# Digital communication and collaboration in lower secondary school

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## Abstract
This article investigates factors influencing teachers in secondary school when they plan for pupils' use of digital tools for collaboration and communication. Six social studies teachers in Oslo were interviewed about how they facilitate digital collaboration and communication. The results demonstrate that teachers facilitate this to a certain extent, both in the form of pupils' co-writing and sharing files with each other. However, there is little communication between pupils by means of digital tools as an integrated part of the teaching. None of the teachers mentioned communication using digital tools as part of basic competence without being directly asked about it. Based on the analysis of the interviews, it is likely that the barriers to using digital tools for collaborating and communicating are time restrictions and the pupils' lack of digital competence. As the pupils are physically at the same place at the same time, it is perceived as unnecessary to spend time facilitating digital communication and collaboration. The findings indicate that systematic and planned work with digital competence, including communication and interaction, should be facilitated.

Keywords
digital communication, digital collaboration, digital competence

## Introduction
Information and communication technology (ICT) permeates all parts of society, and pupils and teachers are expected to use digital tools in all aspects of teaching and learning. Digital tools are available to most pupils in Norway (Fraillon et al., 2014; Krumsvik et al., 2013; Rohatgi & Throndsen, 2015; Smahel et al., 2020; Staksrud & Ólafsson, 2019). However, access to digital tools are not the same as ICT being used in a pedagogical context (Hatlevik et al., 2013, pp. 35-36). The digital tools must be used consciously and in coherence with the teacher's pedagogical and professional competence (Mishra & Koehler, 2006). Studies have shown that even though the digital infrastructure is good, it is difficult to identify a positive correlation between increased investments in equipment, and pupils' learning outcomes through increased use of technology (Kongsgården & Krumsvik, 2019, pp. 2–3).

Teacher's digital competence is vital when teaching pupils to interact and seek knowledge (Furberg & Lund, 2016, p. 43). Pupils' learning is most efficient when ICT is a supplement to the learning process and is implemented with clear plans, goals, and supportive technological or human resources (Morgan et al., 2016, p. 25). The EU and the OECD recommend that Norwegian authorities should be more concerned with teachers' professional use of ICT than buying digital equipment (Morgan et al., 2016, p. 25). This implies that teachers' use of digital tools is as equally important as schools having good access to ICT (Blikstad-Balas & Klette, 2020, pp. 55–56).

Earlier research demonstrates that Norwegian teachers have positive attitudes towards using ICT during lessons (Gudmundsdottir & Throndsen, 2015, p. 129). Teachers' attitudes towards ICT is crucial for successful implementation of technology in the classroom (Viberg et al., 2020, p. 50). However, research also demonstrates that teachers in Norway differ from teachers in other countries by being less favorable to the use of digital tools for helping students collaborate (Gudmundsdottir & Throndsen, 2015, p. 126; Morgan et al., 2016, p. 4).

Pupils use a wide range of communication and collaboration methods at home, but not in a school context (Bjørgen, 2013, p. 77). Pupils mostly use digital tools for writing alone in a school context (Blikstad-Balas & Klette, 2020, pp. 62-63). Although many Norwegian students say that they have learned to use ICT at school, over 70 % answer that they have learned to communicate on the internet on their own, while fewer than 5 % state that they have mainly learned this at school (Rohatgi & Throndsen, 2015, p. 108).

The aim of this paper is to get a better understanding of the communication and collaboration component of teachers' professional digital competence. The research question is formulated as follows:

*What factors influence social studies teachers' facilitation of pupils' digital communication and collaboration skills at the secondary level?*

Emphasis is placed on how the digital competence is presented in the framework for basic skills, in the general part of the Knowledge Promotion Reform, an education reform introduced in 2006, and in the curriculum for social studies at the secondary level (Utdanningsdirektoratet, 2013, 2016, 2017, 2020).

To address the research question, two frameworks that address the use of technology are used as a theoretical foundation; the Technological Pedagogical Content Knowledge (TPACK) framework and the Technology Acceptance Model (TAM). TPACK provides a framework for the digital, academic, and pedagogical requirements placed on teachers in the 21st-century school system (Koehler et al., 2013; Mishra & Koehler, 2008). It suggests that technology is more likely to be used if teachers see it as relevant to specific didactic approaches (Scherer et al., 2019, p. 14). The TPACK framework shows how knowledge (K) about technology (T), pedagogy (P), and content (C) can overlap and result in four different competencies, technological pedagogical knowledge (TPK), pedagogical content knowledge (PCK), technological content knowledge (TCK) and Technological Pedagogical Content Knowledge (TPCK). TPACK is at the intersection of all three elements (Koehler et al., 2013; Mishra & Koehler, 2008).

The Technology Acceptance Model (TAM) organizes factors that influence users to accept and use technology (Scherer et al., 2019). TAM distinguishes between the external stimulus and the user's assessments (cognitive response), which consist of assumptions about the usefulness and how easy it is to use the technology. If perceived usefulness is considered worthwhile (behavioral ingenuity), it may result in the technology's actual use (Davis et al., 1989, pp. 985–986; Davis & Venkatesh, 1996, p. 20). The model distinguishes between intended use of technology and actual use (Scherer et al., 2019).

This paper is divided into six sections. After the introduction, an overview of the role of digital competence in Norwegian secondary school is provided. Section three elaborates on the research design, including the selection of informants, data collection and analysis. The results are presented in section four, and are discussed further in the fifth section. This section also addresses the limitations of the study, before section six closes the paper with some final conclusions and some suggestions for further research.

## Digital competence in norwegian secondary school

Digital technology enables new forms of collaboration and communication (Hatlevik et al., 2015, p. 69) and influences young people in many ways: a participatory culture, access to information, opportunities for communication, and content production (Erstad, 2010, pp. 60–61). "The development of e-mail, chat, sms and online communities has created new conditions for communication and communicative competence as a skill for the 21 century" (Erstad, 2010, p. 61). In a Norwegian context it is suggested that collaborative learning using digital tools have been given too little space and focus in the framework for basic skills (Hatlevik et al., 2013). Moreover, it is argued that there has been a lack of tradition of using digital tools for collaboration and communication in schools, even though the importance of digital collaboration is increasing (Hatlevik et al., 2013).

The curricula in Norway have undergone many changes in recent years, and digital competence has been emphasized. Both the Knowledge Promotion Reform from 2006 and the new curriculum, introduced in 2020, emphasize that pupils should learn through collaboration. It is pointed out that pupils think, experience, and learn to interact with peers through communication and collaboration (Utdanningsdirektoratet, 2017, p. 14). In 2016, the framework for digital skills was updated with a more precise definition of communication and cooperation (Utdanningsdirektoratet, 2016). Basic digital skills are divided into five facets: 1) use and understand, 2) search and process, 3) produce and edit, 4) communicate and collaborate, and 5) exercise digital judgment. Digital collaboration involves using digital resources to plan, organize, and carry out learning processes with peers, for example, through co-writing and sharing files (Utdanningsdirektoratet, 2016, p. 2). Communication is not explained in detail in the framework, but adapting, selecting, and assessing digital resources based on professional purposes is mentioned.

Both the curriculum and the framework for basic skills, focus on digital skills as an inter-disciplinary and basic competence (Krumsvik et al., 2013; NOU 2013:2, 2013; Utdannings-direktoratet, 2013, 2016, 2020). Even though there is an increased focus on digital skills and competencies in the curriculum, it seems unclear what they entail in teaching (Gilje et al., 2016, pp. 101–102). Few qualitative studies investigate digital skills as they appear in the framework for basic digital skills (Gilje et al., 2016, p. 113). Furthermore, few studies focus on how the basic skills are implemented in the classroom (Rødnes & Gilje, 2016, p. 21). In extensive studies of students' digital skills, communication skills have not been tested (Hatlevik et al., 2015, p. 70). In addition, perceptions of what it means to work with the basic skills in the curriculum include everything from activities related to the skill to specific training on the skill itself (Rødnes & Gilje, 2016, p. 19).

The topic of 21st-century skills has been researched internationally. 21st-century skills are often defined as learners' ability to collaborate, communicate, be critical and creative, and use technologies for learning (Häkkinen et al., 2017). Many learners find it cognitively and motivationally challenging to engage in collaborative learning when communicating via digital platforms (Weinberger, 2011). This is often explained by learners lacking effec-

tive strategies for digital collaboration. Appropriate support and guidance are crucial for learners' development of effective strategies for digital collaboration (Vogel et al., 2016).

Even though pupils are referred to as digital natives and have extensive digital skills, recent research suggests that pupils' digital competence varies (Prensky, 2001; Scolari, 2019, p. 19). Digital communication is regarded as a leisure activity because it is used to nurture friendships and hobbies and present tastes and preferences (Bjørgen, 2013, p. 76). Several examples show that students use a wide range of communication and collaboration tools at home, but these are not used in school contexts (Bjørgen, 2013, p. 77; Blikstad-Balas & Klette, 2020, pp. 62–63). Norwegian pupils and students are, to a greater extent than their peers in other European countries, using digitals tools for messages and chat (Rohatgi & Throndsen, 2015, pp. 101–103).

Even though some Norwegian pupils say that they have learned to use ICT at school, more than 70% of the pupils state they have learned to communicate on the internet on their own. In comparison, fewer than 5% state that they have mainly learned this at school (Rohatgi & Throndsen, 2015, p. 108).


## Research design

### Research context and participants

The research design is founded on a constructivist and socio-cultural worldview, where knowledge is constructed and developed in interaction with the environment (Creswell, 2007, pp. 20-21). Teaching involves aspects that are difficult to measure, and a qualitative approach was chosen (Creswell, 2007, pp. 21, 40; Krumsvik, 2019; Kvale & Brinkmann, 2015). The study's goal, the theoretical framework, research questions, methods, and the research ethics mutually influence each other and contribute to the study's coherence (Creswell, 2007, p. 39; Krumsvik, 2019, p. 72).

Based on the research question, the sample selection was social studies teachers in Oslo's secondary schools. It was estimated that 4-6 interviews would be sufficient to shed light on the research question, and make it possible to conduct a proper analysis of the interviews (Krumsvik, 2019, p. 159; Kvale & Brinkmann, 2015, p. 148).

All secondary schools in Oslo (n=62) were contacted (Oslo kommune, 2020). However, lack of response made it necessary to contact more schools, and all secondary schools in the neighboring cities, Drammen (n=9) and Asker (n=16), were contacted as well (Asker kommune, 2020; Drammen kommune, 2020; Oslo kommune, 2020). Eventually, six teachers from Oslo expressed their interest, and interviews were arranged. All informants worked at schools with easy access to laptops, wi-fi, Office365, and LMS (1:1 computing). The interviews were conducted at the informants' schools between 27 February and 6 March 2020. Random names corresponding to the informants' gender were assigned to the informants. Table 1 shows an overview of the informants' experience and education.

**Table 1** The informants' experience and education

|  | Experience as a teacher (years) | Education (finished) | Additional education |
|---|---|---|---|
| Anne | 20 | Nordic didactics, contemporary history, religion | |
| Camilla | 5 | Mathematics, social studies, music, pedagogy | Professional digital competence (PDC) |
| Katrine | 9 | Mathematics, Norwegian, religion, social studies, drama, pedagogy | Professional digital competence (PDC) |
| Marianne | 3 | Economics, Norwegian, French, pedagogy | |
| Linda | 2 | English language and literature, Norwegian, pedagogy | |
| Kristian | 11 | Literary studies, international politics, religious studies, Nynorsk didactics | |

## Data collection

A qualitative research interview approach was chosen in order to understand the informants' worldviews and uncover experiences that are not easily identifiable through a quantitative approach (Bevan, 2014, p. 136; Høffding & Martiny, 2015, p. 562; Kvale & Brinkmann, 2015, p. 20).

Data were collected through individual, semi-structured interviews (Kvale & Brinkmann, 2015). The research question formed the basis for the interview guide (Krumsvik, 2019, p. 84). The interview guide's thematization was based on the purpose of the study, prior knowledge of the topic, and theories related to the subject and the method (Kvale & Brinkmann, 2015, p. 140). The central themes were followed up with additional questions to ensure the information retrieved was reliable and valid (Krumsvik, 2019, p. 26; Kvale & Brinkmann, 2015, p. 97).

The transcription was verbatim. The transcription and analysis work in this study was done by Computer Assisted Qualitative Data Analysis Systems (CAQDAS). The software made it possible to handle the text efficiently and precisely (Kvale & Brinkmann, 2015, pp. 225–226; Marshall, 2002, p. 58).

During the interviews, attention was focused on the conversation itself, and a short log was written immediately after each interview. The informants were contacted after the transcription to get clarifying comments and additional information. Quotes from the interview and interpretations of these were written into a coherent text. The text was then sent to the informants by email, and they could comment on the content (Caelli, 2001, p. 278; Krumsvik, 2019, pp. 198–199).

## Data analysis

A critical analysis of the interviews was done in five steps (Kvale & Brinkmann, 2015, pp. 221–222). 1: The interviewee describes his life world without focusing on interpretation or explanation. 2: The interviewees discover new elements during the conversation. 3: The

interviewer interprets the answers and discusses this with the informant. 4: The interviewer interprets the transcribed interview. 5: The informants are re-interviewed, and there is room for corrective additions and comments.

An inductive procedure was used to analyze the interviews into a more abstract system with categories and codes representing the essence of the content (Creswell, 2007, pp. 38–39). The numbers of occurrences of topics and keywords in the interviews are, to a certain extent, emphasized. However, there are many reasons why an informant raises a topic, so dealing strictly with this will not necessarily lead to a higher quality of analysis (Creswell, 2007, p. 152).

Before coding, no specific themes or categories were expected to appear. During the coding, different keywords and themes emerged (Creswell, 2007, p. 152). The coding was a mix of expected keywords and information that was new and surprising (Creswell, 2007, p. 153). The codes and keywords have been subject to revision, simplification, and abstraction. The research question inspired the codes used in the analysis, but otherwise, they are based on keywords that summarize what the informants focused on. As such, the coding was done intuitively (Kvale & Brinkmann, 2015, p. 306).

## Results and discussion

### Factors influencing teachers' facilitation of pupils' digital communication and collaboration skills

Based on the analysis of the interviews, this section presents factors influencing social studies teachers' facilitation of pupils' digital competence, and more specifically, pupils' digital communication and collaboration skills. The factors are divided into six groups: positive attitudes, technology used as a means to an end, physical presence in the classroom, time perspective, pupils' digital skills, and teachers' digital skills. Quotes are used to illustrate the factors and are translated from Norwegian to English.

### Positive attitudes

The informants agree that digital competence is a crucial part of 21st-century education. They express a positive attitude toward using digital tools. Linda: "I believe a lot in using a PC at work, both on my part and that of the pupils because it will be incredibly important in the future". She believes there must be a balance between digital and analog tools. A positive attitude is vital for the successful integration of digital tools in teaching (Gudmundsdottir & Throndsen, 2015, pp. 126–127; Viberg et al., 2020, p. 50). However, it may be worth asking whether a teacher, no matter how positive about digital methods, can facilitate the full range of skill areas in the framework for digital competence. Meaningful choices, related to open, constructive, reflective and cognitively based collaborative tasks (Kongsgården & Krumsvik, 2019, p. 3), will probably be harder to make without professional digital competence at the intersection between pedagogy, technology and content in the TPACK framework (Mishra & Koehler, 2008). A teacher has to be able to use a piece of technology in specific teaching situations, not just in isolation (Koehler et al., 2013, p. 61; Zhao et al., 2002, p. 490).

### Teachers' digital skills

Both experienced and newly qualified teachers express a need to learn more about using digital tools in a meaningful way (Blikstad-Balas & Klette, 2020, p. 57). After attending a course about professional digital competence, one of the informants says it this way: "I became much more aware of how important teachers' digital competence is." According to

TAM, courses and competence development will help teachers assess the usefulness and ease of using new technology in teaching contexts (Scherer et al., 2019, p. 31).

**Technology used as a means to an end, not as an end in itself.**
Focus on digital skills and tools is often an indirect result of academic goals. Technology is used as support for didactic approaches that have been chosen. According to Anne: "It is a tool in a learning process, so it is the learning process I am concerned with and not the tool itself. However, one can also have the tool itself as a goal." The teachers' lesson plans lie on an axis between technology and academic content, and the focus is closest to the academic content (Mishra & Koehler, 2008).

**Physical presence in the classroom**
One reason for the lack of focus on communication and collaboration seems to be that pupils are present in the classroom. Introducing digital communication can make the lessons unnecessarily complicated, according to the teachers. The teachers say that it feels odd to ask the pupils to communicate using digital tools as part of schoolwork: "But that's probably why I haven't done it: They are here physically. They can just talk to each other. I haven't thought much about it, to be honest." Only one of the teachers says that real-time communication between students has been relevant when working with digital tools. The data in this study cohere with previous surveys by saying that the Internet is introduced to the pupils at school, but they are on their own when developing these skills (Rohatgi & Throndsen, 2015, p. 108).

**Time perspective**
Digital tools are seen as a means to save time, especially when assessing pupils, and as an obstacle, if pupils do not master the tools. Linda says time is the most critical limitation when planning for the use of digital tools: "Time, yes, that too. Absolutely, time too. How much time I have got, and they. That is, with them, and afterward. How much time will I spend on pre- and post-work? It will probably be a lot." This is in line with research on time as a limiting factor, time spent on preparations, practicing the use of technology, and dealing with technical problems (Bingimlas, 2009, p. 239). Previous research states that when teachers are motivated to use digital tools, time will be less critical (Ertmer et al., 2007, p. 57). Research also has shown that experienced teachers rank time significantly higher as a limiting factor than teachers with less experience (Ertmer et al., 2007, p. 58). In this sample, there were no differences between the informants regarding such attitudes.

**Pupils' digital skills**
Pupils' attitudes, prior knowledge, and digital judgment are perceived by several teachers as an obstacle when using digital tools for collaboration and communication. Kristian thinks it can be problematic to use digital class chats due to concerns regarding students' privacy. It is time-consuming to teach pupils digital judgment and online behavior in addition to maintaining an academic focus.

Several informants stated that the pupils ask a lot for help when they use digital tools. The teachers would have used ICT to a greater extent to practice collaboration and communication if the pupils had sufficient digital skills. If the pupils do not master a digital tool, there is little time during the school day to practice the specific skills, such as using menu systems, using the school's LMS, or sending attachments with an e-mail. Camilla says: "In tenth grade there are still some who do not know where the assessment overview is in its-

learning." Camilla's experience is in line with research findings where pupils in eighth grade have difficulty navigating the school's LMS or the menu system of software such as Word (Blikstad-Balas & Klette, 2020, p. 64). Even though the pupils are digital natives, one has to assume that the digital competence varies (Blikstad-Balas & Klette, 2020, p. 64; Prensky, 2001; Scolari, 2019, p. 165).

Linda explains that she has tried various forms of digital collaboration, but the methods have not worked out. She believes that pupils' attitudes and lack of digital knowledge play a role. Her pupils do not receive training in how to use video chats, messages, or other digital forms of communication. Linda says that she has not used such solutions with the pupils using the digital tools they have access to. It seems that technical solutions at schools appear to be more challenging to access than what pupils and teachers are used to from various social media they use in their free time. According to TAM, perceived ease of use is essential when teachers choose technology (Davis et al., 1989, pp. 985–986; Davis & Venkatesh, 1996, p. 20). Kristian says: "I know why we use Facebook. That's because it's so easy. We have it, and everything goes smoothly."

## Overall discussion

The results demonstrate a range of factors influencing teachers' facilitation of pupils' digital competence. When it comes to digital communication and collaboration as part of digital competence, the results demonstrate that some teachers focus on pupils collaborating digitally, especially pupils sharing digital files. However, none of the interviewed teachers focus on pupils communicating in real time via text or voice by means of digital tools.

The teachers participating in the study teach social studies. However, it does not appear that this is decisive in influencing their opinions and experiences they have associated with the integration of digital working methods in teaching. This is somewhat surprising since social studies is intended to help pupils in developing digital citizenship, according to the core curriculum (Utdanningsdirektoratet, 2020, p. 5). The new curriculum in social studies emphasizes that pupils should be able to communicate and collaborate digitally (Utdanningsdirektoratet, 2020, pp. 5–6).

The overall impression from the interviews is that the teachers do consider practicing communication and collaboration using digital tools as relevant. But none of the informants mentions digital collaboration or communication skills without being asked directly about it. It seems more common to let pupils collaborate using and creating digital products than to let them communicate using digital tools. Some of the teachers in the sample state that they regularly work with collaboration in the form of co-writing, and most of the informants say that the pupils often share documents. File sharing is the most common way to collaborate, according to the sample in this study.

None of the teachers has had a particular focus on the pupils' using digital tools to communicate with each other, for example, by using messaging systems or video calling. This study confirms what other studies have shown: Although much ICT is used at school, the vast majority of pupils learn to communicate elsewhere (Rohatgi & Throndsen, 2015, p. 108). A greater focus on the teacher's professional digital competence will be useful to help pupils understand how they can utilize digital tools for communication and collaboration at school. There are several factors affecting this. The most apparent obstacles for the teachers is other aspects of basic digital skills, limited time available, immature pupils, and lack of sufficient digital competence. Digital interaction and communication also appear, for some of the teachers, as an unnecessary and complicated part of schoolwork. One of the informants

says that it might seem somewhat prearranged and artificial to practice communication in a classroom context where all the pupils are in the same room at the same time.

There are limitations associated with the study. The recruitment of informants was difficult. This may be for several reasons, such as for instance lack of time or interest in participating. This can lead to a bias in the diversity of opinions. Challenges and obstacles related to lesson planning may not appear to the same extent as it might in a more random selection. In this case, semi-structured interviews were chosen as the method. Other possible approaches, such as focus group interviews, or a combination of several methods, could have produced a greater diversity of opinions. The researchers' experience from secondary school as teachers can also affect the analysis and the results (Dowling, 2007, p. 136; Gubrium & Holstein, 2012, p. 34).

## Conclusion and directions for future research

This study explored the factors influencing social studies teachers' facilitation of pupils' digital communication and collaboration skills at the secondary level. The analysis of the interviews revealed groups of factors such as positive attitudes, physical presence in the classroom, time perspective, pupils' digital skills , teachers' digital skills, and technology used as a means to an end, not as an end in itself.

The most obvious implication of this research is that there should be a greater focus on the skills area that deals with communication and collaboration in the framework for digital skills (Utdanningsdirektoratet, 2016). Systematic work with digital skills in schools should include pupils' communication and interaction. Pupils must be trained in the full range of basic digital skills, including communication and interaction.

If interaction and communication tools can be more easily integrated into teaching, teachers will, to a greater extent, plan for the use of these (Davis et al., 1989). It seems that an essential factor may be the ability to limit pupils' possibilities to engage in inappropriate digital activity. Attention to interaction and communication as part of teachers' education can lead to an increased focus on this area of skills by strengthening teachers' TPACK (Davis et al., 1989; Mishra & Koehler, 2008).

Regarding facilitating interaction and communication, digital infrastructure is an interesting point not thoroughly examined in this study. Is the infrastructure in place so that teachers can immediately get to work, or must underlying structures be set up requiring a form of digital competence that not all teachers possess?

The study was planned before everyday school life changed radically for all teachers and pupils in Norway during spring 2020. The measures implemented to prevent the spread of Covid-19 led to virtually all teaching at all levels having to take place on digital platforms, and pupils were suddenly thrown into a new digital reality. All teachers and pupils have experienced the need for digital communication and collaboration through a period with home schooling. Will new digital practices emerge?

When communicating via digital tools, ethical issues such as privacy concerns are important to take into consideration. However, none of the informants expresses any real concerns about privacy issues. Privacy issues are important to consider in future research. Ethical considerations are highlighted by the online schooling experienced during the pandemic. Privacy issues are another layer of challenge for teachers when dealing with this part of pupils' digital competence.

It could be interesting to investigate whether secondary schools have changed their focus on which areas related to digital competence will be practiced in the future. Will experiences

from the period of home school change the focus from producing and processing to communicating and collaborating using digital tools? This remains to be seen.

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