infrastructure in the school to guarantee uptime and speed when it comes to internet access

So what decides the patterns and determines the effects? Anything that makes sure the pupils learn to do what the requirements from UDIR tell them to do, and that they get a passing score at the national test at 4th grade. Is this a bad thing? Not at all. It means that the teachers know why to use technology, and how it needs to be used in their classrooms. The biggest challenge with achieving this is having motivated teachers, desirable with also an interest in technology.

Our case study gives a good insight into how technology can be used in primary schools. In addition, the study shows why teachers should use technology and what motivates them to use technology. The findings in this report can be useful for schools that have not yet taken the leap into technology, as it shows what they can achieve, how they can achieve it and some critical steps to make it successful.

The class setup plays an important part when it comes to how technology works in the classroom. From observation, we have seen how the patterns can change just within the same hour, going from different ways of working alone to working in groups. Technology like SMART board can create a unique calm over the classroom as pupils focus on a screen with "live" content compared to a black board. Working with iPads, both alone and in group, lets the pupils play games and discover material in a new and exciting way. This is a powerful "tool" for the teacher as it can be used as both a reward for good behaviour, and a punishment (losing access) with bad behaviour.

For schools that are considering taking the jump into technology we would recommend finding the motivated teachers, the one with interest for technology and make sure they get a saying in the situation.

7.1 Suggestions for future research

Even with all the research that has been conducted in this field so far, there is plenty of room for more to come. From this case study one could consider doing research into these different topics:

- Take at least two secondary schools, one where the pupils come from primary schools where they have used technology like SMART board and tablets on a regular basic, and one where this was not common tools. Compare how comfortable the pupils are with technology, their digital skills, and how technology fits into the teaching. It would be interesting to look into how much effect it can have to establish technology as part of the school already in primary schools.
- Do a study to learn how schools decide what kind of applications to install on their tablets. Look into what the deciding factors for choosing software is, and where the responsibility lies. One could also look into the different municipality to see how many of them offers the schools access to software for SMART boards, like Lokus.
- One could take an opposite direction from what this case study does and look into why teachers decide not to use technology if they have it available. It could give valuable information for schools to see what needs to be changed in order for their investment into technology to actually be beneficial for the pupils.
- Do a research where the focus is on the pupils in primary schools instead of the teachers. Do this to learn more about how they feel about the possibility to use technology.

Especially doing a research on the pupils to learn more about what they think of technology would be valuable in this field. For us the teachers have been the focus, so it would be possible to take the findings from this report and link it up with findings from the pupils view.

7.2 Personal reflection

The road to complete a case study can have many challenges and interesting moments. Minor challenges that just causes a delay in the time schedule, or moments that make you realise that you are doing something important. Working on this thesis we have faced both challenges and had moments that helped formed our view on technology and schools. To start with the challenges they were mainly related to time delays. Teachers have a busy schedule with planning, meetings, courses, holidays and this lead to one of the interview and observation to be conducted a good while after the others. For some case studies this might have turned into a problem, but since we were following a grounded theory approach when it came to analysing the data it gave us the opportunity to form the last interview and observation from what we had already uncovered during analyses.

Another challenge we faced is the difficulty with creating the right structure for your paper, to present the information in a way that makes it easier to read. We have all read dozens of research papers, some are easy to read while others just make you want to give up without learning anything. The structure in this paper changed many times from the start to the end, and this is a time consuming task. We believe that in the end we came up with a structure that gives the reader an explanation into the research process, the reason for going with a qualitative method, how data was analysed and finally an interesting discussion to answer the research questions.

Along with changes to structure is all the text production that ends up being discarded. As first time researchers it can be a challenge to know exactly what you will need so we ended up creating more written text than necessary. This is all part of the learning process for a paper of this magnitude.

One of the turning point for us while conducting the interviews was to witness how engaged and excited teachers where about technology, both young and old. It became clear that these teachers had all seen what kind of positive addition technology could give to a classroom, and they all wanted to both learn more, and use it more. This gave us an extra motivational boost, seeing that the work we were doing could have real life impact for teachers everywhere.

All in all working with this thesis have been a journey. It has had its rough patches, but we are grateful for the opportunity to be do research into this important field.

References

Aschehoug. (2015). Velkommen til Aschehougs portal for digitale læremidler - grunnskole og videregående skole. from http://www.lokus.no/

Bratvold, E., & Kyrkjebø, F. (2011). IKT i skulen: kva, kven, korleis og kvifor.[Leikanger]: Digitalt skulesamarbeid i Sogn og Fjordane.

Corbin, J. M., & Strauss, A. L. (2015). *Basics of qualitative research : techniques and procedures for developing grounded theory* (4th ed. ed.). Thousand Oaks, Calif: Sage.

Creswell, J. W. (2014). *Research design : qualitative, quantitative, and mixed methods approaches* (4th ed. ed.). Los Angeles, Calif: SAGE.

Duesund, L., Stray, J. H., & Bjørnestad, E. (2014). Uro i skolen. *Norsk pedagogisk tidsskrift, 98 ER*(03), 149-151.

E-Commerce, G. E. o. (2002). Local Area Network (LAN). Retrieved May 22, 2015, from Encyclopedia.com: http://www.encyclopedia.com/doc/1G2-3405300291.html

Egeberg, G., Gudmundsdottir, G. B., Hatlevik, O. E., Ottestad, G., Skaug, J. H., & Tømte, K. (2013). Monitor skolen 2013 - Om digital kompetanse og erfaring med bruk av IKT i skolen *Skolens digitale tilstand [The Digital State of Affairs in Norwegian Schools]. Oslo: The Norwegian centre for ICT in Education*. http://www.iktsenteret.no.

Egeberg, G., & Wølner, T. A. (2011). Board or bored Sluttrapport. iktsenteret.no: Senter for IKT i utdanningen.

Flaatten, S. V., ; Porsgrunn PPT. (2013). *iPad-prosjektet ved Myrene skole*. Porsgrunn kommune: Porsgrunn kommune.

Forsknings- og kompetansenettverk for I.T. i utdanning. (2005). Digital skole hver dag - om helhetlig utvikling av digital kompetanse i grunnopplæringen. Oslo: Forsknings- og kompetansenettverk for IT i utdanning.

Forsknings- og kompetansenettverk for IT i utdanning. (2009). *ITU monitor : 2009 Skolens digitale tilstand*. Oslo: Forsknings- og kompetansenettverk for IT i utdanning.

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory : strategies for qualitative research*. New York: Aldine de Gruyter.

Hauge, T., Hagedal, M. S., & Nasjonalt, l. (2000). Internett i skolen : etikk og jus. Oslo: Nasjonalt læremiddelsenter.

Haugerud, L. (2011). Elevers erfaringer med digital mobbing, og mulige konsekvenser dette kan ha for elevenes selvoppfatning og psykiske helse. In A. T. Klomsten & F. F. S. O. T. P. I. Norges Teknisk-Naturvitenskapelige Universitet (Eds.): Norges teknisk-naturvitenskapelige universitet, Fakultet for samfunnsvitenskap og teknologiledelse, Pedagogisk institutt.

Interactive Norway. (2010). Kort brukerveiledning for Smartboard *uia.no*: Odd Erik Pedersen.

Interactive Norway. (2015). SMART Board – Verdens mest solgte interaktive tavle! , from http://smartboard.no/

Klette, K., & Universitetet i Oslo Pedagogisk, f. (2003). Klasserommets praksisformer etter Reform 97Evaluering av Reform 97. Oslo: Pedagogisk forskningsinstitutt.

Kongsgården, P. (2014). Digital didaktikk – bedre læring med nettbrett (74 ed.). hit.no.

Krumsvik, J. R. (2007). *Skulen og den digitale læringsrevolusjonen*. Oslo: Universitetsforl.

Krumsvik, J. R., Egelandsdal, K., Sarastuen, K. N., Jones, Ø. L., & Eikeland, J. O. (2013). Sammenhengen mellom IKT -bruk og læringsutbytte (SMIL) i videregående opplæring (pp. 395).

MARSHALL, G. (1998). overt participant observation. *A Dictionary of Sociology* Retrieved May 21, 2015, from Encyclopedia.com: http://www.encyclopedia.com/doc/1O88-overtparticipantobservatn.html

Oppvekst Pedagogisk senter. (2010). Felles system for kartleggingspraksis i grunnskolen (pp. 40). Kristiansand: Kristiansand Kommune.

Orlikowski, W. J., & Baroudi, J. J. (1991). Studying Information Technology in Organizations: Research Approaches and Assumptions. *2*(1), 1-28. doi: 10.1287/isre.2.1.1

Ottestad, G., & Universitetet i Oslo Institutt for lærerutdanning og skoleforskning. (2014). Digitale ferdigheter for alle? : norske resultater fra ICILS 2013. Oslo: Senter for IKT i utdanningen UiO, Institutt for lærerutdanning og skoleforskning.

Red Jumper Limited. (2015). Book Creator for iPad - create ebooks and pdfs, publish to iBooks. Retrieved May 10, 2015, from https://itunes.apple.com/us/app/book-creator-for-ipad-create/id442378070?mt=8

Senter for IKT i utdanningen. (2014). Grunnskolelærerutdanning 1.-7., from https://utdanning.no/studiebeskrivelse/grunnskolelaererutdanning_1.-7.

Senter for IKT i utdanningen. (2015). Velkommen til Senter for IKT i utdanningens plan for øving av digitale ferdigheter i grunnskolen. Retrieved 07.03.2015, 2015, from www.iktplan.no

Soomro, S. (Ed.). (2010). *New Achievements in Technology Education and Development*. intechopen.com: InTech.

Statistisk Sentralbyrå. (2014). Bruk av IKT i husholdningene, 2014, 2. kvartal. from https://www.ssb.no/ikthus/

Techterms.com. (2015). The definition of IT defined and explained in simple language. Retrieved May 31, 2015, from http://techterms.com/definition/it

Thea Dihle, M. S. D., Anne Berit Eik, Lise Høiberg og Stine Terese Vatne. (2013). *Muligheter for bruk av iPad som hjelpemiddel for barn*. Høgskolen i Sør- Trøndelag: Høgskolen i Sør- Trøndelag, avdeling for Helse – og sosialfag, bachelor i ergoterapi.

Tømte, C., Kårstein, A., & Olsen, D. (2013). IKT i lærerutdanningen: På vei mot profesjonsfaglig digital kompetanse? *Oslo, Norway: NIFU* (pp. 62).

Urquhart, C., Lehmann, H., & Myers, M. D. (2010). Putting the 'theory' back into grounded theory: guidelines for grounded theory studies in information systems. *Inf. Syst. J., 20*(4), 357-381. doi: 10.1111/j.1365-2575.2009.00328.x

Utdanningsdirektoratet. (2006). *Kunnskapsløftet - Læreplan for grunnskolen og videregående opplæring*. http://www.udir.no: Utdannings- og Forskningsdepartementet.

Utdanningsdirektoratet. (2014). *Veiledning til lærer - kartleggingsprøve i digitale ferdigheter 4.trinn*. http://www.udir.no/vurdering/kartlegging-gs/#Digitale-ferdigheter: Utdanningsdirektoratet.

Utdanningsdirektoratet. (2015a). Om Utdanningsdirektoratet. Retrieved May 31, 2015, from http://www.udir.no/no/Stottemeny/Om-direktoratet/

Utdanningsdirektoratet. (2015b). Udir.no - Kartlegging grunnskole. from http://www.udir.no/vurdering/kartlegging-gs/#Bekymringsgrense

Walsham, G. (1993). *Interpreting information systems in organizations*. Chichester: Wiley.

Walsham, G. (2006). Doing interpretive research. *European Journal of Information Systems, 15*(3), 320-330. doi: 10.1057/palgrave.ejis.3000589

Wengraf, T. (2001). *Qualitative research interviewing: Biographic narrative and semi-structured methods*: Sage.

Wiig, I. K. (2015). deleogbruk.no - samarbeid - utdanning - kompetanse. Retrieved May 27, 2015, from http://delogbruk.no/

Wolfswinkel, J. F., Furtmueller, E., & Wilderom, C. P. M. (2013). Using grounded theory as a method for rigorously reviewing literature. *European Journal of Information Systems, 22*(1), 45-55. doi: 10.1057/ejis.2011.51

Östling, M. (2014). 1. trinn – iPad som digitalt læremiddel. https://baerumskolen.files.wordpress.com/.

Attatchments

ATTACHMENT 01 - INFORMASJONSBREV

Informasjonsbrev

Vi er to studenter fra Universitetet i Agder som holder på med en masteroppgave innen Informasjonssystemer. Via kontakt med skolen din fikk vi tilbakemelding at du ønsket å være med på ett samarbeid til vår masteroppgave, og det setter vi stor pris på.

Det vi ønsker å finne ut er hvilke bruksmønster det er til den teknologien dere har tilgjengelig, og hvordan den blir brukt. Vi ser først og fremst på hva slags teknologi det er snakk om, på hvilke måter denne teknologien blir brukt og eventuelt ikke blir brukt i et undervisnings perspektiv. Vi knytter dette så opp mot de konkrete målene som er gitt på www.iktplan.no der det står hva en elev bør kunne på de ulike trinn. Vi vil prøve å få en oversikt på hvilke kunnskapsnivåer lærere har i henhold til å bruke teknologien som er tilgjengelig i skolen. Dette vil vi gjøre ved å gjennomfør intervjuer lærere og observasjoner i undervisningen.

For å best mulig gjennomføre en slik oppgave ønsker vi å dele undersøkelser inn i tre deler. **Intervju** - **observasjon** - **intervju**.

Første intervju: Komme i kontakt med deg som person og spør rundt din bruk av teknologi i undervisningen og hvilken erfaring du har med teknologi. Danne en forståelse for hvilke retningslinjer som er gitt fra skolen til deg som lærer, samt hvilke opplæring du har gjennomført før du begynte å bruke teknologien i undervisningen.

Observasjon: Vi ønsker å sitte inn i undervisningen for å se hvordan du bruker teknologi i en dag til dag undervisning. For å få mest mulig ut av en observasjon må det ligge grunnlag for at teknologi blir brukt i timen vi observerer. Det er ønskelig at det ikke blir satt noe ekstra ordinær undervisning når vi observerer, ettersom vi ønsker å se den vanlige bruken av teknologiske hjelpemiddel

Andre intervju: Vi ønsker å ha et nytt intervju etter gjennomført observasjon for å reflektere rundt de ulike bruksområdene og hvordan teknologien ble brukt. Vi ønsker da å gå gjennom det vi observerte, se på de bruksmønstrene som forekommer og eventuelt se etter andre måter teknologien kan bruke på.

Med informasjonen vi samler inn så vil vi prøve å finne de forskjellige bruksmønstrene som forekommer i barneskolene og se hvordan dette svarer på kravene til regjeringen sin retningslinjer. Alle intervju og observasjoner vil være anonyme, dataen som blir samlet inn vil bli brukt i en sammenheng som gjør det umulig å identifisere den enkelte lærer eller arbeids plass.

Har du spørsmål er det bare å ta kontakt.

Christoffer Hvolbæk
Mob: 96 999 666
E-post: Christoffer.Steinsland.Hvolbak@kristiansand.kommune.no

Thomas Strømmen Ask
Mob: 90 820 372
E-post: thomas.ask@outlook.com

ATTACHMENT 02 - INTERVIEW WITH ICT CONTACT!

Introduksjoner (Maks 5 minutter)

1. Hvem vi er.
    - Master oppgave på UiA, informasjonssystemer.
    - Våre tanker er å finne ut bruksmønster av den tilgjengelige teknologien i barneskolen, med fokus på læreren.
    - Først et Intervju med læreren, så observasjon i undervisningen, så et nytt intervju som er åpent hvor vi snakker om hvordan undervisningen ble gjennomført.
    - Vi har snakke med Hånes skole hvor vi har fått Geir Birkeland som kontakt person med et team på 3 lærere på første trinn. På V skole har vi fått tilbake melding fra Magne Sørbø om at vi kan snakke med Mathias Svindland (5-7Klasse) og Vidar Opedal (1-4Klasse). Jobber med å få til en avtale med dem.
    - Kikket på IKTplan.no og SMIL ☺ rapporten
2. Hvem er du og hva er din rolle i oppvekstsektoren i Kristiansand kommune?

Intervju

3. Et tema som bruksmønster av teknologi er det noe som vil være interessant for dere å lære mer om?
4. Hva er den største utfordring av å være pådriver av pedagogisk bruk av IKT i skoler og barnehager i Kristiansand? Hvor møter du den største motstanden?
    - Er det de som levere pengene, altså politikere.
    - Barneskoler (Ledelse/Lærere) Altså, 1 – 7. Knytt opp mot iktplan.no
5. Har dere fått et positivt eller negativt utfall ved bruk av teknologi i skolene?
    - Får du tilbakemelding fra lærerne om de er fornøyde eller misfornøyde til den teknologien som allerede er blitt implementert i skolen?
    - Hvilke undersøkelser har dere gjennomført for å finne ut hvordan disse investeringene (teknologi) har ført til forbedring i barneskolene?
6. Ut fra tilbakemeldinger og det du har erfart, blir dagens investeringer brukt rett? Vi lurer da på om det burde bli brukt mer penger / tid på opplæring og trening i forhold til hva det blir brukt på innkjøp av utstyr.
7. Hvordan ser du på dagens opplærings rutiner av teknologi for lærerne i barneskolen?
8. Hva er de største utfordringene i tiden framover med bruk av teknologi i barneskolen?
9. Din personlige mening ville du brukt mer eller mindre penger på teknologi i skolen? Hvorfor ditt svar?
10. Har du noen pointers du kan gi oss og eventuelt er det noen du tenker at vi bør kontakte i henhold til vår oppgave? Har du noen dokumenter eller brosjyrer som du kan peke oss mot?
11. Kan vi kontakte deg igjen om vi har flere spørsmål?

ATTACHMENT 03 - FIRST TEACHER – FIRST INTERVIEW GUIDE

Introduksjon

1. Fortelle litt om oss og hvem vi er, hva vi jobber med og hva vi ønsker ut av intervjuet.
2. Intervjuobjektet forteller litt om seg selv, sin stilling, hvor lenge personen har jobbet i skolen.

Klasse og teknologivalg

3. Hvilket trinn er det du underviser?
4. Hvilken type tilgjengelig teknologi er det du bruker i undervisningen?
5. Hva bruker du den tilgjengelige teknologien i klasserommet til?
6. Hvilke utfordringer er det med å bruke teknologier i dine timer?
    a. Følger elevene med eller sitter de å gjør andre tinge når teknologien blir brukt?
    b. Hvordan handterer du problematikker med elever som ikke bruker teknologien til det de skal?
    c. Hvordan handterer du problematikken med elever som ikke har noe grunnkunnskap om bruken av teknologien i forhold til andre elever?
    d. Er det noen fag som er mer egnet enn andre til å bruke teknologi i?
    e. Har kvaliteten på utstyret tilgjengelig betydning på bruken?
7. Hva er målet med å bruke teknologien i undervisningen?
    a. Er disse knytt opp mot målene gitt fra udir?
    b. Er du enig med kravene gitt fra udir når det kommer til hvor mye og hva elever skal kunne på ulike trinn i skolen?
8. Er det noen teknologiske hjelpemiddel du gjerne vil ha utenom de du allerede har?

Om intervjuobjektet

9. Hvor mye opplæring har du fått på bruk av teknologi, og hva ble det fokusert på under en eventuelt opplæring?
    a. Hadde du noe om pedagogisk bruk av teknologi i din utdanning?
    b. Hvordan teknologi virker fra et praktisk perspektiv
    c. Hvordan man kan bruke teknologien pedagogisk.
10. Hvor trygg føler du deg på å bruke teknologi i undervisningen?
    a. Hvorfor / Hvorfor ikke?
11. Føler du at du har den kunnskapen du trenger for å bruke teknologien i undervisningen?
    a. Hvorfor/hvorfor ikke?
12. Er det gitt rammer og eller regler fra skoleledelsen som sier noe om hvordan du skal bruke teknologien i undervisningen?
    a. Er disse til hjelp, eventuelt gjør jobben vanskeligere?
13. Er det viktig for deg å ha et høyere kunnskapsnivå en elevene på bruken av teknologien?

    a. Hvorfor / Hvorfor ikke?
14. Hva er din viktigeste rolle som lærer når teknologien inntar klasserommet?
15. Har du en interesse for teknologi som går utenom mulig bruk i skolen? Kan dette ha en effekt på hvordan og hvor mye du bruker det i undervisningen?
16. I 2014 ble det budsjettert mer 4 millioner kroner fra politikerne til Kristiansand Kommune for bruk på IKT i skolen i Kristiansand. Denne summen skal fordeles jevnt til alle elevene som er på skolene i Kristiansand, rundt 11000 elever. Hva er dine tanker rundt dette?

ATTACHMENT 04 - FIRST TEACHER - SECOND INTERVIEW GUIDE

1. Hvordan ser du på undervisningen som akkurat ble gjennomført?
    a. Var det noen ting som du ser på som gode / negative i undervisningen?
    b. Er dette et kjent problem?
2. Følte du deg komfortabel med å bruke teknologien i undervisningen? (IPAD og PC (WYSE terminaler))
3. Var teknologien PC/IPAD med på å spise av tiden tilgjengelig for elevene? (Bruker elevene for lang tid til å få den opp å løpe?
    a. Ved Ja, hvorfor og hvor ofte skjer dette?
    b. Ved Nei, hva gjør at teknologien ikke er en tidstyv i dine timer?
4. Gav din rolle som veileder en positiv gevinst for elevene i denne timen? (Hva og hvorfor)
5. Ser du andre bruksområder for teknologien i undervisningstimene?
6. Hvordan er ditt syn på bruken av IPAD i timen?
    a. Blir dette godt tatt imot?
7. Hvordan er ditt syn på bruken av PC i timen?
    a. Blir dette godt tatt imot?
8. Føler du at det var nok lærere tilstede i timen når teknologien ble brukt?
    a. Kunne du gjennomført den type stasjonsundervisning med iPAD og pc uten ekstra hjelp? Bruk av teknologi krever flere lærere i klasserommet?
9. Ville du brukt denne teknologien i alle undervisningstimene om du hadde muligheten til det?
10. Hadde det vert betre / enklere å gjennomføre undervisningen om alle brukte iPads?
11. Går all hjelpen iPad og stasjonære pc stasjonen krever utover kvaliteten på den siste stasjonen?
12. Observerer at det av og til berre blir «klikket» på svaralternativ uten å nøye nok lese hva det blir spurt om, enkel prøve seg fram metode. Man kan da sette spørsmål til kva eleven faktisk får ut av dette. Vanskelig for lærar å ha kontroll på alle iPads samtidig. Tanker rundt det?

ATTACHMENT 05 - SECOND TEACHER – FIRST INTERVIEW GUIDE

Introduksjon

1. Fortelle litt om oss og hvem vi er, hva vi jobber med og hva vi ønsker ut av intervjuet.
2. Intervjuobjektet forteller litt om seg selv, sin stilling, hvor lenge personen har jobbet i skolen.

Klasse og teknologivalg

3. Hvilket trinn er det du underviser? **5 trinn på Wills Minne skole**
4. Hvilken type tilgjengelig teknologi er det du bruker i undervisningen? **IPAD, SmartBoard og Laptop**
5. Hvordan bruker du teknologien? (Prøv å skaffe konkrete eksempler)
6. Hvilke utfordringer er det med å bruke teknologier i dine timer?
    a. Følger elevene med eller sitter de å gjør andre tinge når teknologien blir brukt?
    b. Hvordan handterer du problematikker med elever som ikke bruker teknologien til det de skal?
    c. Kan variasjon i kunnskap hos elevene påvirke undervisningen? Hvordan?
    d. Har kvaliteten på utstyret tilgjengelig betydning på bruken?
7. Er det noen fag som er mer egnet enn andre til å bruke teknologi i?
8. Hva er målet med å bruke teknologien i undervisningen?
    a. Er disse knytt opp mot målene gitt fra UDIR?
    b. Er du enig med kravene gitt fra UDIR når det kommer til hvor mye og hva elever skal kunne på ulike trinn i skolen?
9. Er det noen teknologiske hjelpemiddel du savner?

Om intervjuobjektet

10. Hvor mye opplæring har du fått på bruk av teknologi, og hva ble det fokusert på under en eventuelt opplæring?
    a. Hadde du noe om pedagogisk bruk av teknologi i din utdanning?
    b. Mener du at det er en kobling mellom trenging/bruk/kurs og bruken av teknologibruken i klasserommet?
    c. Hvordan man kan bruke teknologien pedagogisk.
11. Gjør teknologien det lettere/vanskeligere å være lærer og undervise?
    a. Hvorfor / Hvorfor ikke?
12. Hvor trygg føler du deg på å bruke teknologi i undervisningen?
    a. Hvorfor / Hvorfor ikke?
13. Føler du at du har den kunnskapen du trenger for å bruke teknologien i undervisningen?
    a. Hvorfor/hvorfor ikke?
14. Er det gitt rammer og eller regler fra skoleledelsen som sier noe om hvordan du skal bruke teknologien i undervisningen?
    a. Er disse til hjelp, eventuelt gjør jobben vanskeligere?

15. Er det viktig for deg å ha et høyere kunnskapsnivå en elevene på bruken av teknologien?
    a. Hvorfor / Hvorfor ikke?
16. Hva er din viktigeste rolle som lærer når teknologien inntar klasserommet?
17. I 2014 ble det budsjettert mer 4 millioner kroner fra politikerne til Kristiansand Kommune for bruk på IKT i skolen i Kristiansand. Denne summen skal fordeles jevnt til alle elevene som er på skolene i Kristiansand, rundt 11000 elever. Hva er dine tanker rundt dette?

ATTACHMENT 06 - SECOND TEACHER – SECOND INTERVIEW GUIDE

1. Hvordan ser du på undervisningen som akkurat ble gjennomført? (**Positive og negative innvendinger**)
2. ~~Følte du deg komfortabel med å bruke teknologien i undervisningen?~~
3. Var teknologien i dette tilfellet en tidstyv? (Bruker elevene for lang tid til å få den opp å løpe?
    a. Ved Ja, hvorfor og hvor ofte skjer dette?
    b. Ved Nei, hva gjør at teknologien ikke er en tidstyv i dine timer?
4. Kunne du gjort den samme undervisningen uten bruk av teknologi?
    a. Ville elevene da trolig brukt mer eller mindre tid for å produsere det de gjorde i timene?
5. Gir din rolle som veileder en positiv gevinst for elevene i denne timen?
6. Ville du brukt annen teknologi enn det du har i dag for å gjennomføre denne timen?
    a. Har du ønsker om å kvitte deg med en eller flere typer teknologi?
7. ~~Bruker du teknologien på best mulig måte slik du har den tilgjengelig i dag?~~
    a. ~~Mener du at prioriteringene på bruk av IKT fra UDIR er gode?~~
    b. ~~Har du ønsker om at skoleledelsen gjør endringer til regler og rutiner for teknologien som er tilgjengelig i skolen?~~
    c. Hvordan ser du på bruken av teknologi i skolen og undervisningen framtiden?
8. Hva er ditt syn den største hinderet på å ta i bruke teknologi i klasserommet?

Alternative spørsmål

9. Hvorfor hadde ikke alle elevene hver sin enhet av teknologi tilgjengelig?
    a. Er det et økonomisk spørsmål?
    b. Et det andre faktorer som spiller inn her?
10. ~~10.~~ Hvordan går det når elevene i de tilfellene der det kreves at teknologi blir brukt av flere enn ~~en elev sammen? (gruppearbeid, samarbeid osv.)~~
11. ~~Hvilke fag ville du brukt for eksempel iPad?~~
12. ~~Har skolen nok enheter til at alle elevene skal kunne jobbe samtidig med hver sin enhet eller må de da jobbe sammen to eller flere pr enhet?~~
13. Vi observerte at det var 4 lærerstudenter tilstede i tillegg til deg som hovedlærer.
    a. Hvilket antall lærere ville du vært komfortabel med å bruke før det ville gått ut over undervisningen?
    b. Pleier dere å bruke dette antallet med lærere når dere dele opp klassen eller var dette et ekstraordinært tilfelle?
14. Under spørreundersøkelsen så opplevde vi at en Laptop sluttet å virke (tomt batteri), og du fikk hjelp av Thomas til å fikse dette.
    a. Hvordan ville du handtert denne situasjonen om du hadde vært aleine som lærer?
15. Har elevene jobbet mye med iPad programmet Book Creator før?
16. Er det mange elever som har jobbet med og brukt en iPad utenfor skolen?

ATTACHMENT 07 - THIRD TEACHER – FIRST INTERVIEW GUIDE

Introduksjon

1. Fortelle litt om oss og hvem vi er, hva vi jobber med og hva vi ønsker ut av intervjuet.
2. Intervjuobjektet forteller litt om seg selv, sin stilling, hvor lenge personen har jobbet i skolen.

Klasse og teknologivalg

3. Hvilket trinn er det du underviser? **(1 trinn klasse 1C på Hånes skole avd Heståsen)**
4. Hvilken type tilgjengelig teknologi er det du bruker i undervisningen? **(IPAD, SmartBoard, Laptop, PC)**
5. Hvordan bruker du teknologien? (Prøv å skaffe konkrete eksempler)
6. Hvilke utfordringer er det med å bruke teknologier i dine timer?
    a. Følger elevene med eller sitter de å gjør andre tinge når teknologien blir brukt?
    b. Hvordan handterer du problematikker med elever som ikke bruker teknologien til det de skal?
    c. Kan variasjon i kunnskap hos elevene påvirke undervisningen? Hvordan?
    d. Har kvaliteten på utstyret tilgjengelig betydning på bruken?
7. Er det noen fag som er mer egnet enn andre til å bruke teknologi i?
8. Hva er målet med å bruke teknologien i undervisningen?
    a. Er disse knytt opp mot målene gitt fra UDIR?
    b. Er du enig med kravene gitt fra UDIR når det kommer til hvor mye og hva elever skal kunne på ulike trinn i skolen?
9. Er det noen teknologiske hjelpemiddel du savner?

Om intervjuobjektet

10. Hvor mye opplæring har du fått på bruk av teknologi, og hva ble det fokusert på under en eventuelt opplæring?
    a. Hadde du noe om pedagogisk bruk av teknologi i din utdanning?
    b. Mener du at det er en kobling mellom trenging/bruk/kurs og bruken av teknologibruken i klasserommet?
    c. Hvordan man kan bruke teknologien pedagogisk.
11. Gjør teknologien det lettere/vanskeligere å være lærer og undervise?
    a. Hvorfor / Hvorfor ikke?
12. Hvor trygg føler du deg på å bruke teknologi i undervisningen?
    a. Hvorfor / Hvorfor ikke?
13. Føler du at du har den kunnskapen du trenger for å bruke teknologien i undervisningen?
    a. Hvorfor/hvorfor ikke?
14. Er det gitt rammer og eller regler fra skoleledelsen som sier noe om hvordan du skal bruke teknologien i undervisningen?
    a. Er disse til hjelp, eventuelt gjør jobben vanskeligere?

15. Er det viktig for deg å ha et høyere kunnskapsnivå en elevene på bruken av teknologien?
    a. Hvorfor / Hvorfor ikke?
16. Hva er din viktigeste rolle som lærer når teknologien inntar klasserommet?
17. I 2014 ble det budsjettert mer 4 millioner kroner fra politikerne til Kristiansand Kommune for bruk på IKT i skolen i Kristiansand. Denne summen skal fordeles jevnt til alle elevene som er på skolene i Kristiansand, rundt 11000 elever. Hva er dine tanker rundt dette?

ATTACHMENT 08 - THIRD TEACHER – SECOND INTERVIEW GUIDE

1. Hvordan ser du på undervisningen som akkurat ble gjennomført? (**Positive og negative innvendinger**)
2. Følte du deg komfortabel med å bruke teknologien i undervisningen?
3. Var teknologien i dette tilfellet en tidstyv? (Bruker elevene for lang tid til å få den opp å løpe?
    a. Ved Ja, hvorfor og hvor ofte skjer dette?
    b. Ved Nei, hva gjør at teknologien ikke er en tidstyv i dine timer?
4. Kunne du gjort den samme undervisningen uten bruk av teknologi?
    a. Ville elevene da trolig brukt mer eller mindre tid for å produsere det de gjorde i timene?
5. Gir din rolle som veileder en positiv gevinst for elevene i denne timen?
6. Ville du brukt annen teknologi enn det du har i dag for å gjennomføre denne timen?
    a. Har du ønsker om å kvitte deg med en eller flere typer teknologi?
7. Bruker du teknologien på best mulig måte slik du har den tilgjengelig i dag?
    a. Mener du at prioriteringene på bruk av IKT fra UDIR er gode?
    b. Har du ønsker om at skoleledelsen gjør endringer til regler og rutiner for teknologien som er tilgjengelig i skolen?
    c. Hvordan ser du på bruken av teknologi i skolen og undervisningen framtiden?
8. Hva er ditt syn den største hinderet på å ta i bruke teknologi i klasserommet? (For lite utstyr, dårlig utstyr, gjerne kom med dømer)

Alternative spørsmål

9. Blir det kjøpt inn mer utstyr senere?
10. ~~10.~~ Hvordan går det når elevene i de tilfellene der det kreves at teknologi blir brukt av flere enn en elev sammen? (gruppearbeid, samarbeid osv.)
11. Er det mange elever som har jobbet med og brukt en iPad utenfor skolen?

ATTACHMENT 09 - FOURTH TEACHER – FIRST INTERVIEW GUIDE

Introduksjon

1. Fortelle litt om oss og hvem vi er, hva vi jobber med og hva vi ønsker ut av intervjuet.
2. Intervjuobjektet forteller litt om seg selv, sin stilling, hvor lenge personen har jobbet i skolen.

Klasse og teknologivalg

3. Hvilket trinn er det du underviser? **(1 trinn klasse 1X på Hånes skole avd Heståsen)**
4. Hvilken type tilgjengelig teknologi er det du bruker i undervisningen? **(IPAD, SmartBoard, Laptop, PC)**
5. Hvordan bruker du teknologien? (Prøv å skaffe konkrete eksempler)
6. Hvilke utfordringer er det med å bruke teknologier i dine timer?
    a. Følger elevene med eller sitter de å gjør andre tinge når teknologien blir brukt?
    b. Hvordan handterer du problematikker med elever som ikke bruker teknologien til det de skal?
    c. Kan variasjon i kunnskap hos elevene påvirke undervisningen? Hvordan?
    d. Har kvaliteten på utstyret tilgjengelig betydning på bruken?
7. Er det noen fag som er mer egnet enn andre til å bruke teknologi i?
8. Hva er målet med å bruke teknologien i undervisningen?
    a. Er disse knytt opp mot målene gitt fra UDIR?
    b. Er du enig med kravene gitt fra UDIR når det kommer til hvor mye og hva elever skal kunne på ulike trinn i skolen?
9. Er det noen teknologiske hjelpemiddel du savner?

Om intervjuobjektet

10. Hvor mye opplæring har du fått på bruk av teknologi, og hva ble det fokusert på under en eventuelt opplæring? (Du var her når smart BOARD først blei kjøpt inn? Fikk du noen opplæring?)
    a. Hadde du noe om pedagogisk bruk av teknologi i din utdanning?
    b. Mener du at det er en kobling mellom trenging/bruk/kurs og bruken av teknologibruken i klasserommet?
    c. Hvordan man kan bruke teknologien pedagogisk.
11. Gjør teknologien det lettere/vanskeligere å være lærer og undervise?
    a. Hvorfor / Hvorfor ikke?
12. Hvor trygg føler du deg på å bruke teknologi i undervisningen?
    a. Hvorfor / Hvorfor ikke?
13. Føler du at du har den kunnskapen du trenger for å bruke teknologien i undervisningen?
    a. Hvorfor/hvorfor ikke?
14. Er det gitt rammer og eller regler fra skoleledelsen som sier noe om hvordan du skal bruke teknologien i undervisningen?
    a. Er disse til hjelp, eventuelt gjør jobben vanskeligere?

15. Er det gitt mål/retningslinjer av skolen for hva elevene skal kunne når de går ut av de forskjellige trinnene?
16. Er det viktig for deg å ha et høyere kunnskapsnivå en elevene på bruken av teknologien?
    a. Hvorfor / Hvorfor ikke?
17. Hva er din viktigeste rolle som lærer når teknologien inntar klasserommet?
~~18. I 2014 ble det budsjettert med 4 millioner kroner fra politikerne til Kristiansand Kommune for bruk på IKT i skolen i Kristiansand. Denne summen skal fordeles jevnt til alle elevene som er på skolene i Kristiansand, rundt 11000 elever. Hva er dine tanker rundt dette?~~

ATTACHMENT 10 - FOURTH TEACHER – SECOND INTERVIEW GUIDE

1. Hvordan ser du på undervisningen som akkurat ble gjennomført? (**Positive og negative innvendinger**)
2. Følte du deg komfortabel med å bruke teknologien i undervisningen?
3. Var teknologien i dette tilfellet en tidstyv? (Bruker elevene for lang tid til å få den opp å løpe?
    a. Ved Ja, hvorfor og hvor ofte skjer dette?
    b. Ved Nei, hva gjør at teknologien ikke er en tidstyv i dine timer?
4. Kunne du gjort den samme undervisningen uten bruk av teknologi?
    a. Ville elevene da trolig brukt mer eller mindre tid for å produsere det de gjorde i timene?
5. Gir din rolle som veileder en positiv gevinst for elevene i denne timen?
6. Ville du brukt annen teknologi enn det du har i dag for å gjennomføre denne timen?
    a. Har du ønsker om å kvitte deg med en eller flere typer teknologi?
7. Bruker du teknologien på best mulig måte slik du har den tilgjengelig i dag?
    a. Mener du at prioriteringene på bruk av IKT fra UDIR er gode?
    b. Har du ønsker om at skoleledelsen gjør endringer til regler og rutiner for teknologien som er tilgjengelig i skolen?
    c. Hvordan ser du på bruken av teknologi i skolen og undervisningen framtiden?
8. Hva er ditt syn den største hinderet på å ta i bruke teknologi i klasserommet? (For lite utstyr, dårlig utstyr, gjerne kom med dømer)

Alternative spørsmål

9. Blir det kjøpt inn mer utstyr senere?
10. ~~10.~~ Hvordan går det når elevene i de tilfellene der det kreves at teknologi blir brukt av flere enn en elev sammen? (gruppearbeid, samarbeid osv.)
11. Er det mange elever som har jobbet med og brukt en iPad utenfor skolen?

ATTACHMENT 11 - OBSERVATION REPORT FROM THE FIRST SCHOOL

Our observation at school A was in a first grade class. The student base was 36 students, 22 girls and 14 boys divided into two groups. One group with 6 boys and 12 girls, and the other had 7 boys and 10 girls. One group started with an ordinary lesson and the second group started with a technological educational lesson. We only participated and observed the lessons with a technological nature.

In this lesson, there were two teachers present. One was the main teacher for the class, a man, and the second was an assistant, a woman. He`s main focus was helping the students with the computers and math questionnaire, and she helped the students with their iPad`s. This lesson had three stations where the students had to work on different tasks. On the first station they had to logon to the computer using their own username and password, this task was repeated up to three times before they could do other math related tasks on the computer. The second station was iPad; students played a math game named "King of Math". Only working on this task for the session. The third station was a math exercise with paper and dices. We did not observe the third station other than looking at the effected on the rest of the class, if the teachers had to use much time guiding the students and if it effected any of the other stations with noisiness or other things.

Before the work on the stations started the hole group gathered in a

iPad
This class had newer used iPad before and was something new for them. The main teacher started the lesson by showing the group how the iPad worked and how they should us it. Before the lesson the teacher had started, logged on and started the game on all iPad`s, so when the students started using them they would all get the same front screen to start from. Only one of 36 the students had used this game before, and almost half of the students had used an iPad before.

Most of the students enjoyed this station and worked quietly with their own tasks. Only one student ended up closing the program, and then the second teacher had to ask the first teacher on how to start it again. The students tried their best and got rewards in the game on how well they did, and we observed that this lead to a local competition between the students on the group. Showing each other their score and loved it. One of the biggest problems was to actually read the assignment before answering.

Computer
At this station the students had to logon to the computer using their own username and password. The username was straightforward with both letter and numbers, but the password had both numbers, lowercase and capital letters. Even if the students had done this a few times before, it was a hard task for six year old. Some students managed to logon to the system the required three times, but most of the students only made it two or almost three times before time ran out. Only one student in the class had memorised the username

and password, the rest had to use a paper with their information on. They got this handed out by the teacher when they started their session. Students on this station had to get more guidance than other stations, even more then the iPad station. One of the bigger problems with the computers was it took a long time between pressing <Enter> on the keyboard until they were fully logged in. When waiting for the computer to login the students started chatting with other students, making them loose their concentration.

ATTACHMENT 12 - OBSERVATION REPORT FROM THE SECOND SCHOOL

For this observation, we sat in with a 5th class for a double session which involved the use of smart board, iPads and laptops. Teacher divided the class into two groups, one working on the iPads, the other using laptops, and switched after the first session. The class had in total 21 kids, got divided 12 and 9. The session we observed also had four teacher students from the University of Agder helping. The main teacher for this class took care of the laptop session, while the four teaching students had the second half of the class, the ones working on the iPad.

The iPad class:
All the teaching students stayed and helped this class behind, so for the first session it was 4 teachers and 12 kids, second 4 teachers on 9 kids. This is naturally a lot more than normal, as we will come back to later. Each of the kids got an iPad each, and the teacher used the smart board to present today's task. With the help of an application called Book Creator, they were going to create a book about the ancient Greece. They were also allowed to go online to get additional information (if the textbook was not enough) and find pictures as long as they were related to ancient Greece. The teachers had some rules about how the book should be created and the content, but besides that, the kids stood quite free to design the book how they want.

For the first class, there were some small technical problems with two of the iPads available, so two of the kids ended up working together. No one of the teaching students had used iPads on this setting before, so they were not familiar with the equipment (unless they owned personally). When it comes to the application the kids had used it before, so it did not take long before they were busy working away on the book. Some had more fun looking at old pictures taken before, but the teaching students walked fast around and made sure everyone used the correct application.

The laptop class:
The main teacher, which is also the one we interviewed, took the rest of the class into another classroom and they got a laptop each. The first part of the class was about completing an online survey, but after they finished they got to play around a bit more. Teacher told them first to log into Itslearning (learning platform for the school in Kristiansand) and send private messages, to both teacher and other kids in class. Afterwards the teacher had a quick quiz where the kids used google to find the answers and say them together out load in class.
The laptops had some problems with poor battery time, which made one shut down during the first session. This laptop was replaced with a new one. For the second session it happened again, and this time all the leftovers laptops were either out of power, or close to running out. There was one free power cable, which saved the day, this time.

ATTACHMENT 13 - OBSERVATION REPORT FROM THE THIRD SCHOOL

For this observation, we sat in for a double session with the 1C class. The class has in normal 22 kids, but in our observation, there was one missing. For the first part of the session, the teacher was alone with the kids, but for the second part, she had another special teacher assisting. The class followed a "stasjonsundervisning" where they divide the kids into groups from three to five kids, which go from station to station in the classroom, in total there were five stations. Two of the stations involved the use of technology, this being iPad and Smart board. The other used traditional learning methods. We will focus mostly on the stations involving technology for this report.

The iPad station:
With the iPads, they used an application called "Les" which is an application to help the kids read and learn words. All the kids at the iPad station had their own iPad and they worked alone, with some space between them, as the application would read the letters / words aloud to them. There was a calm over this workstation, as all the kids seems pleased with working with an iPad, something that is different from just paper and pencil, and they focused on the task ahead.

The smart board station:
The teacher uses online resources to let the kids interact with the board. Assignment was to link the pictures on the board with the letter "b". They would go up towards the board one at a time, find the right pictures and go back in line. Some of the tasks where more difficult than others, the kids would than help each other out, working as a team. Everyone using the smart board gets very involved, and interact well with the technology.

It is clear that the kids are well used to both the iPads and smart board, and we are told that the application they are using today have been used a few times before. There is little to no none waiting time on those stations as they all know what they are doing. Some had trouble adjusting the sound on the iPads, and some had small problems typing the password to unlocking, but this was taken care of fast, from other kids at the iPad session or the teacher. From the teacher perspective she has full control over the technology, there is no problems when it comes to the teacher competence and the use of iPad or the smart board. The teacher explains that this class has been using both smart board and iPad from school start and many of the kids has iPad experience from their homes.
There are no visible problems with the equipment; both the iPads and smart board are working without any issues.

We think that both the iPads and the smart board are used in a smart and effective manner, and by running small groups on different stations, everyone gets to participate over turn. Teacher confirms that the kids are always looking forward to "play" with the iPad or the smart board, as this can be seen more as playtime than normal school work from their view. Teacher is clearly comfortable with using this kind of equipment to both mix the sessions up, and to make the teaching more diverse.

The only downside is that such a big class with five different stations can get a little bit out of control as long as there is only one teacher available. The teacher in questions agrees with this, but also informs us that they are normally two teacher presents, which makes it easier to have control and help. The smart board station is the one that requires most attention, as the one doing the traditional work are all working on tasks they have done before in other occasions.

It is clear for us that technology in this case helps to enhance the teaching, as it offers new and exciting ways to learn and work together. The kids have gotten used to using technology in the classroom, they treat it well, and there is not much waiting. The technology is working as intended, and they all seem excited and glad to be able to use these kind of tools. The teacher do agree with this, and tells us that she is very happy with the equipment her school has to offer.

In the end, as well as in the beginning, the kids gather in front of the smart board. Teacher put's on a English song on YouTube on the smart board, another easy way to make the kids pay attention and sit quiet down to watch before the day ends.
Teacher informs us in the end after the kids have left the class that this is a typical session in her class, so what we have seen in today's observation is something that we could expect to see any other day in the week.

ATTACHMENT 14 - OBSERVATION REPORT FROM THE FOURTH SCHOOL

For this observation, we sat in for a double session with the 1D class. This was the first session of the day so we have seen how the teacher starts a regular school day. The class had 23 pupils, and the technology we saw today was use of smart BOARD and iPads. Different from the other observations, this teacher was alone for the double session, and this was the norm, at least for the start up each day. We meet up with the teacher in the classroom around 10 minutes before the bell rings; the spare time was used to get everything up and running.

Also different from our other observations is that there were no station based teaching, but she divides the class into groups from 2-3 pupils after the morning presentation. We can also see that the content for the SMART board has been made ready the day before with what they are going to do this morning. We are told that this is because it saves time. If It is not ready in advance it might take too long in the morning and the pupils can lose focus.

She does not use laptops in general in the classroom. The pupils have one hour a week at a computer lab.

The use of smart BOARD
All the pupils gathers in front of the smart BOARD, in a "lyttekrok" where the teacher starts off the day. After introduction is over a group is left to work on the SMART board. They use the online portal "Lokus skule" to work with the curriculum. The "game" they play on the smart BOARD is rather easy and does not require any drag and drop movement; it is just point and click. This is an advantage considering the screen is not that responsive.

The use of iPads
The teacher hands out the iPads, the pupils are divided into groups, 2-3 per iPad. There is 3 pupils left that works on the SMART board. They are all working on the same task.
Teacher walks around the class, all the groups are given attention to make sure they work as intended. The pupils in a group either share the iPad around (one task each) or works together on the tasks. Teachers tells us later on that she prefers that they share the iPad around and she makes sure they do this when checking up on the groups.

The way we have seen technology used is similar to our other observation. Pupils interact with the SMART board, they use application on the iPads and they work together. There is "educational noise" in the classroom. When it gets too loud, the teacher is fast to make sure the pupils causing the noise calms down and goes back to work. Sharing an iPad between two or three pupils work out fine, as long as the teachers make sure everyone gets their turn.

The SMART board is as mentioned not as responsive as the screen on an iPad, but the teacher informs us that it is not that big a problem. The pupils manages fine to interact with

it. The SMART board is some years old, and even if the teacher would like a new one she has no problem using this one.

While changing subjects the teacher has an iPad, which she uses to present the app, they are going to use (LES). She gives clear introductions to how they should use the iPads for this part of the session. For this part of the session the smart BOARD is idle, everyone works on iPads. One group with two, rest is three per iPad.

As with the other observations we have been too during this case study technology enhances the classroom teaching in an exciting way, for the teacher and the pupils