

CATERING FOR STUDENT DIGITAL COMPETENCE

Teachers navigating the complexities
of digital-infused education

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of digital-infused education

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Doctoral Dissertation

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ISBN: 978-91-8115-164-0 (PRINT)
ISBN: 978-91-8115-165-7 (PDF)

Doctoral Thesis in Applied Information Technology towards Educational Science,
at the Department of Applied IT, University of Gothenburg.
The thesis is available in full text online
<http://hdl.handle.net/2077/84928>

This doctoral thesis has been prepared within the framework of the graduate school
at the Centre for Educational and Teacher Research, University of Gothenburg

Centre for Educational Science and Teacher Research,
CUL Graduate school in educational science
Doctoral thesis 110

In 2004 the University of Gothenburg established the Centre for Educational Sciences and Teacher Research (CUL). CUL aims to promote and support research and third-cycle studies linked to the teaching profession and the teacher training programme. The graduate school is an interfaculty initiative carried out jointly by the faculties involved in the teacher training programme at the University of Gothenburg and in cooperation with municipalities, school governing bodies and university colleges.

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Cover illustration: Plausible maps in ever-changing terrains of digital-infused education by Johanna Andersson @johannaandersson.art

Printed in Borås, Sweden 2025
Printed by Stema Specialtryck AB



ABSTRACT

There have been massive investments in school digitalization worldwide, which have led to high policy expectations for potential outcomes, one being that students will be able to use digital technologies and understand their consequences. Thus, the thesis aims to contribute to a deeper understanding of how teachers make sense of *student digital competence* and how it is catered for in digital-infused teaching practices today. For this purpose, teachers' accounts and enactment, as well as what conditions teachers face, are investigated in three multi-sited ethnographic studies where teachers and other personnel working in 14 primary, lower-secondary, and upper-secondary schools in Sweden participated. Individual and focus group interviews, observations, fieldnotes, informal conversations, texts and walkthroughs generated the data which were qualitatively analyzed using the practice theory of sensemaking.

The results indicate that, apart from considering student digital competence as a subject-specific curricular concept, it can additionally be understood as a vague, narrow, technical-instrumental and cross-curricular one. Teachers individually and differently cater for cross-curricular aspects, that is, *technical aspects*, *source criticism* and *how students can avoid dangers in relation to digital technologies*. In almost every lesson, teachers dedicate time to instructing their students in how to navigate digital platforms for schoolwork, which is why a new, tacit, and cross-curricular school subject of *platform bureaucratization* was identified. The expectations expressed in policies in relation to participation in a digital-infused society, for example, *digital rights*, *participation*, *engagement*, and *critical resistance*, *legislative* and *ethical aspects*, as well as *data-* and *AI-literacies*, are not as visible, and few teachers consider it their task to attend to these aspects. The identified constraining conditions relate to *policies* and prevailing *discourses*, *school development strategies*, *digital technologies*, and *how students' digital-infused out-of-school activities are made sense of*.

The practical and pedagogical implications let bottom-up and top-down perspectives meet, since the implications involve teachers, school leaders and facilitators such as school librarians and ICT advisors, and transnational and national stakeholders.

Keywords: Student digital competence; school digitalization; primary and secondary school; curriculum; cross-curricular; teacher; teacher sensemaking; platform pedagogies; platform bureaucratization; digital literacy

ACKNOWLEDGEMENTS

I guess it all began at the kitchen table where my mum, Birgitta, assessed her students' assignments. Somehow, I figured out that a written note would catch her attention, and before I could read, I wrote a question and she answered me in writing. 'What did the note say?' She had to teach me. It became a playful game where the five-year-old me experienced that education was not only about getting a job in a distant future, but also to provide a rich life here and now.

There are many I would like to thank. My supervisors Annika Bergviken Rensfeldt and Thomas Hillman, your feedback has been most valuable to me. Thank you also for introducing me to the international research team "Reconfigurations of Educational In/ Equalities in a Digital World" (RED). A special thanks to Paul Prinsloo for your huge hospitality during our visit in South Africa. The meals in your home, all the things you arranged for us – I don't know how to express my gratitude well enough. Thanks also to Philip Kwashi Atiso Ahiaku and Godfrey Muyambi who so kindly arranged the field work in Gauteng and KwaZuluNatal in South Africa. A special thanks also to Pato Ferrante, Lydia Heidrich, Inez Dussel, Felicitas Macgilchrist, and Alejo González López Ledesma who arranged our gathering in Argentina. Awesome. Many thanks also to Federico Williams and, once again, Godfrey Muyambi, I enjoyed co-writing the book chapter with you.

I also want to thank the ones who were my supervisors at the beginning of my Ph.D. journey, Ylva Hård af Segerstad and Mette Liljenberg. I would have loved continuing working with you. Johan Lundin and Anna-Lena Godhe have also been part of the supervision team, and I would like to thank you for your work and the good times. Another one who has been of big help is Mathias von Felitzen - thank you for your technical support, and your enormous help with the layout of this thesis.

A special thanks to all the people who have shared their knowledge with me during these years. Anette Olin Almqvist and Jonas Almqvist, thank you for not believing me when I said I would not apply for a position as a Ph.D. student. I needed that push. Ulf Blossing, you kindly offered me valuable advice when I finally applied for the position. Sara Willermarck, Annika Lantz-Andersson, and Cathrine Tømte, thank you for

agreeing to discuss my work, and for your helpful feedback during the milestone seminars. Ylva Hård af Sefgerstad and Johan Lundin, thank you for your work as examiners at different times. David Lundie, Glasgow University, Isabel Tarling, Limina Education, Cape Town, Rebecca Eynon, Oxford University, thank you for so generously agreeing to meet with me when I came visiting. Ann-Charlotte Mårdsjö Olsson, thank you for keeping in contact when I have been on leave from my work at the Department of Education during these years. Åsa Hirsh, Anna Hulterström and many others there, the positive work experiences with you have kept me going at many times.

Thank you, the Department of Applied IT, especially the PhD students Adam Palmquist, Anita Grigic Magnusson, Bo Yang, Charlotte Arkenback-Sundström, Elin Ericson, Erik Winerö, Izabella Csonka, Karin Ekman, Marcus Kristensen, Marie Gottfridsson, Marie Utterberg Modén, Rasha Al Massalmehand, Svea Kiesewetter, and Postdoc Susan Harrington. A special thanks to Anita, Elin, Izabella, Karin, Marie G and Susan who have always walked the extra mile with me. Thank you, the Tekno research group, the graduate school CUL, as well as the national research school Upgrade, it has been inspiring to meet with you in courses and seminars.

There are two dear friends that need to have a special thanks. Johanna Andersson - thank you for the illustration on the book cover – I love it! And thank you for being there no matter what. Marie Gottfridsson, our “knock, knock” via messages and phone calls has fueled my thoughts in so many ways and I truly value our friendship.

To the most important people in my life - my family; Stellan, I simply love you - thank you for your enormous support. Our children, Joel, Joseph, and Lisa, you bring so much happiness to my life. Adina, I am so glad I have met you and, of course, you are included in my love. Helena, you are probably the best sister someone can have (yes, you are), so knowledgeable, and encouraging to a whole bunch of people. Hugs and thanks to all in your family. Karin and Ulf, thank you for being there. Once again, thank you mum, you did not only teach me how to read and write, but you also taught me that being a teacher is rather fun, hectic, sometimes difficult, and something to be proud of. Finally, thank you dad Åke, grandma Lilly, and granddad Lars. You are still an important part of my life even if you are no longer here.

DISTRIBUTION OF WORK

In alignment with the Vancouver recommendations (ICJME, 2024), I will acknowledge the contributors of the papers (1-4), published or to be published with open access. I have received grants from Hvitfeldtska stipendiestiftelsen and several grants from the Adlerbert Research Foundation (one being KVV5) to attend conferences and visit scholars around the world. I got access to one school through the international research project Reconfigurations of Educational In/Equality in a Digital World (RED), a research project Thomas Hillman was granted funding for by Riksbankens Jubileumsfond, Grant GI19-1500. The project has enabled visits to scholars in other countries. I have no obligations towards any of the scholars or the foundations, why there are no conflicts of interests to report.

Paper 1: Löfving, C. (2023). Making their own sense of students' digital competence. *Nordic Journal of Digital Literacy*, 18(3), 145-157. <https://doi.org/10.18261/njdl.18.3.2>

I am responsible for the design, reaching out to participants, data production, analysis, and of writing of the paper. Lundin, Godhe, and I discussed the first rounds of analysis. I presented the preliminary analysis at an online conference, IRIS/SCIS, Orkanger, Norway, in 2021. I conducted the following rounds of analysis before writing the final version and submitting the manuscript.

Paper 2: Löfving, C., Godhe, A.-L., & Lundin, J. (2023). Teachers' dilemmatic spaces connected to students' net-based out-of-school activities. *The International Journal of Information and Learning Technology*, 40(1), 62-72. <https://doi.org/10.1108/IJILT-03-2022-0042>

The three authors co-wrote the paper. I am responsible for the design, getting access to schools, data production, the first round of analysis, and a major part of writing the paper. Godhe and Lundin offered their advice on what theory to use and on the analysis, which we discussed in several rounds. Godhe is responsible for writing about dilemmatic spaces, and Lundin for writing the introduction. They read the manuscript and offered their advice before I submitted it. I rewrote some parts after the review, and re-submitted the final manuscript.

Paper 3: Löfving, C. (2023). Teachers' negotiation of the cross-curricular concept of student digital competence. *Education and Information Technologies*, 1-20. <https://doi.org/10.1007/s10639-023-11800-x>

I am responsible for the design, data production, analysis, and writing the paper. I presented the preliminary analysis at a conference, CUL, Lerum, Sweden, in 2022. Bergviken-Rensfeldt read the last version of the manuscript and offered some advice before I submitted it.

Paper 4: Löfving, C., Bergviken Rensfeldt, A., & Hillman, T. (2024). Platform bureaucratization as pedagogy - a tacit school subject in highly platformized classrooms. Submitted manuscript under review.

The paper is the outcome of the collaboration between the three authors, Löfving, Bergviken Rensfeldt, and Hillman. I am responsible for the design, data production, and the first round of analysis. The three authors were engaged in the analytical process that followed. Bergviken Rensfeldt and I presented the preliminary analysis at conferences; together at NERA, Oslo, Norway, in 2023, and I alone at ECER, Glasgow, Great Britain, in 2023. I wrote the first draft of the manuscript, which the three authors then discussed and further analyzed. The three authors rewrote the manuscript several times before I submitted it. The research is part of the research project Reconfigurations of Educational In/Equality in a Digital World (RED), for which Hillman received funding by Riksbankens Jubileumsfond under Grant GI19-1500.

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PART 2 - THE PAPERS

PAPER I

Making their own sense of students' digital competence. Teacher negotiation and its implications for democracy and (in)equality

PAPER II

Teachers' dilemmatic spaces connected to students' net-based out-of-school activities

PAPER III

Teachers' negotiation of the cross-curricular concept of student digital competence

PAPER IV

Platform bureaucratization as pedagogy - a tacit school subject in highly platformized classrooms

APPENDIX

Part 1

CATERING FOR STUDENT DIGITAL COMPETENCE

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CHAPTER 1

INTRODUCTION

In recent years, education worldwide has become increasingly infused by *digital technologies*. Today, laptops, tablets, smartphones, as well as different software applications such as digital platforms with their various applications can be accessed through software interfaces and used for pedagogical and administrative purposes. However, according to the results of the International Computer and Information Literacy Study (ICILS), all 14-year-old students in the participating 35 countries around the globe are not as digitally competent as expected, and there are huge differences between students' digital competences (Fraillon, 2024). This thesis engages in a pressing need to investigate what role education play when it comes to catering for *student digital competence* in Sweden. Thus, the activities of the people who meet the students day to day, namely the teachers, are of specific interest, as well as the conditions that enable or constrain their work.

A central concept in this thesis is *catering for*. It is used to capture all teaching activities, planned and unplanned, that may have an impact on student digital competence, not only be the ones where teachers have decided to instruct the students about various aspects of digital competence. The concept of digital competence is used throughout this thesis, since it is used in policies in the European Union (EU) and, thus, in Sweden, where the studies comprising the thesis are conducted. The concept is referred to in general terms in Swedish national curricula, indicating that general aspects of digital competence are to be catered for in all school subjects. (The general aspects are outlined in the appendix, Figure 1). However, specified aspects such as “programming” or “source criticism” are specifically mentioned in some subject syllabi (National Agency

for Education, 2022a, 2022b), indicating specific attention to these aspects in some school subjects. Further, the thesis acknowledges the close connection between digital competence and similar concepts. For example, digital literacy is sometimes used interchangeably with digital competence, and they are both associated with various forms of knowledge, skills, values, attitudes, and meeting complex demands (Ferrari et al., 2012; Gouseti et al., 2024; Ilomäki et al., 2023; Marín & Castañeda, 2023a). However, defining digital competence is not easy, since the concept can be regarded a symbol which carries different meanings to different people (Pondy et al., 1983), or a *boundary object* which consists of several temporal and local dimensions that people relate to in various ways (Star, 2010). My understanding of the concept of digital competence is in line with how Ilomäki et al. (2016) express the concept as something emergent rather than static:

Digital competence consists of the skills and practices required to use new technologies in a meaningful way and as a tool for learning, working and leisure time, understanding the essential phenomena of digital technologies in society as well as in one's own life, and the motivation to participate in the digital world as an active and responsible actor. (Ilomäki et al., 2016, p. 670-671)

When teachers engage in catering for student digital competence, they can be understood as participating in socially, situated, processual, material, and recurrent activities which form their *teaching practices* (Nicolini, 2017; Scharzki, 2018). In this thesis, teaching practices refer to teaching activities where teachers either plan their teaching, sometimes individually and sometimes together with others, or where they carry out teaching, or follow it up. Some teaching practices can be found in specific meetings and work constellations where teachers are to negotiate meaning (Vangrieken et al., 2015) to be able to work towards shared goals (Lave & Wenger, 1991; Wenger, 2000). In these practices, technologies may be used to digitize what previously has been analog, or for digitalization, that is, to communicate or construct content in new ways together with either software or people.

1.1 POLICY EXPECTATIONS REGARDING EDUCATION

Digital technologies may be related to in different ways due to different expectations regarding the purpose of education. Normative expectations of teaching activities are often found in *policies*, that is, in political, commercial or interest-driven regulations that can occur in transnational and government, municipal, or local regulations, and which may be revised as societal expectations and norms change (Willbergh, 2015). They can be prescriptive, written down or merely agreed upon (Braun et al., 2010; Willbergh, 2015). Consequently, expectations can be presented as policies represented by various transnational, national, and local stakeholder. These can be political organizations, educational technology (EdTech) companies, researchers, media, school personnel, and parents who all may have their say on educational questions.

At transnational level, policy-stakeholders such as the Organization for Economic Co-operation and Development (OECD), the European Union (EU) with its European Commission (EC), and the United Nations Educational, Scientific and Cultural Organization (UNESCO), can be considered part of these expectations as they aim to influence national decisions, which in turn, aim to influence local teaching practices (Priestley et al., 2021). The influence is to steer education in certain directions (Falloon, 2020; Ward et al., 2015).

Additional influences may come from social media, where teachers can meet in online discussion-groups outside of work, and sometimes act as influencers (Carpenter et al., 2023). Some policies are produced at a national level and presented in a national curriculum, which can be described as “an official statement of what students are expected to know and be able to do” (Levin, 2008, p. 8). When I use the concept of *national curriculum*, I refer to such an official text-document, otherwise *curriculum* carries a broader meaning which concerns questions of the purpose of education, activities in the school organization, as well as in teaching practices (Coşkun Yaşar & Aslan, 2021; Priestley et al., 2021).

Drawing on the above, teachers face a broad range of expectations when navigating the complexities of digital-infused education concerning how to use digital technologies and for what purposes (Eynon, 2022; Pangrazio, 2019). Even if policies seldom provide any clear or

linear path to follow, they can give the impression that there is a prevailing consensus (McGarr et al., 2021; Nordin & Sundberg, 2018). However, if policy guidelines become too controlling they may downplay what happens more spontaneously, for example, in relation to practices out-of-school (Biesta, 2013). Moreover, when teachers try to act in alignment with policies, the underlying ideas are seldom enacted in the same ways in every context (Mikulec & Ermenc, 2016). The *enactment*, that is, the merge of sense and action, (Sandberg & Tsoukas, 2015), varies. *Context* here refers to what phenomena surround and immerse the practices (Schatzki, 2005, p. 467-468), for example, present and past activities in and outside of a school organization, and to materiality, structures, norms, and values expressed in, for example, policies (Cuban, 2020; Priestley et al., 2017; Priestley & Xenofontos, 2021; Williamson & Eynon, 2020).

To sum up, policies can be understood as made, rather than reflecting an actual state of facts presented as given rules that can be applied in all contexts (Maguire et al., 2011). The understanding is in line with *critical realism*, meaning, there is a world out there, however, differently made sense of in situated and social practices (Benton & Craib, 2011). This is a prominent perspective of this thesis.

1.2 DIFFERENT PURPOSES OF EDUCATION

Different expectations may represent different purposes of education. Some may advocate for education to meet the economic needs in society and to educate for students' future employability, some may advocate for students to be educated in how to navigate and impact society (Eynon, 2022), while others may emphasize equal opportunities and reducing inequality among students (Pagani et al., 2016). Other expectations focus on technical issues on how technologies can innovate and enhance learning in traditional school subjects (Alam & Mohanty, 2023), while others focus on what competences are needed to make use of technologies (Gudmundsdottir et al., 2024).

The different purposes may represent different proportions of *knowledge acquisition*, *socialization* into norms and values, or *subjectification* "which has to do with the interest of education in the subjectivity or 'subject-ness' of those we educate. It has to do with

emancipation and freedom and with the responsibility that comes with such freedom” (Biesta, 2013, p. 4). In this thesis, which is concerned with teachers catering for student digital competence in primary, lower secondary, and upper secondary schools, students are recognized as subjects being able to contribute to knowledge of what such competence entails (MacKenzie, 2024), even if they in this thesis only are being heard through the accounts of their teachers.

Subjectification could be understood as having connotations with how children’s rights and freedom are stated in the Convention on the Rights of the Child (United Nations, 1989), and in the comment on children’s rights in relation to the digital environment: “Meaningful access to digital technologies can support children to realize the full range of their civil, political, cultural, economic and social rights. However, if digital inclusion is not achieved, existing inequalities are likely to increase, and new ones may arise.” (The United Nations Committee on the Rights of the Child, 2021, § 1.4). Subjectification is thus understood as one of several purposes of education, similar to *Bildung* which has several connotations depending on who is asked. *Bildung* could be described as the “process where, through engagement with existing meanings - or with a wider term: culture - individuals ‘invest’ themselves into those meaning(s) and thus become someone” (Biesta, 2016, p. 834). Another aspect of *Bildung* refers to developing as human beings who are part of society, concerning democratic rights (Gustavsson, 2002; Willbergh, 2015; Wulf, 2003). When “digital” is added to *Bildung*, it involves being empowered to ethically consider and participate in digital-infused society (Krumsvik, 2014).

Krumsvik et al. (2016) point out that teachers need to understand what kind of digital competence students need in a digital-infused society, in what can be defined as *digital Bildung*. Similar arguments are made by Skaar (2024), who advocates for digital *Bildung* in education. Since digital technologies are continuously developed, not the least due to a huge interest in generative large language models (LLMs), Krumsvik (2024a) has later stressed that “[t]he complexity around the digital *Bildung* arenas that the pupils participate in increases with the impact of artificial intelligence both in and outside school, and both teacher educators and teacher students must be vigilant about this” (p. 57). Students in primary schools and onwards can thus be understood as being

part of such digital Bildung-arenas. Being able to navigate in and being part of a digital-infused society, can additionally be understood through the concept of *digital citizenship* (Ribble et al., 2004), further explained in chapter 2.

However, what purposes of education to focus on is not straightforward. If there is a strong focus on one of the purposes, other ones may be diminished. Even if multiple purposes are acknowledged, they may contain conflicting ideas; socialization into norms may contain ideas of both cooperation and individualization, as well as obedience to authority and being able to questioning the same (Cuban, 1986, p. 8). Consequently, teaching practices are in this thesis understood as surrounded and infused by different expectations, which, in turn, adds to the complexities, or dilemmas, in teaching practices.

1.3 DIGITAL-INFUSED TEACHING PRACTICES AS PART OF THE CURRICULUM

When teachers navigate the complexities of digital-infused education, they engage in their teaching practices based on their *pedagogical beliefs*, *agency* and *professional identity*, that is, teachers' understandings of themselves (Engeness, 2021; Lasky, 2005). Further, their engagement is based on *conditions* in relation to the school organization and its broader context influenced by policies, structures, norms, and values (Priestley et al., 2017). Sometimes different practices in- and out-of-school merge into each other's areas (Fawns, 2022). In a digital-infused society, students' out-of-school activities tend to be *digital-infused*, or (inter)net-based, as society consists of a mixture of digital and analog activities, and where the practices are not always easy to separate (Gouseti et al., 2024).

Moreover, it has been argued that some technologies, such as digital platform-applications, entail certain pedagogical meanings, and can thus influence or co-constitute the teaching practices of which they become part of (Kerssens, 2023; Mörtzell, 2024; Perrotta, 2023; Sefton-Green, 2022; Sefton-Green & Pangrazio, 2021). Consequently, teaching practices may be infused by dilemmas, making the practices part of *dilemmatic spaces* where dilemmas can be considered ever-present and

natural parts of the teaching activities (Fransson & Grannäs, 2013). To counteract various dilemmas, and to organize for what could be thought to be well-functioning practices, decisions are sometimes left to by single, appointed personnel (Tømte & Smedsrud, 2023). However, this may cause other dilemmas, which is why Selwyn et al. (2018) argue that some digital-related issues, like digital platform-usage, needs to be negotiated also by the ones using the technologies, here the teachers who meet with their students day to day.

The abovementioned conditions are examples of what may generate the school curriculum. Hence, this thesis can be placed in the field of *curriculum studies* with a special interest in *school digitalization*, since it focuses on digital-infused teaching practices placed in a broader context. Part of the field of curriculum studies is *didactics* (sometimes referred to as *didaktik*), a domain common in central Europe and Scandinavia (Kansanen, 2009). Didactics concern instructional processes where general and subject-specific ideas, age of students, and technology usage are catered for (Kansanen, 2009, p. 32). Although this thesis is not to be placed only in the domain of didactics, the domain needs to be acknowledged, since teachers function as pedagogical and didactical links between the various expectations and the students. Teachers are in charge of *classroom activities*, *lessons*, which can be described in organizational terms as based on activities, where the teacher initiates different interactions and where one sequence leads to another (Mehan, 2013; Weick, 1993). Most activities can further be described as based on what in higher education is referred to as constructive alignment between the object to be taught, what teaching activities to engage in, and how to assess students' performances of their understandings of the teaching object (Biggs, 1996). Here, the teacher's professional agency comes to play (Trigwell & Prosser, 2014) together with conditions that are part of the broader context (Priestley et al., 2017).

To direct the focus, this thesis mainly engages in teachers' accounts and enactments of catering for student digital competence in teaching practices, and in what conditions teachers face as part of a broader context, for example, related to student digital-infused out-of-school activities. Understanding teaching practices as part of such a broader context, is to take another stance than maybe bashing teachers for either embracing technologies or not (Cuban, 1986).

1.4 SWEDEN – AN EXAMPLE OF DIGITAL-INFUSED EDUCATION

When investigating teachers' accounts and enactments of catering for student digital competence and what conditions teachers face, Sweden will serve as a relevant and interesting example, not least for other countries going in a similar digital-infused direction. During the last decades there have been major investments in digital technologies in Swedish education. Previous research has engaged in questions of how well-prepared teachers consider themselves to be to use digital technologies in teaching practices, a competence sometimes referred to as *professional digital competence* (PDC) (Krumsvik et al., 2016), or pedagogical digital competence (From, 2017), and in what ways technologies are implemented in schools (Mårell-Olsson & Bergström, 2018; Sperling et al., 2024). However, while previous research has been valuable, research on pedagogical activities in situated and digital-infused teaching practices is still lacking (Hangartner et al., 2024), specifically on how student digital competence is catered for in those practices when paying attention to contextual matters such as school organizations (Pettersson, 2018b; Tømte & Smedsrud, 2023).

Following the first roll out of one-laptop-for-each-student (1:1) in some of Swedish secondary schools in the beginning of 2010 (Tallvid, 2015), student laptops are no longer an exception in most schools, and the Swedish education system is one that uses the most digital platforms in the world (Hillman et al., 2020). To meet the needs of teachers, there have been various digitalization projects, and national online courses have been provided, for example, the national course Practical IT- and Media Competence (PIM), launched in Sweden in 2006 (National Agency for Education, 2013). Another online course on digital competence was later provided by the Swedish National Agency for Education (n.d.) to be used by schools for teacher group-discussions. Outside of Sweden, transnational online and asynchronous courses have been provided (see Europass Teacher Academy, 2020; UNESCO, n.d.). The Swedish investments in school digitalization can be understood based on the long record of trying to achieve equal opportunities for all students in Sweden. In study 1, paper 1, I use the concept of *(in)equality* (Pagani et al., 2016) to investigate any such relation to student digital competence.

The Swedish national expectations on digital competence were explicitly expressed in 2017, when the Swedish Ministry of Education (2017) launched a new policy; a national agenda for school digitalization, including writings that students were to develop, what was referred to as, adequate digital competence (appendix, Figure 1). The year after, the concept of digital competence became a teaching object to explicitly relate to in all school subjects (National Agency for Education, 2022a, 2022b). However, the OECD has criticized Sweden for not doing enough (OECD, 2018b, p. 180). In the beginning of the 2020s, there was intensive policy work based on a proposal for a national agenda in Sweden stating, among other things, that municipality organizers needed to have an action plan for school digitalization and to consider how to use data in education (Ministry of Education and Research, 2017).

Lately, a digital backlash in digital-infused teaching practices has been identified in some countries around the world (Albris et al., 2024). For example, the Swedish national agenda on digitalization was criticized by the next Swedish Minister of Education, part of the government elected in 2022, for letting digitalization in education go too far (Edholm, 2022), which fueled the debate on the purpose of digitalization and digital competence in education. Instead, the Minister of Education commissioned the National Agency for Education to recommend, by 2025, what digital tools to use in education (U2023/03229).

There is nothing to say that digital competence or other similar concepts will always be highlighted in policies such as the Swedish national curricula. However, digital competence may be considered here to stay as long as society is infused by digitalization, regardless of how digital competence or related concepts are framed in various policies in the future.

1.5 AIM AND RESEARCH QUESTIONS

This thesis aligns with research interested in how teaching practices are configured beyond the investments in, and policy expectations regarding, school digitalization. Here, teaching practices are understood as socially and actively constructed activities that are part of, and conditioned by, a broader context (Priestley et al., 2012), which is why I place this thesis in the field of curriculum studies, targeting questions of school digi-

talization, and specifically on digital competence. The concept of digital competence is expressed in educational policies, such as Swedish national curricula. However, policy is understood as something lived and done, instead of something static, and is not perceived in the same way for everyone in all situations (Pinar, 2015; Priestley et al., 2021). Previous research on school digitalization has mainly engaged in teacher professional digital competence (PDC). Less attention has been paid to situated and pedagogical questions of how teachers cater for student digital competence (Hangartner et al., 2024). Consequently, there is an identified research gap, which I intend to fill by directing my interest towards the part of teacher PDC that is associated with catering for student digital competence. For this purpose, I use ethnographic research methods to investigate teachers' accounts and enactment of their teaching-practices, further explained in the methodology chapter, chapter 5.

Based on the above, this empirically grounded thesis will take a novel and much needed practice-based and organizational approach to the way student digital competence is catered for by teachers in digital-infused teaching practices today. Instead of asking *why* policies are not implemented in a special way, it asks *how* teaching practices are constructed when teachers try to make sense of how to cater for student digital competence. The aim is to contribute to a deeper understanding of how teachers make sense of student digital competence and how it is catered for in digital-infused teaching practices. The knowledge is to be a resource for teachers, school leaders, facilitators and policy makers working at different levels, when catering for student digital competence at different times and in different contexts.

The key research questions are:

RQ1: How is the emerging policy concept of digital competence accounted for and enacted by teachers in digital-infused teaching practices?

RQ2: What conditions enable and constrain catering for student digital competence in teaching practices?

RQ 1 is accounted for in paper 1, 3, and 4, and RQ 2 is accounted for in all four papers.

1.6 THESIS OUTLINE

The thesis consists of two parts. The first comprises this *introductory* chapter, a *background* chapter outlining how policies on digital competence have unfolded throughout time, and a chapter on *related research* which situates the thesis in a wider field by connecting it to research conducted in the areas of educational science and organizational theory. From this departure, I build the argument on how I have designed the research and formulated the overarching research questions. Next is a *theory* chapter on what theoretical frameworks and related concepts I have used. The following chapter on *methodology and methods*, lay out the ethnographic methodology of the thesis and what methods and ethical questions I have considered to serve the aim of the thesis. The following chapter on *paper summaries* provides the main findings of each study presented in four papers, and how they contribute to the aim of this thesis. Next follows the *discussion* chapter where I synthesize and discuss how the studies underpinning this thesis contribute to answering the overarching research questions and to the aim of the thesis. Further, there is a chapter with *conclusions*, followed by a *Swedish summary* of the text which can be useful for a Swedish audience. After the references, there are an *appendix with figures referred to in the text*. The second part of the compilation thesis consists of the *four empirical research papers*:

1. Making their own sense of students' digital competence. Teacher negotiation and its implications for democracy and (in)equality, published in the Nordic Journal of Digital Literacy.
2. Teachers' dilemmatic spaces connected to students' net-based out-of-school activities, published in the International Journal of Information and Learning.
3. Teachers' negotiation of the cross-curricular concept of student digital competence, published in the journal Education and Information Technologies.
4. Platform bureaucratization as pedagogy - a tacit school subject in highly platformized classrooms, submitted manuscript under review.

CHAPTER 2

DIGITAL COMPETENCE AND RELATED CONCEPTS IN POLICIES – A BACKGROUND

This chapter provides a background on how the emerging concept of digital competence and relating literacy concepts can be understood, since these are sometimes used interchangeably (Ferrari et al., 2012; Ilomäki et al., 2023). I will describe digital competence and its relating concepts from a historical perspective zooming in on events from the 1960s until today, which are chosen based on their relevance for understanding aspects of digital competence. Further, I will describe how the concept is expressed by transnational policy actors, and in Swedish national curricula.

2.1 UNDERSTANDING DIGITAL COMPETENCE FROM ITS HISTORY

The concept of digital competence first appeared as a policy concept in 2005, and is used more frequently in policy documents than in educational research (Ilomäki et al., 2016). Since the concept can be understood in various ways, it may be problematic to try to determine too categorically what to include. To make it even more complicated, other concepts, such as *digital literacy*, *digital skills*, *digital citizenship*, *21st century skills*, and *digital Bildung* (Hwang et al., 2020; Marín & Castañeda, 2023a; Willbergh, 2015), are often used interchangeably. Some policies focus on digital competence for all citizens (Vuorikari et al., 2022), some for teachers (From, 2017; Redecker & Punie, 2017; UNESCO et al., 2024a),

and some for students (UNESCO et al., 2024b). Due to different contexts, there can be various interpretations of the digital-related concepts (Pangrazio et al., 2020).

Looking back, and to understand the origins of digital competence, when computers were developed during the 1960s, they were intended to be used by a small group, usually in lab environments. The technical competences required by these few people were mostly about programming (Ferrari et al., 2012). At the same time, there were hopes that digital technologies would help students learn in new ways and make it easier for teachers by relieving them of some of their workload. However, it turned out that teachers' workload often increased when technical solutions entered teaching practices, as those came to be restructured and had to be made sense of (Bergviken Rensfeldt & Rahm, 2022).

In the United States in the 1970s, Papert developed a computer program for children, Logo, with the intention that they would learn to program while creating something in various school subjects. The students would feel they could influence the computer and thereby master other areas of life (Papert, 1993). This was a different idea in a technology-oriented era, which was mostly characterized by *computer literacy*, that is, learning about the computer, even if there were elements of machine learning, or aspects of AI, and thereby, *AI-literacy* at this early stage (Kahn & Winters, 2021). AI has lately caught huge attention, although some of its vast meanings has been around since the 1940s (Williamson & Eynon, 2020).

When computers entered Swedish schools in the 1970s and 1980s on a relatively small scale, it was often for administrative use or for teaching *computer science*. At that time, there was a technical view of computers in Sweden, aligning to computer literacy - one should learn about computers, instead of with them (Tallvid, 2015).

In the 1980s, there was a period when personal computers became more broadly used in society and digital software applications became more user friendly (Ferrari et al., 2012). In 1982, the Grünwald Declaration (The Grünwald Declaration on Media Education, 1983) was initiated by the UNESCO and articulated the importance of teaching *Media and Information Literacy (MIL)*. The initiative was described as based on the need for children and students from pre-school to adult education to develop knowledge and competences in order to critically

examine both electronic and printed media to communicate through the available media channels.

During the 1990s, digital technologies continued to be developed, with concepts such as *information technology* (IT) and *information and communication technology* (ICT) becoming increasingly common and demanding information-related skills (Stopar & Bartol, 2018). Those concepts have continued to be part of the Swedish policies linked to, among other things, democratic issues (UNESCO, 2021). They include the concept of *source criticism*, which is used for both searching for and evaluating sources (Sundin & Carlsson, 2016). Additional concepts have recently been formulated in Sweden, such as *search criticism* (Sundin & Haider, 2019b), which is about understanding how a search on the internet can generate useful search results and not just an understanding that a source needs to be examined (Enochsson, 2007). Another concept worth attention is *source trust*, which refers to conditions related to whether one can trust society's institutions and what information they provide, as well as the ability to reflect on why some sources may be more credible than others (Sundin & Haider, 2019a). Lately, the National Agency for Education (2024b) has begun to use the concept of *source awareness* in relation to digital competence. As seen, digital-related issues are continuously attended to in educational policies.

After a period of financial investment and governmental attempts to introduce ICT in schools in Sweden, a period followed at the turn of the millennium when in-service training initiatives for teachers were provided to all municipalities in the country (Bergviken Rensfeldt & Player-Koro, 2020). At the same time, in the first decades of the 21st century, the concept of *21st Century Skills* (Common Core State Standards Initiative, 2022) was launched in the United States, which implies competences such as critical thinking, creativity, collaboration, but also more specific competences related to the use of digital technologies (Ananiadou & Claro, 2009). During this time, in 2004, the concept of *digital citizenship* was launched, indicating competences in being part of a digital society (Ribble et al., 2004), giving it close connotations with digital competence. According to Pangrazio and Sefton-Green (2021), digital citizenship refers to being both a citizen who personally interacts via various digital networks in daily life and to being a citizen in a society in a more traditional way,

for example voting in elections but via digital systems. The concept could be said to have a normative connotation with development and change, but also with technification, large-scale use, and surveillance (Pangrazio & Sefton-Green, 2021), exemplified by a conceptual framework focusing on “Ethics (E), Media and Information Literacy (MIL), Participation/Engagement (P/E), and Critical Resistance (CR)” (Choi, 2016, p. 573) (appendix, Figure 2). Further, Choi and Cristol (2021) discuss how digital citizenship cannot be treated as a neutral technical skill, but how it needs to involve exploration and collaboration. This is emphasized by Webster (2023) who claims that policies quickly become outdated, creating a need to continuously explore what it means to be a citizen by addressing upcoming issues relating to societal changes and various complexities that are part of a societal context.

In the early 2000s, the concept of *digital literacy* emerged in research from English-speaking regions, as well as in policies. While the concept of literacy is used across a wide range of areas, when used in relation to digital technologies, it is mainly about skills required to use such technologies effectively, but also about being critical and creative in relation to digital expressions. For some, digital literacy means a list of skills, while for others it has a broader meaning linked to situated, social interactions and social values (Pangrazio et al., 2020). Back in the early 2000s, the concept referred to an understanding of digital technologies in a social context, which is a broader perspective than understanding it solely from a technological perspective (Spante et al., 2018). In an European Commission eLearning initiative at that time, “the DigEuLit project”, digital literacy was expressed as “the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions and communicate with others” (Martin & Grudziecki, 2006, p. 255). It derived from a tradition linked to studies on competence in relation to technical aspects (Falloon, 2020), rather than from a tradition that has links to studies on media use, referred to as *media literacy* (Erstad & Amdam, 2013).

As competences and literacies might change when technologies changes, digital literacy has thereafter been described in more social constructivist and task-driven terms, one example being the ability to create,

manage, publish, socialize, research, and surf the internet (Reynolds, 2016, p. 741), or as “situated multiple integrated skills and practices (conceptual, attitudinal, procedural, and ethical) that empower people (individuals and groups) to participate and communicate efficiently in society. Consequently, DL [digital literacy, my comment] is a permanently evolving concept within the communicative environment” (Marín & Castañeda, 2023a, p. 1093). In a more recent European policy document, “Key Competences for Lifelong Learning”, digital literacy is described as *literacy competence*, and relates to knowledge, skills, and attitudes, framed as linguistic interaction through digital technologies and other material (European Commission, 2019, p. 6).

Nowadays, concepts that can be linked to digital competence, or digital literacy, include sub-areas such as *programming*, as well as broader concepts such as *data literacy*, *multimodal literacy*, *new media literacy*, and *AI-literacy*, deriving from various traditions and times (Ala-Mutka et al., 2008; Gallardo-Echenique et al., 2015; Hwang et al., 2020; Ilomäki et al., 2016; Kahn & Kellner, 2005; Krumsvik, 2024a; Pangrazio et al., 2020; Pangrazio & Sefton-Green, 2020). However, while “literacies have converged into digital competence” (Ferrari et al., 2012, p. 82), it is argued that digital competence “is more than the sum of its parts” (p. 82).

Another example of the close connection between digital competence and digital literacy, is a literature review by Ilomäki et al. (2023) on research papers and policy documents about *critical digital literacies* (CDL) in education, published between 2005 and the beginning of 2020. They define CDL by explaining how critical awareness contains reflexivity and aspects of empowerment in digital practices and online engagement. The search terms they used included variations of “literacy” and “competence” indicating the concepts close relationship (Ilomäki et al., 2023). The researchers identified the following themes as being part of CDL, ranging from the most to the least frequent: “E-safety, Participation and presence, Digital literacy, Media literacy, Digital citizenship, Technology literacy, Information literacy, Data literacy, Digital game literacy, Online learning, Digital creativity and innovation, and Digital well-being” (p. 2-3) with a higher proportion on negative issues. They conclude that CDL is an emerging concept which needs to be continuously attended to. Further, CDL lays the groundwork for acknowledging the potential and the critical

perspectives of data usage, and for competences in how to interpret data and data visualizations (Eynon, 2022; Gouseti et al., 2024; Karataş et al., 2024; Pangrazio & Selwyn, 2021).

Some countries have recently moved towards a more technological-oriented approach. In England and Wales, *computing* is now a subject in its own right (Larke, 2019), and in Denmark, the subject of *technology comprehension* relies on data science but also design of digital technology (Andersen & Tafdrup, 2021). In Finland, *programming* became part of the school subjects of mathematics and crafts, while in Sweden it became part of mathematics and technology (Heintz et al., 2017). The technological-oriented development in Sweden can be understood from the fact that many students have each been provided a personal digital device for schoolwork by their school (Bergviken Rensfeldt & Player-Koro, 2020; Tallvid, 2015), and schools have been equipped with digital platforms and other digital software applications developed by both national and global EdTech companies (Bergviken Rensfeldt & Hillman, 2024; Pothong et al., 2025). van Dijck (2020) has described such digital platforms and their software applications as trees. The roots represent the layers where infrastructural systems - with their cables, data packages, satellites, and data centers - are found and are globally connected. The trunk symbolizes what mediates data upward and downward between the infrastructures and the users. These intermediary platforms are, for example, the login services, messaging services, social networks, and retail services. They are at the core of, what has been called, platformization processes, and thereby they may entail huge power. From the trunk, the branches reach out with their many applications and get their nutrition from the widespread roots and the rather few stakeholders in the trunk. The leaves of the branches symbolize the software-features in the platforms that the end-users engage with. Understanding *platformization* through this metaphor, opens up for an understanding of platforms as not being neutral. Instead, they can be understood to mediate whatever interests that are incorporated in educational datafication (Pangrazio et al., 2022, p. 265), and generate what has been framed as platform pedagogies (Sefton-Green, 2022; Sefton-Green & Pangrazio, 2021).

Pangrazio et al. (2022) emphasize the importance of that teachers and students collectively try to make sense of how data are being represented

in platforms, speaking to notions of *data-literacy*. When education is getting more and more entangled in processes where platforms are used, there are voices arguing for digital competence not only from a technical point of view, but from an understanding of what interests of power that comes with it (Eynon, 2022; Pangrazio, 2023). Some of the software applications include generative large-language-models (LLMs) which can generate automated responses (Chen et al., 2020; Kahn & Winters, 2021). This, in turn, has opened up for an interest in *AI in education (AIED)* (Hwang et al., 2020), which relates data literacy, for example concerning algorithmic sorting, and plagiarism-detection tools, which might speak to a yearning for a society that is predictable and controllable (Kizilcec & Hansol, 2023). Such automated systems can be used in ways that change how people work on different tasks, which is why it is essential to consider and reflect on what happens when this occur (Andrejevic et al., 2023). Lately, there have been voices advocating for *informatics* in education, meaning “the study of information and data, computers, and algorithmic processes, including their principles, hardware and software designs, applications, and their impact on society” (Dagiene et al., 2022, p. 336).

Based on the understanding of the close relationship between the presented concepts, I will continue to use the concept of digital competence, while including various aspects related to literacy, digital citizenship and digital Bildung, in the concept. The continuous development of digital technologies calls for further discussions on what competences may be required and by whom, but also, discussions on what conditions support the enactment of digital competence in teaching practices.

2.2 TRANSNATIONAL ACTORS ENGAGED IN DIGITAL COMPETENCE

As mentioned in the first chapter, one transnational policy actor that has an interest in influencing how digital competence is understood is the OECD. Since the 1990s, the organization has had an influence over the field of education, particularly through the knowledge test they facilitate, the “Programme for International Student Assessment” (PISA), which is

a test that many countries became involved in during the 2000s (Wahlström et al., 2018). The OECD additionally conducts transnational surveys of teachers and school leaders, and every fourth to sixth years the survey “Teaching and Learning International Survey” (TALIS) is conducted. Based on its results, as well as from the results of other studies, the OECD produces reports on how to advise different countries on their approach to educational matters (OECD, n.d.). Through one of their reports, they warn about letting young people use digital devices at any time and with no guidance (OECD, 2024). At the same time, they state that “digital technology is essential for education” (p. 2) and that it is important for students to have access to digital devices in their schoolwork, as well as being taught how to use the devices and their software applications. This is only one of many examples of what competences the OECD considers needed in a global society. Concepts are constantly being renegotiated, and in a vision that extends to 2030, the OECD emphasizes the importance that students have a chance to develop as individuals who feel a sense of purpose in life, and who can collaborate with others to take actions for a sustainable world (OECD, 2018a). From my point of view, the vision reflects aspects of Bildung, even if aspects of employability are still evident.

Another important policy actor is the EU, which in 2006 defined digital competence as a key competence needed to participate in society (European Parliament and the Council of the European Union, 2006). It is now framed as basic digital competence, which is seen as a basic skill equivalent to reading and knowledge in mathematics (The Council of the European Union, 2018), and a key competence for lifelong learning (European Commission, 2019). The EU has developed a framework for what digital competence means, namely the “Digital Competence Framework for Citizens” (DigComp) (Vuorikari et al., 2022) where the subtitle of version 2.2 promises “new examples of knowledge, skills and attitudes” (appendix, Figure 4). The framework consists of five areas (where the concept of literacy is used, which strengthens the close relation between the concepts of competence and literacy): *Information and data literacy, communication and collaboration, digital content production, security, and problem solving*, which are divided into different levels to be reached in sequences. There are several content descriptions for each area and the

areas have four levels in which they can be reached: foundational, intermediate, advanced, and highly specialized. The framework is expected to be updated at the end of 2025 (EU Science Hub, n.d.).

To take further action, the European Commission (2020) developed an action plan, the “Digital Education Action Plan” which extends to 2027, where one of the ambitions is to create networks and platforms in the field of education to provide information and develop policies. One initiative is the transnational “DigComp Community of Practice” where policy actors and educators primarily in higher education translate DigComp 2.2 into European languages and exchange ideas on how to use the framework nationally (All digital, n.d.). The action plan additionally mentions the need to develop guidelines and help for teachers to train students in how to deal with disinformation (European Commission, 2020). In 2022, the European Commission developed such a teaching proposal, suggesting that teachers should take an interest in students’ realities and refer to those when catering for aspects related to disinformation (European Commission Directorate-General for Education Youth Sport Culture, 2022). Another point emphasized in the action plan is that AI and related resources should become part of the EU digital frameworks (European Commission, 2020).

Other actions are taken by the policyactor UNESCO, who has created the “ICT Competency Framework for Teachers” (ICT CFT) (UNESCO, 2018), a tool not only for teaching and learning, but also for school administration, professional development, and how to align teaching practices in classrooms with certain policies. Each area is expected to be worked with in sequence, while reaching for higher levels, like the aim of several other competence frameworks. Moreover, the organization has taken on the assignment to provide guidelines on AI in education and highlights this particular area as relating to digital competence for both students and teachers (UNESCO et al., 2024a; UNESCO et al., 2024b) (appendix, Figures 3 and 4).

These examples are only some of all the expectations on digital competence that are expressed in policies, which is why the transnational policy-engagement in digital competence can be considered massive. There are many stakeholders who want to have their say, not the least EdTech companies who also have developed frameworks and guidance for teachers

(see TeachAI, 2024). To evaluate how the expectations are met, the EU has created online tools, one named SELFIE, where teachers can measure their own PDC (European Commission: Joint Research Centre & Economou, 2023). However, while the policy frameworks address adapting to an emerging digital-infused society, they mainly refer to technologies as tools and not always as related to pedagogical issues (Arstorp, 2021). Further, critical voices argue that relying too heavily on frameworks may reduce contextual solutions (McGarr et al., 2021; Starkey & Yates, 2022).

2.3 NATIONAL AND LOCAL ACTORS ENGAGED IN DIGITAL COMPETENCE

Guidelines on a macro level may not have much influence on teaching practices (Krumsvik, 2014), and European countries approach guidelines within policies differently, as there is room for interpretation (Olofsson et al., 2021). For example, Norway has developed its own framework for teachers regarding the development of teachers' and student teachers' PDC (Kelentrić et al., 2017). Local interpretation also applies to the states of the USA that have chosen to align with the US national standards in 21st century skills/digital skills for arts/literacy and mathematics (Common Core State Standards Initiative, 2022; Savage & O'Connor, 2015). In Australia, states and territories are encouraged to interpret the national frameworks and generic competences regarding digital literacy, which is similar to the 21st century skills, expressed in national policy documents (Australian Curriculum and Assessment Reporting Authority, 2018; Australian Government, 2021). In Argentina, a national policy program for secondary schools, called Conectar Igualdad (Secretería de Educación, n.d.) was implemented between 2010 and 2018. All public secondary schools were provided with internet access, and the students with digital devices. The reason was a political call for social inclusion and to attract students to continue to secondary school, as well as to cater for digital citizenship. This can be understood from Argentina's not too distant history of revolution and dictatorship, where various forms of emancipation could be crucial for surviving. In comparison to other policies presented here, which can be understood based on, so-called, neoliberal

values of assessment and measurement of outcome, Argentina's policy has had a different focus (Dussel, 2020). However, new governments, as elected in Argentina in 2023, may quickly remove such initiatives.

In the Nordic countries, even if a technological-oriented approach on digital competence has been identified (Bergviken Rensfeldt & Player-Koro, 2020), there is also an expectation that digital competence will promote, among other things, democratic ideas (Erstad et al., 2021), which for long has been the orientation of education in the Nordic countries (Arnesen & Lundahl, 2006). However, Nordic national curricula have mainly introduced directives on digital competence relating to policy expectations of lifelong learning and for citizens to be employable in a democratic society (see European Commission, 2019; The Council of the European Union, 2018), differently introduced in the different Nordic countries (Erstad et al., 2021; Olofsson et al., 2021).

2.4 DIGITAL COMPETENCE IN SWEDISH POLICIES

Although policies do not always have a crucial impact on teaching practices (Krumsvik, 2014), transnational policies may have some impact on national policies, which in turn, may impact local teaching practices, although the impact often varies (Sundberg, 2023). In a study of four Swedish national policy strategies on digitalization between the period 2011-2016 (Hanell, 2018), European values of lifelong learning and employability were found to be replicated in the strategies to some extent. The Swedish policies emphasize that students need to develop adequate digital competences, expressed as “being able to use and understand digital tools and media”, “having a critical and responsible approach”, “understanding the impact of digitization on society” and “being able to solve problems and put ideas into action” (appendix, Figure 1) (National Agency for Education, 2020, 2023) for the nation not to lose its global position of economic growth. Hence, economic and instrumental perspectives were prioritized in the documents at the expense of other elements, such as societal aspects and aspects of developing as human beings (Hanell, 2018). However, the former Swedish digitalization strategy from 2017 expressed an expectation that digital competence would sustain democracy. Further,

the goal was then for Sweden to become the best in the world concerning digitalization by the end of 2022 (Ministry of Education and Research, 2017)

In 2018, Swedish national curricula stated that digital competence should be included in all school subjects (National Agency for Education, 2022a, 2022b). In the curricula, teaching is described on the basis that it “shall promote students’ continued learning and knowledge development based on the students’ background, previous experiences, language and knowledge” (National Agency for Education, 2022a, Chapter 1). The expectation that students are to learn based on their previous experiences can be understood as there being a current situation from which they can learn more. The revision of the curricula was conducted even though the Swedish Committee on Education (2016) pointed out that there were few studies that have been able to show that the use of digital technologies improves school results. Instead, arguments in favor of catering for digital competence in schools included the EU’s eight key competences (European Parliament and the Council of the European Union, 2006), that is, competences citizens need to participate in society, of which digital competence is one (Swedish Committee on Education, 2016). Around this time in 2018, several measures were implemented in Swedish education, for example the national action plan for digitization of the Swedish school system, #SkolDigiplan (Swedish Association of Local Authorities and Regions, 2019) and the support-document for school organizers, Skoldigiguide (Swedish Association of Local Authorities and Regions, n.d.). The #SkolDigiplan emphasized, among other things, how education was to cater for student digital competence. A report (SOU 2020:56) stated that digital-related content in the national curricula should contribute to students’ media and information literacy (MIL, in Swedish known as MIK):

More directly linked to the democratic discourse in a digital age is the mission to help students develop a responsible approach to digital technology, to be able to see opportunities and understand risks and be able to evaluate information. This task includes teaching about information search, source criticism, reviewing images and knowledge of the platforms’ content moderation through algorithms and the like, i.e. such content that is part of media and information literacy (p. 118).

Thus, MIL could be understood to have continued to have gained a prominent role in what could be described as digital competence in Swedish schools. The national curriculum for Compulsory School, Pre-school Class and School-Age Educare from 2018 was revised in 2019 and 2022 (National Agency for Education, 2022a). In the revision of 2022 there was an additional emphasis on understanding how different actors, among them algorithms, can influence society (National Agency for Education, 2023, p. 19), which may speak to a concern about the influence of social media. More recently, the Upper Secondary School Curriculum has been updated in terms of programs and syllabi (National Agency for Education, 2022b) with a stronger focus on factual knowledge acquisition (Department of Education, 2023). Additionally, since 2024, AI is an optional subject in Swedish upper secondary schools (National Agency for Education, 2024a).

To support teachers in their work to cater for student digital competence, apart from defining four aspects of adequate digital competence, the Swedish National Agency for Education has published training materials that principals and teachers can use to jointly develop their PDC (National Agency for Education, n.d.) something that external stakeholders also have provided online (Internetstiftelsen, n.d.). Lately, both the Swedish National Agency for Education and other stakeholders have hosted several national online meetings where Swedish municipality authorities, principals, teachers, researchers, and EdTech companies have gathered to discuss how to approach AI in education. Consequently, the expectations and efforts related to school digitalization in Sweden can be considered extensive.

Based on the above, there are still questions of how teachers, in their position between policies and students, make sense of student digital competence and how it is catered for in digital-infused teaching practices today. Are teachers catering for the many aspects of digital competence here mentioned or just some? Does the catering serve student digital competence in how to manage digital technologies to manage schoolwork, or can other purposes be identified? As students are sometimes taught by several teachers, each responsible for their teaching subjects, how is the catering for student digital competence coordinated in the school organization? The next chapter will investigate related research on these issues.

CHAPTER 3

RELATED RESEARCH

In this chapter, I present a review relevant to the aim of the thesis, namely, to contribute to a deeper understanding of how teachers make sense of student digital competence and how it is catered for in digital-infused teaching practices. For this purpose, I have searched for related research engaged in studying digital-infused teaching practices concerned with teachers' social and processual organizing activities in relation to aspects of digital competence. Considering this broad perspective, I have not only searched for research on teaching practices related to classroom activities, but also, for research related to out-of-school practices and to school organizations outside of the classroom and how those practices relate to each other. The review is divided into two sections. The first section engages in how research has conceptualized digital competence in relation to teaching practices. The second section engages in research on organizational questions of digital-infused teaching practices as part of a wider context. Finally, I summarize what is known from the related research presented here and suggest identified research gaps that require further attention.

3.1 METHOD

I have chosen a narrative review (Agarwal et al., 2023) as it can cover a wide range of topics within selected themes, not always known of in advance (Bryman, 2008). In this endeavor, I have searched for peer-reviewed studies on school digitalization and digital competence in the fields of educational science and organizational theory, as these fields can inform how teachers make sense of student digital competence and how it is catered for

in digital-infused teaching practices also from an organizational perspective. Notably, I have used the concepts of digital competence and digital literacy to find relevant studies, as the concepts are often used interchangeably. Pangrazio et al. (2020) highlight in a literature review of the 30 most cited articles on digital literacy in Scandinavian-, English- and Spanish-speaking research, as do Spante et al. (2018), that digital competence is used more frequently in research from Scandinavia, while digital literacy is more frequently used in English-speaking countries, and sometimes the concepts are used interchangeably in research (Ilomäki et al., 2023).

Both literature reviews and empirical case studies have been valuable for the review to get an overview and to learn from different cases. I have prioritized research from 2018 and onwards when searching databases. However, I have followed references in the reviews and studies through chain referrals (Biernacki & Waldorf, 1981) to find similar study objects to further guide my understanding. Since the studies part of this thesis are conducted in Sweden, where Swedish, Nordic and European policies on digital competence are applicable, I have partly directed the searches towards these regions. However, since research in English-speaking countries tends to influence research in these policy regions, I have additionally broadened the searches. I am aware that this choice disregards knowledge on research using other languages than English and from other regions, but the choice is made to give a deep understanding of contextual aspects.

3.2 THE CONCEPT OF DIGITAL COMPETENCE IN RELATION TO TEACHING PRACTICES

Research on digital competence in relation to teaching practices is often framed within adult or teacher education, or directed towards teacher professionals and their professional development (Aagaard & Lund, 2020; Basilotta-Gómez-Pablos et al., 2022; Gudmundsdottir et al., 2020; Hatlevik, 2017; Howard et al., 2021; Hämäläinen et al., 2021; Krumsvik, 2008, 2014; Lindfors et al., 2021; Lund et al., 2014; Starkey, 2020; Szczyrek et al., 2024; Tondeur et al., 2012; Voogt et al., 2016). Other strands of research on digital competence target students (Hatlevik & Christophersen, 2013; Livingstone et al., 2023; Pangrazio, 2019; Siddiq et al., 2016a; Spina et al.,

2021; Stoilova et al., 2021), and teachers addressing student digital competence (Eynon, 2022; Ilomäki et al., 2023; Livingstone & Sefton-Green, 2017; Midtlund et al., 2021; Siddiq et al., 2016b; Wood et al., 2020). Others pay attention to student digital competence in relation to organizational matters in those practices (Agéllí Genlott et al., 2019; Håkansson Lindqvist & Pettersson, 2019; Pettersson, 2018b; Tømte & Smedsrud, 2023), and yet others target citizens in the wider society (including teachers and students) (Ferrari et al., 2012; Schwarz et al., 2024). To gain a better understanding of how digital competence and related concepts have been researched in relation to teaching practices, I will start by focusing on research on teachers and their PDC, as this field seems to attract a considerable amount of interest. Another reason is that this competence involves catering for student digital competence. From this departure, I will investigate research on didactical questions relating to the focus of this thesis, namely, catering for student digital competence.

3.2.1 TEACHER PROFESSIONAL DIGITAL COMPETENCE

The research field of teachers and their digital competence can be understood from the field of curriculum studies and didactics, and is sometimes framed as teacher, or teacher educator, PDC (Aagaard & Lund, 2020; Gudmundsdottir et al., 2020; Krumsvik, 2014), also referred to as digital teaching competence or digital teaching literacy (Marín & Castañeda, 2023b). This competence is not only about knowing how to use digital technologies in everyday life but specifically knowing how, when, and why to use it in teaching practices (Aagaard & Lund, 2020). PDC is not a unified or very well-defined concept when used in research, as shown in a literature-review by Skantz-Åberg et al. (2022). Based on studies from Europe, Africa, and Asia, they have identified the following areas of PDC: *technological competence*, *content knowledge*, *attitudes to technology use*, *pedagogical competence*, *cultural awareness*, *a critical approach*, and *professional engagement*, where pedagogical and technological competence are the most frequently appearing competences (Skantz-Åberg et al., 2022, p. 6). A framework for teacher educators, “Teacher Educators’ Digital Competence”, was developed based on previous studies on digital competence, and is to be used by teacher educa-

tors to meet the intentions from transnational and national levels in their practices (Krumsvik, 2014). The framework demonstrates PDC as being reached in levels of adoption, adaptation, appropriation, and innovation in relation to parameters of self-awareness and practical proficiency. When these parameters work together, the PDC ranges from basic digital skills to higher proficiency levels where the highest one concerns digital Bildung. However, in a Norwegian large-scale study (Krumsvik et al., 2016) where upper-secondary teachers answered a survey on “the relationship between teachers’ individual digital competence and demographic, personal and professional characteristics” (p. 160), the results indicate that even if most of the teachers had basic digital competence, their didactical digital competence and digital Bildung varied. Formal education, screen time, and continuing education in ICT contributed to the highest levels of their individual digital competence.

Olofsson et al. (2020) state that teachers need to have some PDC to know how to use digital devices and to solve some of the technical problems that arise in their teaching practices. Based on observational data from three secondary schools in Sweden and interviews with teachers, the results indicate that if students’ digital competence is to be catered for, the enabling conditions are not only about well-functioning technical school-infrastructures where work can be communicated and administered, teacher PDC is essential (Olofsson et al., 2020). The Norwegian researchers Aagaard and Lund (2020) have described PDC in higher education as a combination of pedagogical and didactical competence, digital skills, and subject-specific knowledge. As such, PDC focuses both on subject-specific competences and generic ones that cuts across school subjects. Additionally, it focuses on professionally oriented digital competence which is to bridge teaching-practice activities with activities thought to be relevant for students’ future work-life, and on transformative digital competence which is to encourage initiatives to transform the practices (Aagaard & Lund, 2020). Another explanation of PDC is it being a “complex and reciprocally interplaying set of resources - i.e., knowledge, skills and attitudes - concerning teaching-and-learning with media and about media” (Cattaneo et al., 2021p. 176). Deciding what aspects of student digital competence that can be catered for in teaching practices can thus be considered part of PDC.

Given the various takes on teacher PDC, research on the same varies. Some research concern ‘teacher beliefs’ and teachers’ perceptions (Ertmer et al., 2012; O’Neal et al., 2017; Prestridge, 2017; Sadaf & Johnson, 2017; Tondeur et al., 2017). Others concern the actual use of digital devices in classrooms (Serrano-Ausejo & Mårell-Olsson, 2024; Tømte et al., 2020). One example of research that combines teachers’ self-reported beliefs and the usage of digital technologies in classrooms, is a literature review of 80 studies from all over the world (Svoboda et al., 2020). The results indicate that if teachers report their digital usage to be frequent, they tend to have more positive attitudes towards digitalization and can more easily integrate digital devices into their teaching. Another example is an online survey with teachers in Germany (Runge et al., 2023), where teachers’ beliefs about student differentiation and about empowering students were positively related to whether the teachers reported using digital technologies to enhance the quality of their teaching practices.

3.2.2 DIDACTICAL QUESTIONS RELATED TO DIGITAL COMPETENCE

Policies often express expectations regarding what some stakeholders consider essential competences, and may promote frameworks that can be either knowledge-specific or concerned with more vague competences, expressed as, for example, “learning to learn” (Álvarez-Martínez-Iglesias et al., 2021, p. 2). Research which focuses on competences related to instructional educational processes can thus be found in either subject-specific or general didactic fields and relate to subject-specific or general competences (Kansanen, 2009), such as digital competence. Sometimes frameworks are used to capture teachers’ accounts on competences, or schools’ digital maturity regarding digitalization (Begicevic Redjep et al., 2021; Castaño Muñoz et al., 2023; Krumsvik, 2014; Tømte & Smedsrud, 2023; van de Oudeweetering & Voogt, 2018). A large-scale study seeking to capture these aspects, took the form of an online survey which used the framework SELFIE, developed by the European Commission, and where approximately 40.000 teachers across Europe participated (Castaño Muñoz et al., 2023). The teachers were asked how they used digital technologies in their teaching practices and the results showed that teach-

ers reported seeing their students develop digital competence the most when digital technologies were used in cross-curricular projects. The same research group has, in a paper drawing on a large-scale survey with primary and secondary teachers in Spain, discussed the ambiguity of deciding on in what school subjects digital competences are to be catered for when it comes to more general aspects, or how they can be assessed, as numerical assessment may not capture all nuances related to competences (Trigueros-Cano et al., 2022). What is interesting is that many of those studies here reported on, are based on surveys of self-reported data. These surveys may capture teachers' accounts of how they experience their own competences. However, qualitative, in-depth research-methods like observations may generate other understandings of various activities that could be harder to account for (Patton, 1990), something I will discuss in chapter 5, when arguing for the methodology of this thesis.

As outlined in chapter 2, digital competence is not a well-defined or unified concept and contains several different aspects and research areas (Ilomäki et al., 2016). A prominent research area related to digital competence is how to search for information. In a literature review which set out to cover what competences students in primary to higher education need to be able to participate in a digital-infused society, the results indicate that already at early ages, students need to learn how to find, filter, process and shape information, as well as how to share information with others (Gibson & Smith, 2018). According to Gibson and Smith (2018), this is a re-current process that needs to be progressed in most subjects during the years of education, and so it additionally needs to be a collective effort in the school organization if students are to be considered part of the society, something I will come back to.

Research interests are now expanding from mainly having been concerned with information skills to also include other areas. Another research area focuses on digital citizenship. However, while more studies are being published on digital citizenship than before, there is a lack of empirical and experimental studies, as well as a focus on primary through upper secondary teachers (Richardson et al., 2021). In an interview study involving 165 teachers in primary through secondary schools in Sweden on digitalization and its impact on equity and students' attainment of curricular goals, the teachers expressed an ambiguity in how to cater for

student digital competence (Godhe et al., 2023). While some of them expressed the importance of preparing students for citizenship in a digital-infused society, they did not go into details on how this issue should be catered for. According to the researchers, one reason for this could be that policies on education are mainly based on economic benefits and not on social equity-concerns for students.

Lately, research has been expanding in the area of AIED (see Karataş et al., 2024; Krumsvik, 2024a). In a literature review in the field, based on 160 K-12 studies conducted in 2011 – 2021, the most common topics were related to pedagogical approaches such as adaptive, personalized learning. Other prominent topics were administration of student data and AI tools to enhance learning in, for example, writing. Some of the identified challenges were negative attitudes towards AI, lack of competence for both teachers and students, ethical questions, and difficulties related to the design and use of such tools (Crompton et al., 2024). However, and according to Krumsvik (2024a), “[s]ince the overarching part of the curriculum renewal clearly states that the school has both an educational and a *Bildung* mission, it is important to see these in a dialectical relationship when discussing artificial intelligence” (p. 57).

Deciding which didactical questions to focus on when it comes to digital competence is not straightforward. This is further indicated by the results from a research project involving Finland, Italy, Spain and England, which examined primary and secondary teachers’ perceptions of critical digital competence (framed as critical digital literacies) through teacher focus group interviews (Gouseti et al., 2023). The results indicate that there are contextual diversities between the countries, for example, in Finland and Italy, teachers more frequently discussed source validation, while in Spain and England, online safety was more frequently discussed. However, dominant topics in all countries were digital teaching and learning, and technology use, while less discussed topics were data literacies, digital content creation, digital citizenship, and digital communication and collaboration (Gouseti et al., 2023, p. 16).

As a didactical aid in these issues, and for research purposes, a framework has been developed by Mishra and Koehler (2006); The Technological Pedagogical Content Knowledge Model (TPACK), which addresses contextual technological, pedagogical and content aspects of didac-

tics. It has been widely used in research (Rosenberg & Koehler, 2015; Tømte et al., 2023), although it has received some criticism. For example, Falloon (2020) argues there is a risk that such didactical frameworks signal that digital competence is only something subject-specific and clearly framed, instead of understanding its broader meaning in a changing society. Another concern is that frameworks are too instrumental and do not consider context-specific situations, as is shown by Marín and Castañeda (2023b) in their literature review on digital-literacy (and digital-competence) frameworks. Pareto and Willermark (2019) add to the discussion and state that TPACK tends to be used for teachers' self-reporting of their own digital competence, rather than being used to actively design long-term teaching. Based on the framework, they have developed a model, TPACK in situ, which emerged from a three-year research project with teachers in Sweden, Norway and Denmark, and is intended to help teachers design long-term instruction within their contextual teaching practices.

Using digital technologies to facilitate teaching practices on subject-specific content is only one of many purposes of education. Another purpose could be to differentiate instruction and facilitate an inclusive learning environment, as was the case in a mixed-method study in a primary school in Norway, where teachers had several years of experiences in how to use digital technologies in their teaching (Johler & Krumsvik, 2024). Although the teachers reported a positive outcome, the students' products revealed that the students might have benefitted from more guidance by the teachers. Hence, digital-infused teaching practices without much guidance do not guarantee that student digital competence is catered for. Based on a self-report study involving teachers in Japan, Willis et al. (2019) argue that there can be various purposes behind a teacher's decision to create digital content or to let the students create the same. The latter could, for example, be understood to move beyond a strictly content-based approach to let students experience how digital technologies can be used to engage in a digital-infused and changing society. Thus, didactics also concerns students' experiences regarding content (Kansanen, 2009). Gudmundsdottir et al. (2024) advocate that students need to be involved in what competences are useful to them in their daily lives. When choosing what content to focus on in teaching practices, Lundh et al. (2013) found

in a meta review they conducted on studies in the field of information literacy that there was a normative way of determining which competences students should have. These competences were often tended to by ticking off specific competences in a checklist. One such type of content is source validation, or source criticism, something Haider and Sundin (2022), who are both active in library- and information science, found is widely recognized by teachers in Swedish schools. However, teaching this content is often based on checklists that are intended to evaluate whether historical sources are true or false. Such checklists may have less to say about the large flow of value-ridden information that people encounter in a digital-infused society (Haider & Sundin, 2022).

Another strand of research has re-conceptualized practice theory to include not only schools and classrooms, but students' digital-infused out-of-school practices. However, sometimes the knowledge of those practices is based on presumptions. In an Australian study where young people participated (Pangrazio, 2019), teachers and adults expressed how young people easily navigate between digital technologies, whereas in fact there could be a great deal of variety among those young people. As a consequence, and if the narrative is that young people as a group are digitally competent, they may not ask for help, or teachers may not regard it as necessary to cater for their digital competence. This is particularly important to address, as one major challenge when introducing digital technologies in teaching practices, is when students lack competence to use them (Timotheou et al., 2023).

Another topic that has caught some attention in relation to students' digital-infused out-of-school practices, is how much time students spend online and its causal effect on mental health. To understand more about this, Odgers and Jensen (2020) conducted a meta-analysis on literature reviews published in 2014 - 2019. The results indicate a lack of evidence to make such a connection, albeit a main content-focus concerning student digital competence in education tends to be about warning about the bad influence of digital media rather than teaching students about protective skills. The latter is something Berger and Wolling (2019) focus on in their research on digital competence and media education. However, it should be noted that research on what correlation there is between digital-infused practices and mental health is still young and struggles with some

methodological dilemmas, which is why there is a need for more rigorous research (Krumsvik, 2024b).

Another content focus could be teaching students to live healthy digital lives, not only analogue ones, something Gudmundsdottir et al. (2024) are occupied with in research on digital responsibility and digital life competences. In an interview study with students (age 11 – 16) in Norway, Romania, and Estonia on how children and young people talk about and understand digital responsibility, the result points to that ethics, privacy, autonomy, attitudes, and legislative aspects being important to young people when it comes to using digital technologies. However, there are contradictions. For example, in teaching practices, students can be told to use strong passwords but may be given weak ones by the school and are not encouraged to change them (Gudmundsdottir et al., 2024).

There are attempts to focus on broader aspects concerning digital competence, in what could be referred to as digital citizenship or digital Bildung. The Norwegian researcher Willbergh (2015) advocates for democratic and ethical aspects on the here and now instead of only trying to predict and teach for what professions students will have in the future. In line with Willbergh (2015), the Swedish researcher Wernholm (2021) recognizes in her research children's digital cultures and digital competences, and discusses how students' experiences and identity formation should be given space in education. In a literature review of scientific articles published between 2014 and 2019, Wernholm (2021) identifies how most young people experiment in a hybrid world, that is, a world that is both analogue and digital, asking others for help rather than only reading ready-made instructions, while building their identity and developing different knowledge and skills, something that could be harnessed in teaching practices. Some teachers try to pick up these out-of-school activities in their teaching with various results. One example is an action-research study in which an upper-secondary class in Denmark used the microblog X (at the time named Twitter) to communicate with others in all school subjects (Paulsen & Tække, 2019). The students compared what was possible to do in a time when there was no internet to what they could do through X. Paulsen and Tække (2019) argue that students should be encouraged to question knowledge, how they relate to others and who they want or can be in society. In such teaching practices,

digital technologies are not only used to transfer knowledge from teachers to students, or to facilitate knowledge acquisition, but to enable students to influence who they are in the world and become critical and reflective users. Similar attempts were made in three Australian research projects with students (age 8 – 17) where they were to develop an understanding on how digital data is part of their everyday lives. In a syntheses of the projects, Pangrazio and Selwyn (2021) point out that education on data literacy needs to engage students in their data usage and how to think critically about it, rather than simply warning them about how data is being used by companies. These are not only technological questions, but also, social and ethical ones.

Drawing on the above, as new technologies enter teaching and out-of-school practices, some research is engaged in critical didactical questions and can be placed in the field of critical studies, as can the aforementioned study by Pangrazio and Selwyn (2021). One example of such studies is research on what impact EdTech companies have on teaching practices as they provide transnational or local platforms (Jiahong Lu et al., 2021; Kerssens, 2023; Pangrazio et al., 2023; Sefton-Green & Pangrazio, 2022; Selwyn, 2022; Williamson, 2017). In those digital platforms, application programming interfaces (API:s) allow other applications to interact with the platforms in what can be framed as infrastructuring (Perrotta et al., 2020). Moreover, digital platforms facilitate an increased use of digital trace data, or digital footprints, which can be used to monitor students' and teachers' activities in educational contexts, raising questions of ethics and data usage (Eynon, 2022; Hakimi et al., 2021; Pangrazio & Sefton-Green, 2022). Thus, the usage of digital platforms is nowadays part of pedagogical considerations and research (Pangrazio, 2019).

While digital technologies are increasingly infused into teaching practices, Selwyn et al. (2018) state that there are few signs of a total transformation of education. Rather, administrative tasks and political imperatives of measurement generate the usage. The researchers conducted a large-scale survey of students (age 11 - 18) from three schools in the state of Victoria, Australia, where the students were asked what digital technologies they regarded as useful in education. Far from expectations of competences related to empowerment or collaboration, the results show that digital technology was mainly thought to be beneficial to manage

schoolwork; information retrieval, writing, and for providing infrastructures for contacting teachers. Further, the students were seldom asked to discuss their out-of-school technology-use with the teachers. According to Selwyn et al. (2018), the results indicate that students may be schooled into doing schoolwork in a curriculum context of testing and fragmentation of subject knowledge, something the students try to adjust to. This is further indicated in a Spanish survey of almost 2000 students in the 4th year of secondary education, where they were asked about the usefulness of competences, including digital competence, sense of initiative, and cultural awareness in social sciences, geography, and history. Their answers demonstrated how they found it complicated to align to such competence approaches in their classroom practices if they had been used to an education that prioritized facts and assessment of what could be more easily measured (Álvarez-Martínez-Iglesias et al., 2021).

3.3 DIGITAL-INFUSED TEACHING PRACTICES AS PART OF A WIDER CONTEXT

One strand of research in the field of curriculum studies has focused on how digital competence activities are introduced and enacted in schools, and what conditions there are in relation to school organization, and to national or transnational contexts (Islam & Grönlund, 2016; Kerssens et al., 2023; Larke, 2019; Pettersson, 2018a; Sarva & Purina-Bieza, 2023). Some of those researchers have an institutional-cognitivist perspective where teachers' values and beliefs are emphasized (Ertmer et al., 2012; Sadaf & Gezer, 2020; Tondeur et al., 2017). Others advocates for wider perspectives where process-driven organizational sensemaking-ideas of enactment into environments are encouraged (Eddy-Spicer, 2019). In the following, I will provide an overview of various approaches.

When certain factors are fulfilled, for example, when digital technologies are more or less in place and infrastructure is largely functioning (Olofsson et al., 2020), when teachers have a certain amount of PDC in how to use technologies, and when there is technical and pedagogical support (Sarva & Purina-Bieza, 2023), it has been argued that teachers need to be given opportunities to explore and co-construct their

interpretations of various digital-related topics (Kerssens & de Haan, 2022). Similar arguments of school leaders facilitating opportunities for teachers to experiment with technologies and collaborate, are made based on a Norwegian multi-method case study of primary school-teachers' understandings of their role in technology-rich classrooms (Johler et al., 2022). The study identified various dilemmas which became part of the teaching practices, since the teachers had to keep up to date with emerging technologies that extended the physical classroom beyond its usual borders.

In this thesis, organizational questions are considered to involve positioning processes, identity formation, negotiation, power, and how to navigate in digital spaces that can quickly evolve into something new (Fransson, 2016; Fransson et al., 2019), especially as teachers often face unarticulated demands due to digital-infused practices (Jiahong Lu et al., 2021; Pangrazio et al., 2023; Selwyn et al., 2018). However, negotiation does not seem to occur *per se*, and teachers must continuously deal with many upcoming issues. Some of those issues relate to platform software applications used in education. Digital trace data are often incorporated in these software applications, despite the data not being requested by its users (Selwyn et al., 2018). In a year-long ethnographic fieldwork in three secondary schools in Australia, Selwyn et al. (2022) identified how teachers saw data as objects, and how data were, so to speak, dealt with in different ways by some teachers, rather than discussed. However, in an attempt to let teachers share their thoughts and experiences in a Swedish research project (Sofkova Hashemi, 2024), teachers were asked to jointly reflect on their subject-specific teaching designs in digital-infused grades 1-6 teaching practices (age 7-12). The teachers' retrospective discussions about how their students had handled digital technologies during lessons, helped to identify what various needs the students had, something the teachers had not known about beforehand, but reported potentially considering in the future. There were also overlaps in what competences were required in the different subjects, indicating cross-curricular aspects.

Negotiations with colleagues refers to a contextual understanding of digital-infused teaching practices as being part of a school organization. However, such an understanding is often neglected, something Pettersson (2018b) demonstrate in a literature review of scientific papers published

in 2007 – 2017. She argues that digital competence is not to be seen as an isolated phenomena where single actors, such as teachers, and their agency are separated from the rest of the school organization. The organizational aspects are further emphasized in a study where more than 700 teachers in primary and secondary schools in a municipality in Norway participated in a survey (Cabellos et al., 2024). The results indicate that if a school's facilitating conditions related to digitalization are reported as being high (however not specified in detail in the study), teachers tend to use more information and communication tools (ICT) in their teaching. Even so, it might be argued that the use of technologies in itself is not enough, instead, the didactical approach needs to be considered (Kansanen, 2009).

Didactical approaches can differ depending on sites and organizational levels, as shown in a study on what school owners and school leaders in four Norwegian municipalities thought about the implementation of 1:1 devices in Norwegian primary and secondary schools (Tømte & Smedsrud, 2023). The participants had various understandings of their roles concerning administrative and pedagogical questions, which in turn, could impact how the digital transformation, that is, the disruptive responses from the organization on technology usage (Vial, 2019), was catered for in the different schools. Consequently, school leaders approach to school digitalization can offer either enabling or constraining factors within the organization that affect teachers' ability to engage in digital competence (Tømte & Smedsrud, 2023).

However, school leaders have to deal with a broad range of areas relating to school digitalization, and they, in turn, need to develop PDC to be able to engage in various areas, one being to get "insight into teachers' work with digitalization and the effects of this work in practice" (Håkansson Lindqvist & Pettersson, 2019, p. 226). The relationship between different stakeholders in education can be complex, as is highlighted in an ethnographic study in Swedish primary and secondary schools, where teachers, students and external developers were to co-design how to use AI and learning analytics in a new digital software application in school (Sperling et al., 2024). The negotiations initially facilitated collaboration, but the outcome did not provide intensive use of the application. The co-design had gone from collaboration of ideas to feedback on the developed software application (teachers), to ideas on how to make it profitable for

the EdTech company (developers), indicating their influence on the co-design (Sperling et al., 2024). Following this, the argument that teachers need opportunities to collaborate with others, as preconceptions are one component that influence how they approach policies and how they design teaching practices (Ertmer et al., 2012; Llorent-Vaquero et al., 2024; Sadaf & Johnson, 2017; Tondeur et al., 2017), may not bring an outcome that suits everyone, as there can be various purposes, conditions, or barriers.

Conditions can relate to beliefs and preconceptions, which are considered as examples of internal, or second-order, barriers. Lack of technologies, insufficient time for planning, and inadequate support can be considered external, or first-order, barriers (Ertmer, 1999). Tømte et al. (2023) found in their aforementioned large-scale survey using the TPACK model that Norwegian teachers who were working in schools that had implemented 1:1 devices some years before the rest of the schools in the study, had overcome both external and internal barriers to a larger extent than teachers who worked in schools where 1:1 was introduced later. However, after three years, there was still a large variation in teachers' beliefs in the schools where the implementation of 1:1 was launched first, indicating a continuing need to investigate the conditions of those practices. Tømte and Smedsrud (2023) recommend that school leaders turn to frameworks that can guide them in how digitally mature their school organizations are, one being the "Framework for Digitally Mature Schools" by Begicevic Redjep et al. (2021). The framework centers firstly around areas of planning, management and leadership, which relates to the visions and policies that are developed, for example, on data management. Secondly, it centers around ICT in learning and teaching, which concern implementation of digital technologies and software, as well as teaching and evaluation methods. Thirdly, it centers around development of digital competences, which refers to competences of educational and administrative personnel. Fourthly, it centers around ICT culture, which means how to use technologies in school, for example, concerning netiquette, and finally, ICT infrastructure, which concerns how infrastructure can give the school organization a certain digital maturity (Begicevic Redjep et al., 2021, p. 645-646). Nevertheless, the way to consider student digital competence is not enhanced in the framework other than relating to areas of netiquette and access to technologies.

When continuously considering how to support teachers in catering for student digital competence, there is a need to remember that there is seldom a one-size-fits-all solution. Rather, teacher training or other supporting conditions have to be shaped by the situated context, as shown in the aforementioned focus group study involving teachers in Finland, Italy, Spain and England (Gouseti et al., 2023). Moreover, when teachers are given opportunities to negotiate or co-constitute their practices with others, there are sometimes only a small proportion of issues that are negotiated. In an exploratory small-scale study in Australia, primary and secondary teachers participated in professional learning led by researchers, with the teachers designing surveys on students' digital out-of-school activities (Wood et al., 2020). The researchers lectured on how students' net-based out-of-school activities and interests can be considered in teaching practices and paid attention to this topic throughout the project. Although the teachers were engaged when listening to students' experiences and sharing their reflections on trying to address issues of digitalization and digital competence, their interest tended to focus on health and safety, leaving less room for other issues. A reason could be that a prevailing discourse on students' relation to digitalization has had a health and safety focus for a long time, as well as a focus on negative issues (Smahel et al., 2020; Wood et al., 2020). In line with this result is a Swedish small-scale focus group study on digital technologies and platform usage in teaching practices with secondary teachers (Öberg et al., 2024). The teachers focused on how to use platforms as logistic means for distributing content and getting in contact with students and others. When discussing digital competence, it was mainly in relation to how the teachers tried to develop their own competence as part of their teaching practices. Catering for issues related to student digital competence was therefore not on the agenda.

In the endeavor of implementing policies on digitalization or digital competence in the school curriculum, some rely on policy frameworks and checklists to follow, as reported above. Other stakeholders rely on other more general approaches. One example of municipalities relying on either general or specific approaches is a Swedish comparative cross-case study of four municipalities' implementation work on national policies on digitalization (Gustafsson, 2022). The result indicates that the size of the municipality and the available resources matters. The larger the municipi-

palies tend to take a more general approach to digitalization, where the municipality provides resources and expert competence, and where it is up to the individual teacher to make use of them. The smaller municipalities tend to take a more specific approach, with less varied expert competence (Gustafsson, 2022). Consequently, as contexts differ, context tends to have an impact on the conditions that exist.

3.4 IDENTIFYING RESEARCH GAPS

To better understand how teachers make sense of student digital competence and how it is catered for in digital-infused teaching practices, I have here provided two themes: *The Concept of Digital Competence in Relation to Teaching Practices*, and *Digital-Infused Teaching Practices as Part of a Wider Context*. The review indicates that questions on what content to focus on in relation to digital competence, for what purpose, and how, can be complex. There is research on teachers' beliefs and self-evaluation of their own PDC (Aagaard & Lund, 2020; Ertmer, 1999; Ertmer et al., 2012; Hatlevik, 2017; Krumsvik et al., 2016; Ogodo et al., 2021; Svoboda et al., 2020; Tondeur et al., 2017; Tømte et al., 2023), while less research attends to teachers' accounts of student digital competence, although there are some examples of teachers addressing this competence (Eynon, 2022; Ilomäki et al., 2023; Livingstone & Sefton-Green, 2017; Midtlund et al., 2021; Siddiq et al., 2016b; Wood et al., 2020), and some examples that consider students' perspectives and enactment in digital-infused society (Álvarez-Martínez-Iglesias et al., 2021; Paulsen & Tække, 2019; Wernholm, 2021). Didactics involves questions on how to relate to students' previous knowledge and competence (Kansanen, 2009), and the review highlights that even if teachers report having basic digital skills, their reports of having aspects of what could be referred to as digital Bildung are more scarce (Krumsvik et al., 2016), potentially complicating their ability to attend to student digital competence on how to participate in society, and to democratic issues of how to develop as human beings. Consequently, there is a research gap concerning how teachers cater for student digital competence, something this thesis will address.

While there are studies focusing on teachers' agentic role in school organizations (Kerssens & de Haan, 2022; Wood et al., 2020), there is

a need to additionally consider external conditions that enable or constrain their activities (Ertmer, 1999). One identified supporting condition is well-functioning infrastructures (Olofsson et al., 2020), others being time, and supporting school leaders (Ertmer, 1999), as well as continuous ICT education (Krumsvik et al., 2016). The results further indicates that teachers benefit from trying to make sense of their experiences and sharing their interpretations with others, even if such sharing may involve various dilemmas (Fransson, 2016), for example, focusing on narrow topics without considering a variety of experiences (Wood et al., 2020; Öberg et al., 2024). However, there is a research gap in how to understand the conditions of teaching practices where infrastructures work rather well, where teachers are scheduled to participate in collegial meetings, and school leaders encourage the use of digital technologies as part of teacher PDC. The organizational understanding of teacher PDC is still lacking. The question is important as new digital platform-applications continuously are incorporated into already digital-infused teaching practices and, consequently, teachers face various new expectations.

The thesis will attend to the identified research gaps concerning how teachers cater for student digital competence and what conditions there are by answering the following research questions: RQ1: How is the emerging policy concept of digital competence accounted for and enacted by teachers in digital-infused teaching practices? RQ2: What conditions enable and constrain catering to student digital competence in teaching practices?

CHAPTER 4

THE THEORY OF SENSEMAKING - A PRACTICE-THEORETICAL LENS

To work with the idea of sensemaking is to appreciate that smallness does not equate with insignificance. Small structures and short moments can have large consequences (Weick, 2009).

To contribute to a deeper understanding of how teachers make sense of student digital competence and how it is catered for in digital-infused teaching practices, and by drawing on the related research presented in the former chapter, this thesis aligns with practice theory and to the field of curriculum studies with a special interest in school digitalization. In the first section, I describe the reason for this choice. Following this, I zoom in on the theory of sensemaking and describe how I understand the theory as part of the field of curriculum studies under the umbrella of practice theory, and unpack concepts like *enactment*, *organizing*, *dilemmas*, *interactions*, *justification*, *interpretation*, and *symbols*. I then explain how digital competence can be theorized and analyzed through *boundary objects* and how I use all those concepts as part of the theory of sensemaking. Furthermore, I refer to theories of *dilemmatic spaces* and *platform pedagogies* and describe my use of those theories as part of the theory of sensemaking. Finally, there is a short summary of the chapter.

4.1 PRACTICE THEORY AND THE FIELD OF CURRICULUM STUDIES FOCUSING ON SCHOOL DIGITALIZATION

Practice theory engages in socially, situated, processual, material, and recurrent activities which form various practices (Nicolini, 2017; Schatzki, 2018), and is important to the understanding of practices in this thesis when investigating how teachers make sense of student digital competence and how it is catered for. Hence, I consider practice theory valuable since digital-infused practices, which consists of digital devices, platforms and software applications, policies, organizational values and norms, and interactions between teachers, students and material, can be considered continuously made as part of the curriculum, rather than static (Priestley et al., 2012). This understanding of practices by Nicolini (2012), Schatzki (2018), as well as Priestley et al. (2012), can be traced back to the work of Bourdieu (1977). He is known for theorizing “habitus”, meaning the situated habits, skills and dispositions, or arrangements, that are not “the product of genuine strategic intention” (p. 73), but made as part of a person’s life due to past experience (Bourdieu, 1977). It can additionally be traced back to the ideas of Giddens (1984), who is known for theorizing how situational activities may produce different social structures.

However, this thesis engages in the field of curriculum studies, which can be understood as concerned with questions of educational aims, content, and pedagogy of multi-layered practices (Priestley & Xenofontos, 2021), for example, in relation to organizational structures, values and norms (Priestley & Xenofontos, 2021; Wahlström & Sundberg, 2018). This makes the field suitable for research on teachers’ sensemaking activities (Priestley & Philippou, 2018). Moreover, curriculum studies engages in questions of what is expressed as political expectations and how policies are made sense of and enacted in teaching and other related practices; activities that are seldom carried out in exactly the same way at all levels and sites (Fullan, 2008; Levin, 2008; Wahlström & Sundberg, 2018). The field is further concerned with school development issues in school organizations (Cuban, 2020; Fullan, 2021; Priestley et al., 2017). Fullan (2016) emphasizes the importance of what teachers think and do, as well as organizational conditions to build capacity for teachers to make sense

of what they are already doing (p. 54). Other researchers in the field of curriculum studies follow this tradition of engaging in a broader context also outside of the classroom, for example, in policy activities, considering, but not emphasizing, a top-down perspective by taking a critical policy approach in their studies (see Ball et al., 2012; Braun et al., 2011; Eynon, 2022; Pangrazio, 2023; Priestley & Philippou, 2018).

Scholars like Pinar (2012) have emphasized that curriculum studies should be thought of as conversations in emerging contexts where students' experiences are attended to. Thus, this thesis investigates teachers' accounts, and *enactments*, which indicate a the merge of sense and actions (Sandberg & Tsoukas, 2015), of catering for students' digital competence in relation to students' existing competences and needs with a specific interest in digital-infused materiality (Eynon, 2022), and in relation to organizing aspects (Priestley et al., 2017). Consequently, teachers' classroom practices are of particular interest, but also their other teaching practices of negotiations, planning, assessment, collaboration, and policy activities while relating to artefacts and various ideas. Priestley and Philippou (2018) describes this understanding of curriculum studies as a multi-layered and broad perspective. Following this understanding, I align with educational theorists such as Priestley (2011), Biesta (2015), Ball (2009), Pangrazio (2023), and Eynon (2022). Accordingly, I consider the field of curriculum studies to align with organizational studies (see Weick & Quinn, 1999), which is why I also relate to the work of organizational theorists such as Weick (1976, 1993, 2001, 2006, 2009) and Orlikowski (2007), both engaged in the theory of sensemaking, even though they treat organizations slightly differently. While Weick has a socio-constructivist and interpretative approach to how people make sense of their surroundings, Orlikowski is more concerned with socio-material questions, that is, how humans and material co-constitute each other. However, I find their approaches working well together. Hence, for the purpose of this thesis, I use the theory of sensemaking in the field of curriculum studies under the umbrella of practice theory, as further explained in the next section. The ontology guiding this thesis is the ontology of critical realism, meaning, there is a world out there, but one differently made sense of in situated social practices (Benton & Craib, 2011).

4.2 UNDERSTANDING SENSEMAKING AS PART OF PRACTICE THEORY AND CURRICULUM STUDIES

To further understand sensemaking as a theory in the field of curriculum studies under the umbrella of practice theory, apart from the description of practices above, a common denominator of practice theorists like Weick (1993), Orlikowski (2007), Nicolini (2017) Schatzki (2018), and Priestley et al. (2012), is that they emphasize materiality as part of practices, albeit slightly differently. For example, Orlikowski (2007) critique how “materiality has been largely ignored by organizational theory” (p. 1436), as does Weick (2009) when he argues that technology artifacts are essential parts of processes where people, among other things, read, write and edit their writings and thoughts (Weick, 2009). Priestley et al. (2012) focuses on teachers’ agency and how it is “shaped by the material and social conditions” (p. 194). Another common denominator is their focus on how people interact with other people, and material, and how external conditions shape the situated practices through multi-fold interactions going in both directions (Nicolini, 2012; Orlikowski, 2007; Priestley & Philippou, 2018; Schatzki, 2005; Weick, 2001).

Drawing on those scholars, I argue that materiality cannot be ignored when investigating teaching practices and that there is a need to pay attention to teachers’ perspectives, as practices are socially situated, processual, material, and recurrent activities (Nicolini, 2017; Schatzki, 2018) where teachers’ sensemaking comes to the fore (Weick, 2001) - especially as new software applications found in, for example, digital platforms, are continuously being developed and infused in schools. This concern that theory cannot be too preoccupied with the past, but must pay attention to new and emerging technologies, is additionally raised by Krumsvik (2024c). Therefore, I find it important to investigate teachers’ digital-infused practices, something I do in all of the three studies which are part of this thesis. Moreover, I find the theory of sensemaking, part of practice theory, to be relevant as it focuses on how practices, also new and emergent ones, are made sense of. However, practice theory has been criticized, for example for sometimes being used for any activity people are engaged in and thus making it rather vague. Nevertheless, the spectrum of the theory is broad (Hager, 2012), and by describing how practice theory is used in this thesis

in the field of curriculum studies as an umbrella for the theory of sense-making, I intend not to be vague. In the following, I will therefore describe how I use the theory of sensemaking, understood as a practice theory paying attention to wider aspects, to contribute to the aim of the thesis.

4.2.1 SENSEMAKING AS ORGANIZING-ACTIVITIES TO CREATE ORDER

In the theory of sensemaking, activities can be thought of as impermanent rather than stable, with Weick using the concept of *organizing* as a verb rather than organization as a stable noun (Weick, 2009), similar to what Schatzki (2002), but also Weick (2001), labels as doings. Thereby, the theory of sensemaking as part of practice theory offers a lens which pays attention to, so called, organizing-activities, that is, how teachers act, make choices, sometimes need to justify what they are doing, become conscious of their doings, and construct accounts, or sayings, of their doings which give them a direction for the future (Schatzki, 2002; Weick, 2001). Teacher professional digital competence (PDC) in how to cater for student digital competence is understood as such a sensemaking activity. Those organizing-activities of enactment are to create order in impermanent organizations (Weick, 2009).

Since teaching practices can be considered part of such impermanent organizations (Weick, 2009), they need to be understood in relation to their context (Weick, 2001). Weick et al. (2005) describe the influence between context and enactment as going in both directions. For example, people sometimes refer to macro entities such as policies, to validate their own thoughts, and enact them into fulfilling prophecies (Weick, 2001). And so, “social order is acted into the world and imposes order on that world. This process both creates new organization and reaffirms organization already in place” (p. 15). Another example is when macro entities turn accounts of interpretations into textualized and distributed understandings in reports which can be read as feedback on what has been enacted (Weick, 2009). Sometimes these reports resemble what is going on in the teaching practices, and sometimes not.

Apart from this, macro activities, such as encouraging the implementation of new tasks and triggering the use of certain concepts like the

concept of digital competence, do not always influence what actually happens in the long run in the practices (Weick et al., 2005). Different layers in an organization from the school organizer to the classroom level are seldom tightly coupled, that is, tightly connected to each other, and thus personnel in such organizations tend to *interpret* things differently and hold on to different ideas which fit their existing activities (Cuban, 2020). Hence, what is intended through transnational, national and local policies is not the same as what is enacted (Fullan, 2008). Instead, “sensemaking is about the interplay of action and interpretation rather than the influence of evaluation and choice” (Weick et al., 2005, p. 409). Further, Weick (1976) states that “intentions often follow rather than precede action” (p. 4), so sensemaking is the opposite of making plans at a macro level *for* the teachers to just follow (Weick, 2009). Thus, there is a need to be sensitive to the “ambiguous process of sensemaking rather than that of imposing the rules of rationality on a disorderly world” (Czarniawska, 2005, p. 270). Organizational bureaucratic models might give the impression that organizations are built from strong and streamlined rules, agreements on the same, instant feedback on effects, and no major variation in attention, despite this seldom being the case (Weick, 2001, p. 43).

By interviewing teachers individually and in groups and by observing their activities as part of their teaching practices enabled analysis of the conditions of the context. In study 1, the results were analyzed not only from the theory of sensemaking but additionally compared to a framework for digital citizenship and a policy framework for teacher digital competence (DigCompEdu) (paper 1, and appendix, Figures 2 and 6). The reason was to place the results in a wider context, not only in relation to conventional theories but additionally to policies, and to pay attention to the conditions of both macro and micro levels. However, context is not only concerned with transnational, national, and local policies which can be thought to reflect various norms and values in society, but with school organizations, municipalities, and society as a whole (Priestley & Philippou, 2018). Thus, in study 3, I interviewed principals, an ICT-facilitator, a special needs educator, an educational developer in the school municipality, and teachers, to gain a deeper understanding of the context. I assume that paying attention to context can contribute to the discussion of what

conditions enable and constrain the enactment of the emerging concept of digital competence in teaching practices.

When focusing on the complexities of organizing, attention is drawn to the continuous change (Weick, 1976). This is why my analytical gaze drawing on the theory of sensemaking as presented by Weick (2009) is directed towards what is accounted for (based on interpretation and justification) and what enactment is observed in teaching practices. New forms of material conditions can cause various kinds of *dilemmas* in impermanent teaching practices, for example, related to ethics and usage (Eynon, 2022; Hakimi et al., 2021; Pangrazio & Sefton-Green, 2022; Selwyn et al., 2018). To focus on dilemmas in those practices, I consider the theory of *dilemmatic spaces* (Fransson & Grannäs, 2013) to contribute towards understanding aspects of dilemmas as part of sensemaking. Although Fransson and Grannäs (2013) do not use the theory of sensemaking per se, they use the theory of dilemmatic spaces in a similar way.

To theorize how dilemmas occur; these can be understood as natural outcomes of complexities occurring in interactions with others, where dilemmas cannot just be wiped out but need to be dealt with. Problems, on the contrary, are theorized as something that can be solved, as when something broken is mended and restored (Fransson & Grannäs, 2013; Wegerif, 2008). The continuous character of dilemmas resonates with how to understand sensemaking by drawing on the above; as something that is ever-present even if the intensity varies. Moreover, the analytical lens of dilemmatic spaces, as used in study 2, paper 2, refers to relational practices, with their various contextual and material conditions, rather than to individuals, even if teachers' professional identities are understood to be part of dilemmatic spaces as they are part of an organization (Fransson & Grannäs, 2013). Weick (2009) suggests that instead of trying to avoid dilemmas, it is essential to analytically ask "what's the story here?" and then "now what should I do?" (p. 410), which evokes enactment on the future without suppressing dilemmas.

From my perspective, this opens up for discussions on didactical questions. I am aware of this close connection between analysis and practical organizing activities, that is, between theory and practice. In the studies part of this thesis, I primarily use the theory of sensemaking as an

analytical lens and engage in didactical questions in the overall discussion of the thesis.

While Weick (2009) focuses on various kinds of knowledge-intensive and complex organizations, for example where people engage in sometimes turbulent events, not specifically educational ones, the theory can be suitable for educational studies on school organizations, as they are part of emerging societies (Johnson Jr & Kruse, 2019). According to Weick (2009), turbulent events make people hold on to theories or question the same when retrospectively interpreting what they are doing, as in an act of sensemaking. Here, he uses a metaphor of fire fighters holding on to their tools, or rules, even if an unforeseen situation indicates that it might be better to drop the tools or question the rules (Weick, 2009). However, sometimes a situation can occur through a moment evolving more slowly (Johnston & Fells, 2017), which encourages people to hold on to or question their activities (Weick et al., 2005).

I consider there to be similarities with school organizations where teaching practices are found. As such organizations can be assumed to be more or less loosely or tightly coupled, complex and emergent (Weick, 1976), activities are seldom enacted in exactly the same way in the various levels of the organizations due to different understandings, experiences and contexts (Nehez & Blossing, 2022; Reis-Andersson, 2023). The effort of people *organizing*, or trying to create order, is as Pondy et al. (1983) and Weick (2001) describe it, a process of sensemaking. It is not about sense-giving or sense-taking; instead, it is an active process of dealing with ambiguity and equivocality, trying to make sense of ongoing activities (Czarniawska, 2005). When people engage in creating order in loosely coupled systems where one does not always know what the others in the organization are doing, those practices might become more tightly coupled as people start to compare and explore their ideas (Weick, 1976).

4.2.2 SENSEMAKING AS SOCIAL INTERACTIONS

I understand teachers' accounts and enactments as social events where someone is always at the other end (Weick, 2009), for example, principals, teachers, school librarians, students, parents, administrative personnel, and people working in either the municipality, or at a national or trans-

national level. There could also be an imagined part at the end, for example an author or designer of produced material, as materiality could most often be considered part of any practice. Thus, activities are seldom done in solitude but can be considered as *interactions* (Orlikowski, 2007; Weick, 2001). Weick (2001) defines a moment of such an interaction as a social interact. To give an example from a teaching practice: A teacher instructs the students to do something which evokes reactions; someone yawns, and someone starts working. Those responses most certainly evoke a reaction from the teacher where (s)he can decide on how to continue; perhaps (s)he tells the students to concentrate on the task or encourage them to continue with what they are doing. This is called a double interact. When the students, in turn, respond to this reaction, a triple interact is taking place. All these interactions are public to the ones taking part in them, which makes them irrevocable, binds the teacher to her/ his actions and draws attention to meaning as part of the enactment.

The interactions form a commitment which sometimes needs *justification*, it needs to be explained, accounted for, by the teacher (Weick, 1993). When several actors coordinate their actions, for example sending a text that reaches other people and is responded to in several ways, they become bound to a larger number of interactions which extends the justifications of the various commitments. While explanations that justify activities are often self-confirming, they require particular effort as they are to be socially accepted and are irrevocable once expressed. Thus, social justifications that are shared and spread to others form a vital part of organizing (Weick, 2001). New roles, structures, and shared goals might be created from interdependent needs when people justify their interactions together with others (Weick, 2009).

In studies 1 and 2, part of this thesis, teachers described how they interact with students concerning aspects of digital competence. In study 3, a teacher's interactions with digital platform applications and his students were analyzed. In the study, the aspects of a plagiarism detection feature were analyzed through the analytical lens of interacts, but also, through the analytical lens of *platform pedagogies* where *textualization*, *templatization*, and *trainability* came to the fore (Sefton-Green, 2022; Sefton-Green & Pangrazio, 2021). This refers to how platforms are programmed in specific ways that calls for configurations of texts to be computer-readable,

and where templates decide some of the interaction and what needs to be trained to be able to use the various software applications (Sefton-Green, 2022). The reason for using the analytical lens of platform pedagogies in combination with the theory of sensemaking was to pay attention to materiality in teachers' sensemaking processes, further explained in paper 4 and in the methodology chapter part of this thesis.

4.2.3 SENSEMAKING AS AN ACT OF INTERPRETATION

When asking how the emerging and broadly understood policy concept of digital competence is accounted for and enacted by teachers in digital-infused teaching practices, there is a need to more thoroughly investigate what is meant by *interpretation*, as the accounts of the enactments can be considered based on interpretations. A quote by Johnson Jr and Kruse (2019) explains it as: "When I learn what I think by seeing what I say, the thoughts I wind up with are a meaningful environment of my own making and thus an outcome" (p. 305). This relates to how Weick (2009) describes wisdom; it is about realizing what one does not know, which is an act of mindful consideration, also described as aspects of interpretation. When Weick (2009) explains interpretation, he builds some of his arguments on the work of Dewey (1910/ 1991), who makes a distinction between reflection and thinking, by defining thinking as building on presumptions and own values, not on mindful considerations. Reflection, on the other hand, is about the opposite; mindful considerations taking earlier knowledge into account (Weick, 2009). Moreover, Weick pays attention to insights, which he describes as being mindful about beneficial outcomes and having a "prolonged focus directed towards organizational goals" (Weick, 2009, p. 97), something that can evolve when people search for reasons for their enactment (Weick, 2001). Thus, activities can be both retrospectively and prospectively interpreted (Weick et al., 2005).

However, teachers may not be sure of how exactly to interpret all activities that occur as part of their teaching practices. To use a metaphor of a *cognitive map*, teachers can still try to interpret the, so called, terrain as if they had a map, that is, a picture of a situation. The cognitive map lets people have a direction and orient themselves into action, which may give them confidence to move forward, help them to pay attention to what

they are doing and where they are, and refine their actions as they move along (Weick, 2001). Weick does not propose that there would be one true map to find, only plausible maps in ever-changing terrains, which need to be updated when new experiences are made. It is about wisdom and insights. This is not to say that anything goes, only that even if there are goals and values expressed at the macro level of an organization, the interpretations going on in the practices are not always rational, instead, it is an active process of sensemaking (Weick, 2001).

Further, Weick (2001) argues that when people collectively interpret activities and talk or write the events into, so called, organizing patterns, it is essential to welcome ambivalent use of previous knowledge, dare to questioning the past, and to articulate thoughts on how to move forward. By doing so, people in complex organizations such as schools continuously “convert a world of experience into an intelligible world” (Weick, 2001, p. 9) by reworking their cognitive maps. In the studies part of this thesis, teachers’ accounts and enactments are understood as guided by, as well as updating, plausible maps constructing their teaching practices. Thus, besides having observed teachers, I have paid attention to their accounts of their experiences, thus accounting for teachers’ interpretations.

When trying to understand how teachers make sense of student digital competence, how it is catered for in digital-infused teaching practices, and what conditions there are, the analysis concerns symbolic representations of digital competence where *symbols* can mean different things to different people due to their experiences, in contrast to signs, which only explain how things objectively relate to each other (Pondy et al., 1983, p. 5). For example, a laptop could be contrasted to the sign of a digital tablet. However, someone may express a preference for a certain digital device, and so it becomes a symbol of something. As people explore and interpret symbols, they tend to further label their perceptions into *categories*, or stereotypes, to be able to share their perceptions with others. When labelling, as part of interpreting, they risk distancing themselves from the particularities in the practices, particularities which might not fit into any categories. Thus, it is crucial that it is safe to challenge labels and categories in interactions with others (Weick, 2009).

In such sharing, *boundary objects* can emerge that can function as temporary bridges between people and facilitate nuanced understandings (Star & Griesemer, 1989). Digital competence with its various interpretations can thus be thought of as an emerging object, a boundary object, which can be “plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites” (Star & Griesemer, 1989, p. 393). Such an object consists of several dimensions which are not only temporal and local, but related to in various ways (Star, 2010). Most people would probably refer to digital competence as having something to do with digitalization, hence it has a common identity, but then it may turn into different shapes in their practices, as it is related to differently. This understanding of how identified objects can be differently interpreted refers to critical realism, which additionally refers to aspects of sensemaking and conditions (Benton & Craib, 2011).

In study 2, paper 3, I use boundary object as an additional theoretical lens to focus on what objects are accounted for based on teachers’ interpretations, similar to the research of Olofsson et al. (2021) and Sperling et al. (2024). Weick (2009) describes sharing of perceptions, here accounts, to negotiate interpretations to reduce equivocality and open the way for new negotiations (Weick, 1976, 2009). Thereby, new boundary objects can unfold (Star, 2010; Star & Griesemer, 1989). In study 2, paper 3, when teachers’ interpretations of the concept of digital competence were shared during group interviews and the theoretical lens of boundary objects was used, “temporary bridges” served as a metaphor for how teachers can share their understandings with others in the school organization Weick (2009).

To sum up, I have here demonstrated how teaching practices, that is, “organized human activities” (Schatzki, 2005, p. 471), could be understood from the theory of sensemaking by Weick (1976, 2001, 2009; Weick & Quinn, 1999; Weick et al., 2005), as practices continuously are constructed in impermanent organizations (Weick, 2009). I find it relevant to align with critical realism and use the theory of sensemaking as part of practice theory, placed in the field of curriculum studies where I focus on school digitalization, as I engage in teachers’ accounts and enactment concerning student digital competence and what conditions there are. Teachers are here understood as active subjects, agents, and not objects

passively carrying out policies negotiated by others (Ball, 2015; Priestley et al., 2017). Instead, they are understood to be constantly organizing their teaching practices to create order. This thesis engages is questions of how this is done, when paying attention to teacher professional digital competence (PDC) in how to cater for student digital competence.

As the theory of sensemaking has been used in various ways, not always for strictly analytical purposes, it can be considered rather vague. However, I assume distinctions such as accounts (of interpretation and justification), enactment, dilemmas, boundary object, interaction, and platform pedagogies to be valuable for the analysis when researching particularities. Thus, I consider the theoretical lenses of boundary objects (Star & Griesemer, 1989), dilemmatic spaces (Fransson & Grannäs, 2013), and platform pedagogies (Sefton-Green, 2022; Sefton-Green & Pangrazio, 2021) to further contribute to the theory of sensemaking (Weick, 2001) used in this thesis.

CHAPTER 5

METHODOLOGY OF RESEARCH DESIGN, METHODS, AND ANALYTICAL PROCESS

To contribute to a deeper understanding of how teachers make sense of student digital competence and how it is catered for in digital-infused teaching practices, the methodology of this thesis takes a qualitative ethnographic approach, where the qualitative aspects focus on how people engage in, make sense of, and create practices in social organizations (Silverman, 2016). I find ethnography suitable as the thesis engages in practices paying attention to teachers' accounts and enactments, but also, to external conditions that are part of the school organization, and outside of it, from a critical realist standpoint (see Czarniawska, 2005; Nicolini, 2012; Orlikowski, 2007; Schatzki, 2005; Weick, 2001; Woods, 2016).

This thesis aligns with the research of other critical scholars in the field of curriculum studies engaging in a wider context also outside of the classroom (see Ball et al., 2012; Braun et al., 2011; Eynon, 2022; Pangrazio, 2023; Priestley & Philippou, 2018). However, I use "critical" in a sense that values curiosity about what is not yet fully known. Moreover, I take the critical notion a bit further, as "it could be argued that current critique of digital technologies and education does not sufficiently consider the questions of how and why digital education works for some people" (Selwyn, 2024, p. 53), and I pay attention to teachers' agency, as well as the conditions in which they operate. This post-critical turn seeks to embrace "collective dialogue and action" (p. 56) with "the aim of developing a practical understanding of what is socially actionable" (p. 59), which I consider to be in line with how Pangrazio (2023) argues for valuing teachers as activists, and not only considering them as trying to counteract obstacles in their practices.

To direct the focus, this thesis takes a major interest in teachers' perspectives. Such an approach facilitates an attention to "the significance of the meanings people give to objects, including themselves, in the course of their activities, in other words culture" (Hammersley, 2018, p. 4). Consequently, this thesis shares an interest found in ethnography in engaging in people's experiences, their sayings and doings, as well as the interest in context, that is, how activities relates to other activities at other sites (Hine, 2007). However, ethnography can be approached from various methodological perspectives and is sometimes criticized for being referred to in too general terms (Ingold, 2014). Thus, in this chapter, I first describe what ethnographic methodology this thesis aligns with. Secondly, I describe the methods used for data collection. Thirdly, I describe the analytical process, and the frameworks used for fulfilling the aim of the thesis. Fourthly, I present reflections on the quality of the research conducted, and finally, what ethical considerations have been made, as well as reflections on my role as researcher.

5.1 THE METHODOLOGY OF THE ETHNOGRAPHIC APPROACH

The decision to focus on teachers' accounts and enactment is based on teachers being considered to function as pedagogical and didactical links between the various expectations of education and the students. Further, they can be understood as in charge of designing teaching practices, even if the practices are conditioned by the school organization and other external impacts. Thus, to acknowledge teachers is to acknowledge teachers' agency (Priestley et al., 2012), something I have tried to accomplish by listening to their accounts and by investigating their practices on site in order to better understand the ongoing construction thereof. When conducting this kind of research, even small, mundane moments are considered to contribute to interesting findings. All such moments are part of organizing, yet, in the heat of every-day work, they are not always reflected upon by the ones involved in the practices (Weick, 2009). My ambition has been to pay attention to such moments as part of digital-infused teaching practices, providing teachers with a chance to reflect and think aloud, and to listen to their sayings on how they make sense of their

practices, wherein catering for student digital competence is one of many activities. Further, the ambition has been to observe how teachers interact with their students in digital-infused practices and to engage the teachers in thinking aloud on those activities.

Theory is useful both for how to plan the fieldwork, and for the outcome and the analysis (Gheradi, 2015). When using the theory of sense-making, teachers and their practices are considered part of a wider and emerging school organization where they relate to material, ideas, other people, activities, and a context out of school (Priestley & Philippou, 2018; Weick, 2009). Hence, the ethnographic research needs to account for this, something that strengthened the decision to use a multi-sited ethnographic approach attending to sometimes merging practices and their various conditions (Hine, 2015; Marcus, 1995). Although Hine (2017) nowadays mainly focuses on online settings, and my research only acknowledges those as parts of digital-infused practices, and as I have conducted online interviews through digital technology, I find her ethnographic methodology valuable. To me, it encourages an ethnographic approach where digital platforms facilitate connections between sites.

One scholar who has taken a similar approach as Hine, is the institutional ethnographer Smith (2022). Her methodology of understanding technologies to facilitate how meaning can be shared through texts in multiple sites (Smith, 1999) has in some ways been interesting for this thesis – especially as digital platforms can be understood as examples of such technologies, making them natural parts of fieldwork just like any other field sites (Osborne, 2023). However, when drawing on the theory of sensemaking, I only let myself be partly influenced by the methodology of Smith, not steered by or totally aligning with her perspective. Nevertheless, paying attention to material aspects such as digital platforms tends to be ignored in research on organizational practices (Orlikowski, 2007), so I have made sure to let teachers have their say on those aspects, for examples in interviews, and when observing how they engage with students and technologies in their practices.

To be able to engage in teachers' sensemaking of their catering for student digital competence, I have thus sought to get involved in local settings, listen to teachers' accounts, and take part in the various activities they are involved in, something that is significant for ethnography

(Atkinson, 2015), and which has become part of the methodology of this thesis. Such intense involvement can be conducted in various ways. In my case, I have sought to attend to organizational aspects of teaching practices, as this is a way to investigate teachers' accounts of how they make sense of and interpret activities, as well as how they interact with others in classrooms and in the school organization (Woods, 2016). To gain access to teaching practices and to teachers' accounts of such practices, during the first two years of doctoral research, I contacted teachers, as well as principals at schools. During the following two years of research, I gained access to teaching practices through an international research project already in place, namely the project of "Reconfigurations of Educational In/Equality in a Digital World" (RED) funded by Riksbankens Jubileumsfond.

Sometimes it is argued that ethnographic researchers need to conduct research for a longer period, and sometimes only in one specific setting. The argument can be understood from the origins of ethnography; anthropology, where researchers engaged in trying to understand local practices in remote settings for longer periods of time (Ingold, 2014). Another common argument is that researchers have to use a variety of methods to gain a rich understanding of those being researched (Hammersley & Atkinson, 2007). However, there are arguments that this might reflect a too instrumental view if researchers are bound to only use pre-set designs with pre-determined methods (Hammersley, 2018), and pre-defined questions or hypotheses, and advocate for a more open approach where the researcher follows threads, or clues, and adjusts the research as it proceeds (Atkinson, 2015; Davies, 2008; Hine, 2000). Woods (2016) describes this kind of exploratory ethnography as "the excitement of engaging in a voyage of discovery toward new territories" (p. 5), and I align with this open approach as I understand practices to be divergent and emergent. More precisely, and as explained in the introductory chapter, I regard them as social phenomena where human and material activities intersect (Nicolini, 2012; Orlikowski, 2009; Schatzki, 2005). Consequently, teaching practices can be understood as actively constructed, and conditioned by their context (Weick, 1993). This resonates with how teaching practices are understood in the field of curriculum studies, and where organizational questions come into play. For example, political expectations expressed in policies can be one of many external conditions to consider (Cuban, 2020;

Fullan, 2021; Priestley et al., 2017), Thus, I find it necessary to tune in and listen to the practitioners. Following Weick (2009), sensemaking is about attending to activities and reflections about these. To investigate teachers' sensemaking and do justice to the emergent organizing conditions, I have had to be sensitive to what has been going on in the researched practices.

When paying attention to the teaching practices, the ethnographic process can take different turns which may call for the use of different methods (Hine, 2007; Smith, 1999). This has been the case for this thesis where the three comprising studies have been conducted at different sites. Although the first two studies were not intended to be ethnographic from the start, eventually they became part of an ethnographic understanding. The first study involved individual online interviews with teachers at ten different schools, and the second one involved on-site focus group interviews at three different schools. As the research continued, it made sense to regard all the three studies as ethnographic, with the first study contributing to a first understanding of teachers' individual accounts of their digital-infused teaching practices. The second study contributed to an understanding of teachers' accounts of their practices when discussing with colleagues in their school organization. The third study deepened the ethnographic understanding as it paid attention to both individual and joint accounts from different perspectives in a school organization, as well as to observations of actual activities on site.

Investigating multi-sited matters involves striving "to do justice to the complex patterning of contemporary life" (Hine, 2007, p. 5). Thus, while the first online interviews in study 1 may not have captured an in-depth understanding of the organizational context, as this can be hard in online research, they served as an entry point to the research. As such, interview studies can be regarded as ethnographic (Smith, 1999). During the years, the research has sometimes been intensive for a rather short period of time, as in a compressed time mode, and sometimes the research has been conducted for a longer period with various frequency, as in a selective intermittent time mode (Jeffrey & Troman, 2004). Some argue that a compressed time mode might not provide the same depth as other time modes, since it is more of a snapshot of what is going on, but analyzed together with other findings, it can be an asset in ethnographic research (Jeffrey & Troman, 2004). In my opinion, the different time modes have contributed

to the results of this thesis. When trying to be open to what unfolded during the research, and to better understand the different teaching practices, I have tried to be curious about the activities I might hear about and experience (see Emerson, 2011; Hammersley & Atkinson, 2007).

However, as a researcher with a specific research interest in catering for student digital competence and digital-infused teaching practices, I must admit that, of course, I have directed my gaze towards particular objects in the practices. As the thesis not only aligns with the research field of curriculum studies in general, where ethnography is sometimes used (Priestley & Philippou, 2018; Woods, 2016), but specifically to school digitalization; it is to this area that I have directed my curiosity by trying to answer the research questions. The ambition has been to first inductively understand those practices, to be able to adjust the forward planning of the research. When ethnographic research proceeds, there needs to be an openness to the possibility of changing direction or shifting locations (Atkinson, 2015; Davies, 2008; DeVault & McCoy, 2006), which has been the case for the three studies that form part of this thesis. I value the different studies in this thesis and how the different designs, taken together, contribute to an ethnographic methodology. Consequently, I regard the multi-sited approach to be compatible with the theory of sensemaking and to curriculum studies in general.

5.2 DATA PRODUCTION

I have chosen research methods that I believe contribute to investigating how teachers make sense of student digital competence and how it is catered for in digital-infused teaching practices. A prominent number of related studies on digital competence have involved surveys to investigate teachers' accounts (Castaño Muñoz et al., 2023; Hatlevik, 2017; Ogodo et al., 2021; Tomczyk, 2020; Trigueros-Cano et al., 2022). However, to generate in-depth qualitative analysis of a broad range of past and ongoing activities, I chose methods based on how well they could help with understanding these activities. When I observed how teachers acted during lessons, I could understand the practices from one of several possible perspectives. When interviewing them, I could generate another perspective,

that is, an understanding of their interpretations of an activity (Atkinson, 2015; Hammersley, 2018; Hammersley & Atkinson, 2007; Hine, 2007). In an ambition to gain a rich understanding of such qualitative aspects (Hunter & Brewer, 2015), I have thus used methods of *observations*, *field-notes*, *individual interviews*, *focus group interviews*, *informal conversations*, *texts*, and *walkthroughs*, that is, when someone step-by-step shows how digital technologies are used in a specific practice. They all have different qualities, and risks, as further explained below.

5.2.1 PARTICIPANTS

In each study there was a purposeful sample of participants to provide rich information (Krueger, 2010), further explained in the papers deriving from the three studies. The main criteria were that the participants were trained teachers working in digital-infused teaching practices where teachers and students had access to digital technologies, at least one digital device per two students, and where teachers could be considered used to handling digital technologies in their practices, that is, having some professional digital competence (PDC). Since I regard PDC to be emergent rather than static due to the continuous flow of new software applications entering the teaching practices, the teachers' PDC was not measured. Instead, the participants were to be working in school organizations where the external barrier of lack of technology would not be an issue (Ertmer, 1999), indicating that it would be possible to cater for aspects of student digital competence. In study 1, to get an overview of the situation of catering for this kind of competence, I chose to interview teachers who worked in primary, lower secondary and upper secondary schools (students aged 6–18), as digital competence is part of the Swedish national curricula for those school years. Most of them had participated in a university course on digitalization, so they could be assumed to have some PDC. However, in studies 2 and 3, the purposeful sample targeted participants working in, or in relation to, digital-infused schools in grades 6–9 (students aged 12–15) and who were willing to share their knowledge with me. Those are the last years of compulsory schooling in Sweden, and I wanted to investigate how digital competence is catered for in digital-infused teaching practices during those last years. An overview of the participants and the data production follows in Table 1.

Table 1

Aim, Research Questions, Data Gathering and Publishing Date, and Methods in the three studies of the thesis

Study	Aim	RQ	Data Gatherin	Methods
1	To gain knowledge of how teachers, who can be regarded as having some professional digital competence themselves, and who work at schools where students are provided with access to laptops, make sense of and negotiate their students' digital competence	RQ1: What digital competence do teachers describe as crucial for their students to develop in education? RQ2: How do teachers describe the way in which they cater for their students' digital competence?	Feb – March, 2021 Paper 1 published in Oct, 2023	Semi-structured individual interviews with teachers (n=10) working in primary – secondary schools from the north to the south of Sweden. (approximately 7,5 hours)
2	To investigate and describe the complex and dynamic dilemmas teachers are facing connected to students' net-based out-of-school activities (paper 2), and to consider teachers' understandings of students' digital experiences as an important part of teachers' sensemaking processes (paper 3).	RQ1 (paper 2): What dilemmatic spaces are outlined by teachers in lower secondary schools in Sweden concerning their students' net-based out-of-school activities? (Paper 2) RQ1 (paper 3): How do teachers engage in sensemaking on the cross-curricular concept of digital competence in relation to their students' net-based out-of-school activities (Paper 3)	Oct – Dec, 2021 Paper 2 published in Oct, 2022 Paper 3 published in April, 2023	Semi-structured focus group interviews with five groups of teachers (n=41) split across three schools (grades 6-9), all situated in three different municipalities in Sweden. (approximately: 6 hours)
3	To examine how platform bureaucratization can be understood as a tacit subject in highly platformized classrooms.	RQ1: What pedagogies are produced in highly platformized classrooms?	May 2022 – June 2023 Manuscript submitted in Nov 2024	13 months of field work in one school, grades 6-9: 1. Semi-structured interviews with two principals. (1 hour) 2. Individual semi-structured interviews with * an IT-facilitator, * a special-needs teacher, * an administrator, and * a manager leading the development team in the municipality. (approximately: 4 hours) 3. Semi-structured focus group interviews with the five observed teachers. (1 hour) 4. Observations and fieldnotes of five teachers' lessons. (approximately 58 hours of observation, 33 by me). The teachers had worked as teachers for 8 – 24 years. 5. Informal conversations (throughout the entire fieldwork) 6. Collecting texts and participating in walkthroughs (throughout the entire fieldwork)

5.2.2 INDIVIDUAL AND FOCUS GROUP INTERVIEWS

Ethnographic research often begins with open-ended individual or group interviews (DeVault & McCoy, 2006; Smith, 2003) “to understand people’s perspectives” (Hammersley, 2006, p. 6). I regard teachers’ *accounts*, that is, their utterances and discussions, which might be referred to as sayings (Weick, 2001), as part of their every-day sensemaking processes in their teaching practices. Hence, I decided early on to use individual interviews and, later, focus group interviews as methods, and to record and transcribe those to be able to analyze what had been said. Consequently, I started out by interviewing teachers individually via a video conference tool. It was mainly due to pandemic times, but also an active ethnographic decision for me to visit them in whatever place in Sweden they were based, and at times that suited them (Atkinson, 2015), not the other way round. In this semi-structured interview, the interviewees were asked to elaborate on open-ended questions about their teaching practices related to digital competence, without me defining digital competence, and I could follow up the answers by asking further questions (Price & Smith, 2021).

However, before the individual interviews, and before the focus group interviews in study 2, I asked some questions about teaching experience and school subjects. This strategy of investigating the independent thoughts of teachers in the early stages of the ethnographic research was helpful to better understand how to design the continuing research (Adams, 2010). Later, in study 3 and together with another researcher who were part of the research team, we additionally interviewed two principals, an IT-facilitator, and a special needs teacher, who were all working in the same school, and a manager leading the development team in the municipality. Those semi-structured interviews in study 3 concerned the school organization to better understand teaching practices as being part of such an organization (DeVault & McCoy, 2006; Kearney et al., 2018). Subsequently, in study 3, I decided to once again interview teachers in a focus group to gain a deeper understanding of how teachers collectively account for the way they make sense of student digital competence.

Focus group interviews have been described as “a research technique that collects data through group interaction on a topic determined by the researcher” (Morgan, 1997, p. 5), which was true in the studies 2 and 3. Such interviews can be used at an initial stage, as well as to follow up what has been observed (Krueger & Casey, 2010), and I have found both alternatives helpful for my research. Facilitating interactions between participants have been done in ethnography before (Smith, 2005), and I decided to let participants have the chance to engage in pedagogical discussions similar to the ones that are stipulated in the Swedish national curriculum to be carried out among teachers in schools (National Agency for Education, 2022a, 2022b). Sometimes the principals arrange such discussions, so I offered to arrange them during the teachers’ ordinary time for meetings. It was an attempt to treat the participants as subjects acknowledging their agency (Hammersley & Atkinson, 2007; Priestley et al., 2012), and to analyze what they discussed concerning digital competence. Further, in study 3, it was an attempt to allow the ones observed to question my first analysis (DeVault & McCoy, 2006), something the ethnographic researchers Patton (1990) and Hine (2015), among others, have done. However, researchers and participants can have different views (Eberle & Christoph, 2016), and the follow-up focus group interview was not the same as letting the teachers decide the outcome of the analysis. Instead, the ambition was to listen to them when they discussed their teaching practices in relation to my observations and how the analysis resonated with them (Buscatto, 2016).

I am aware that it might be argued that studies where only interviews are used, as in study 1 and 2, cannot be regarded as ethnographic (Gobo & Marciniak, 2016). I challenge this notion as both the individual and the focus group interviews have been valuable to understand the participants’ activities from their perspectives. Additionally, exploring what people put into concepts through interviews has been used in ethnographic research before (Smith, 2022).

5.2.3 OBSERVATIONS AND FIELDNOTES

The method of using observations often becomes part of ethnographic research as it progresses (Hammersley & Atkinson, 2007). This was the case for this thesis, and I regard observations, among the other methods presented below, as having added important value to the research, since they gave me a chance to study teaching practices as they unfolded.

However, to gain access to teaching practices, a certain amount of trust needs to be built up with the participants (Barbour, 2010). In the last part of the ethnographic research, where I was able to spend considerable time at one school over a longer period, 13 months, I asked some teachers if I could visit them during lessons and observe how they used digital technologies. The frequency of my visits depended on when I was welcome to visit, something that was decided from one visit to another, and depending on what happened on site (Jeffrey & Troman, 2004).

During the approximately 58 hours of lessons spread out over the 13 months, where a colleague and I were invited to observe, I focused on how teachers in Social and Natural Science, Mathematics, Technologies, Swedish, and Modern Languages used digital technologies in their practices, in order to inductively observe what was going on and what aspects of digital competence might appear, rather than focusing on pre-defined aspects of what could be regarded as digital competence. Instead, what might count as digital competence was analyzed later.

When observing teachers during their lessons, I sat at the back of the classroom and took fieldnotes using a pencil and paper or a digital writing pad, a method I used to turn experiences into written texts (Emerson, 2011). However, observing is not just looking for what can easily be identified. Instead, it is about being attentive to both the spoken and unspoken, that is, being sensitive to the complexity of what is being observed (Atkinson, 2015). Since a researcher cannot capture absolutely all the things going on (Hammersley & Atkinson, 2007), I concentrated on some of the activities in the classroom. First, I noted down date, time, school subject, teacher's name, and school year. Second, I noted down how the classroom was arranged, and what technologies was visible. As the lesson began, I concentrated on noting down how the teacher interacted with the students while using technologies or talking about the same.

Behavioral matters or details about the students were left out. Later, on the same day as the observations, I rewrote the fieldnotes on my laptop and polished them so they could also be read by my colleagues in the research team. We had slightly different approaches to how to write fieldnotes, which is common in ethnographic research (Emerson, 2011), and I appreciated the possibility to follow the threads I encountered (Choy et al., 2009).

Using observations as a method has its risks. The researcher needs to get involved in the practices and “look out from the inside” (Woods, 2016, p.4), but also keep their distance, which might not be as easy as it sounds. When the researcher participates in a local setting for a longer period, there is a risk of becoming too involved and not being able to combine the involvement with a more detached and analytical gaze (Woods, 2016). I have continuously reflected on this, and shared my reflections with other researchers, something I have found helpful. Although I did get involved in the practices to some extent, I also tried to maintain some distance during the observations when keeping a low profile at the back of the classroom. To further distance myself, I considered it helpful to write fieldnotes during the observations, as those captured the classroom activities which I could later return to and analyze.

5.2.4 INFORMAL CONVERSATIONS

Informal conversations with participants adds to the researchers’ understandings of the practices, and is a common method in ethnography (DeVault & McCoy, 2006), and thus in all three studies I valued the conversations I became involved in when generating data. I made sure not to start any recordings or to write any fieldnotes before having informally talked about whatever was brought up, either by me or the participants. It was a way to treat them as subjects with agency and to understand various perspectives from their point of view (Hammersley & Atkinson, 2007). In study 3, before, in between, and after lessons, I often sat in the main staff area, or in the teachers’ staff room where they worked when not teaching. Sometimes I had lunch with various staff members and was able to informally talk to them. Through the conversations, I gained a better picture of the school as an organization.

However, I do not consider this method to be rigorous enough in itself and recognize that it builds on spontaneous rather than prepared encounters. As there is seldom time to write down what is said in an informal conversation as it takes place, making the conversation part of the analysis could be problematic. However, I find such conversations to be useful as a complement to other methods, and to deepen my understanding of the context of the teaching practices.

5.2.5 TEXTS AND WALK-THROUGHS

In ethnography, to gain a deeper understandings of the context of which the practices are part, it is common to investigate what texts there are (Hine, 2015). These texts may be written, or displayed in the school as templates, pictures or other visible objects, for example, on a platform or a website, and carry meanings even when the producers of the texts are not present (Smith, 2022).

A website can set out what a school considers important (Hine, 2015), so in all the studies, I looked up the school website, and in study 3, took screenshots of it. I also took pictures of posters on the walls, and of some books and papers used in the practices I visited, when I thought it appropriate and it did not interfere with any activities. Sometimes, I asked the teachers if I could take a picture of what was displayed on the TV screen in the classroom and on the teachers' laptops. I made sure no identities could be traced in the pictures. Moreover, as platforms are highly present in Swedish education, those became part of the last study. The texts on those platforms can be considered produced when they are read, watched, or listened to, sometimes differently by different people due to varying experiences and contexts (Smith, 2022), and can to various extent combine practices (Smith, 2005). Schools might have the same content to attend to, for example a national curriculum, which can be displayed through a platform and templates which are the same in other schools. Thereby, what seems local and is explored locally, could be understood from a broader perspective, for example through the platforms that connect local practices to a broader context (Sefton-Green, 2022).

In my fieldwork, I followed the teachers' movements on these platforms while observing the tv screen in the classroom where the

teachers displayed their laptop screens, and I noted down what activities were displayed. To better understand the practices, I often asked the teachers in between lessons about what I had observed and did not fully grasp. To follow threads further, at one point, I asked one of the teachers for a thorough walk-through of various platforms (Decuypere, 2019). This method of investigating how texts are used by participants is common in ethnography (DeVault & McCoy, 2006), and can add valuable insights as the texts are not investigated in abstraction from any usage (Smith, 2006). I am aware that this method did not allow me to capture everything on the platforms. What was shown to me depended on my knowledge of what to expect from the platforms and what to ask about. However, I consider the glimpses I was able to get of the activities to be valuable in deepening my understanding of the teaching practices.

5.3 ANALYTICAL PROCESS

The methodologically exploratory approach of ethnography in this thesis has called for exploratory analysis of teachers' sensemaking where activities and sense are understood as closely connected, and where their interpretation of activities has come to the fore through their accounts (Weick, 2001). Consequently, in the analytical process of all three studies that form part of this thesis, I initially and inductively familiarized myself with the generated data. More specifically, I investigated teachers' accounts and enactments of their teaching practices regarding digital competence, paying attention to their agency, and what conditions became visible (Priestley et al., 2017; Weick, 2001). I had not decided in advance what digital competence "is". Instead, and in line with Ferrari et al. (2012) and Ilomäki et al. (2016), I regard digital competence as an emerging concept, which is why I was interested in what the teachers expressed and enacted.

For the initial coding, I used thematic analysis (TA) in line with Braun and Clarke (2006, 2019). I transcribed the recorded interviews (studies 1, 2, and 3), read the fieldnotes from the observations (study 3), and marked interesting excerpts related to aspects of digital competence, read the excerpts several times, and discussed them with colleagues. Then the excerpts were marked and clustered into what seemed to relate to the same identified content of the data, which was named in themes

and subcategories (Lincoln & Guba, 1985). The procedure was similar in the three constituent studies. However, some procedures were slightly different: In study 1, the coding was done on paper. In study 2, I used the analytical tool of Nvivo 1.7.2 on two different occasions which resulted in two papers (paper 2 and 3). In study 3, I read all the fieldnotes, texts and transcripts of the interviews, which were shared with the research team, and I familiarized myself with the gathered texts to understand the data material. The sharing of data offered a chance to maintain an analytical distance to the data that might otherwise become too familiar to the researcher (Lahelma et al., 2014), and a chance to better understand the data over time (Buscatto, 2016). However, I mainly analyzed the fieldnotes I had produced myself, which derived from approximately 33 hours of observations, and fieldnotes from informal conversations in staff rooms and other areas in the school, as I had better knowledge of those practices than of practices where I had not been present.

In the next step, the analysis was further elaborated on as I engaged in how to understand the data through various theories, which is why the analysis can be regarded as abductive. Abduction theoretically “seeks a situational fit between observed facts and rules” (Timmermans & Tavory, 2012, p. 171). Subsequently, together with other researchers, I arrived at theories which can be considered closely aligned with the overarching theory, namely, sensemaking, as they contributed to various aspects of the same.

In study 1, I used the framework of digital citizenship by Choi (2016) and the Digital Competence Framework for Educators (DigCompEdu) (Redecker & Punie, 2017), further described in paper 1. (Also see appendix, Figures 2 and 6.) Although these frameworks are not regarded as theories, using them was an attempt to abductively better understand the generated themes from a transnational context. However, I do not regard the frameworks as “rules” but, in line with Priestley and Philippou (2018), as constructions that are part of a context which might have an impact on the teaching practices covered in the study, and which I set out to investigate.

In study 2, on the first occasion of coding, as the first generated themes on a manifest level indicated that the teachers experienced some dilemmas in their teaching practices, which is why the themes were analyzed

again, now in relation to the theory of dilemmatic spaces (Fransson & Grannäs, 2013), further described in paper 2. Drawing on the same study, on a second occasion of coding, I additionally analyzed the participants joint sensemaking on digital competence in relation to what they knew about their students' digital-infused, or net-based, out-of-school activities. Here, and as an extra layer besides sensemaking, boundary objects (Star & Griesemer, 1989), was used to abductively analyze what conflicting ideas and shared understandings that bound the participants together through, so-called, temporal bridges, which is further described in paper 3.

In study 3, the initial coding gave an understanding of teachers' sensemaking activities, where they tend to deal with various dilemmas related to digital competence that constantly occur in their teaching practices, mainly related to how to instruct their students on how to find, retrieve and upload texts on digital platforms. The co-authors of the fourth paper and I thus chose to focus on one sequence with three different episodes deriving from two lessons, to thoroughly analyze how one of the teachers interacted with the platforms when instructing the students. For this purpose, we used the analytical concept of interacts by Weick (2001), and analytical concepts related to platform pedagogies (Perrotta et al., 2021; Sefton-Green & Pangrazio, 2021), namely textualization, templatization and trainability as described by Sefton-Green (2022), further expressed in paper 4.

I consider the theories used for analytical purposes in the various studies to facilitate a joint and holistic understanding of how teachers make sense of student digital competence and how it is catered for in their digital-infused teaching practices, something I will describe when summarizing the four papers deriving from the studies and in the concluding discussion of the thesis.

5.4 REFLECTIONS ON THE QUALITY OF THE RESEARCH CONDUCTED

I regard the qualitative methods I have used in the constituent three studies of this thesis to have been essential for conducting explorative research, and consequently, for the aim of this thesis. However, if the

research is to be justified and credible (Schwandt, 2007), it is important to explain decisions taken and reflect on the quality and relevance of the research. When using quantitative methods it is common to refer to internal and external validation, reliability, objectivity, and generalizability (Lincoln & Guba, 1985). However, in research using qualitative methods, it is common to reflect on the trustworthiness of the same. Trustworthiness can be defined through various areas which sometimes intersect. I use the areas of credibility, authenticity, transferability, dependability, and confirmability (see Lincoln & Guba, 1985, 2007; Schwandt, 2007; Shenton, 2004), as explained below.

5.4.1 CREDIBILITY

The various methods have been used to contribute to the *credibility* of the research. Instead of just paying attention to overt layers of what people have said or done, in what could be labelled as thin descriptions, the ambition has been that the various methods would contribute to an understanding of how the activities were “[p]roduced, perceived, and interpreted”, in what could be labelled thick descriptions (Geertz, 1973, p.7). To be thick, or dense, descriptions need to take their departure from the subject’s point of view and be contextualized in social situations (Denzin, 2001), why the setting of each study has been described in the produced papers. The methods of the three studies were chosen to contribute to dense descriptions, and thus, to the aim of the thesis. Such triangulation of methods can strengthen the credibility of the research (Lincoln & Guba, 1985; Shenton, 2004).

However, each methodological element of such multi-method research had its strength and limitation depending on the situation, something that needs to be reflected upon (Hunter & Brewer, 2015). Throughout the whole research process, I have tried to be sensitive to how to adjust the research methods to what I considered valuable for the research. Conducting interviews has been one of several methods to investigate teachers’ interpretations of the concept of digital competence which can be considered an every-day expression as well as a conceptual element of policies and research. I am aware that the focus on interviews (papers 1, 2, and 3) could be questioned. Especially as the first study (paper 1) builds on data

from online interviews where the online situation could have obstructed the ability to capture the overall context of the participants' practices. On the other hand, the different locations and interview situations could be thought to have enriched the understanding of various digital-infused teaching practices nationwide. Moreover, study 3 (paper 4) contained a rich set of methods, and the study lasted longer than studies 1 and 2. The various methods of generating data in study 3 have been important to the overall analysis of the thesis. Consequently, interviews are only one of several methods, although they represent a higher proportion in the papers comprising the thesis.

Another aspect of credibility refers to the representation of participants (Shenton, 2004). Through purposeful sampling, teachers from 14 schools all over Sweden (primary through upper secondary schools) were represented. The schools could be considered well-equipped with digital technologies. By meeting teachers and others related to them, I was able to follow up various threads in new studies, and to include other members of the organization in the research (Hine, 2007). Further, credibility also concerns the rigor of the analysis. I have continuously discussed the data with other researchers at conferences and seminars to get critical feedback on preliminary analysis, as is essential for the credibility of the research (Lincoln & Guba, 1985; Shenton, 2004; Woods et al., 2000).

5.4.2 AUTHENTICITY

Closely aligned with credibility is *authenticity*, that is, how well the research represents the participants and their realities (Lincoln & Guba, 2007). As I have used a vast range of methods and met a vast range of personnel, the research included different perspectives. Often, I asked the observed teachers about some of the classroom activities after the lesson to make sure I understood what I had observed and to eliminate any misunderstandings on my part (Patton, 1990). On several of those occasions, I was able to better understand some specifics that had previously been unclear to me. To counteract other problems of representation, I began the focus group interviews in study 2 by letting the teachers write some thoughts which I later made sure to address. This was an attempt to invite the teachers who were quieter than the others to be part of the discussions, adding to the authenticity.

5.4.3 TRANSFERABILITY

As socio-material practices are impermanent rather than stable (Weick, 2009), in qualitative research, it is hard to generalize any results. However, it is possible to consider the *transferability* of the studies, meaning that if they are well described, the results can be considered in other settings, paying due attention to the settings' own circumstances. To facilitate transferability, apart from thoroughly described studies, it can be helpful if several studies have been conducted in various settings (Lincoln & Guba, 1985; Shenton, 2004), something I have done. Moreover, to further acknowledge transferability, I have tried to place this thesis in a well-described context paying attention to history, as in chapter 2, and to related research, as in chapter 3.

5.4.4 DEPENDABILITY

Contextuality of qualitative research is additionally part of what is referred to as *dependability*. It is closely related to credibility as it concerns the decisions behind the use of research methods in specific settings and whether the descriptions of the usage are rigorous enough (Lincoln & Guba, 1985; Shenton, 2004). My ambition has been to thoroughly describe the research I have conducted in the various papers deriving from the three studies, as well as here, and to describe my intentions. Hence, I can only hope that this will contribute to the dependability of the research.

5.4.5 CONFIRMABILITY

Finally, *confirmability* refers to the influence of the researcher on what is being researched and on its outcome, an influence Shenton (2004) argues is part of most research, which is why it is essential to describe the ways in which the researcher has reflected on this and what measures have been taken (Atkinson, 2015; Shenton, 2004). On the one hand, the initial questions derives from one's pre-understandings (Adams, 2010), and I regard my experience as a former teacher, school leader, teacher educator, and an advisor on pedagogical and digital issues at municipality and national level, to be an asset. On the other hand, pre-understandings can

obscure what is being researched. This combination of being an insider, a person who is part of the researched world, and an outsider, a person who distance herself and looks at the researched world with open and curious eyes, is a balancing act (Hammersley & Atkinson, 2007).

In all three studies, I tried not to reproduce any stereotypical thoughts of how I might perceive teaching practices from my previous experiences, something Rosvall (2015) raises awareness of. As an example, in study 3, every time I visited a lesson, I focused on noting down what happened on the TV screen in the classroom displaying the teacher's laptop screen. I focused on what notifications were visible, how often the screen was put to rest, and how the teacher interacted with various digital devices and software. These things were new to me after having been absent from primary - secondary classrooms for some years. Thus, I found a curiosity that fueled the research, something Woods (2016) claims is essential when conducting ethnographic research in teaching practices.

5.5 ETHICAL CONSIDERATIONS AND REFLECTIONS ON MY ROLE AS A RESEARCHER

I have followed the ethical guidelines found in “Good research practice” published by the Swedish Research Council (2017, 2024). For example, all participants in the three studies were informed of the studies both orally and in writing, that it was voluntary to participate and that they could withdraw from the studies at any time. Although the participants had signed a letter of consent, I made sure that they knew they could contact me if they had any doubts or questions. I obtained ethical clearance where necessary, and the RED project was given clearance by the Swedish Ethical Review Authority (Swedish Ethical Review Authority, n.d.). Further, I have kept the research organized using secure digital platforms provided by the university. I have addressed the participants' confidentiality during the different parts of the research process by only revealing as much about them as I have deemed necessary. For example, I have used pseudonyms instead of real names. Where I have considered variables such as gender or teaching subjects to not be of explicit importance, they have not been mentioned. However, besides following those

ethical guidelines, there are several practical, iterative and situation-bound considerations to make throughout the research (Davies, 2008; Markham et al., 2018; Schwandt, 2007), as well as reflections on one's role as a researcher (Buscetto, 2016), some of which I present below.

Having gained access to a research site, in ethnography, it is essential to earn the participants' trust (Lincoln & Guba, 1985) and to acknowledge their agency, rather than just treating them as distant respondents (Davies, 2008; Hammersley & Atkinson, 2007). However, in multi-sited ethnography, the researcher needs to be aware of her or his sometimes different positions at different sites (Marcus, 1995). My ambition has been to treat the participants with curiosity and respect, regardless of whether they have been teachers, principals, coordinators at municipality level, or holders of other roles. Thus, when meeting the participants, I made sure to point out that I was eager to learn from them. When asking the teachers something after I had observed a lesson, if I felt they did not want to elaborate on the answer for too long, I dropped the question and, in some cases, came back to it in what seemed to be a more convenient moment. It was a matter of being respectful towards the participants, but also of not losing access to the practices (Barbour, 2010).

Another idea was to not ask the teachers too much about their upcoming lessons to make them wary about my opinion. Thus, I did not focus on their specific lesson plans. Instead, I asked them about what I had observed or if they could elaborate further on what they had told me about their teaching. Another ethical consideration concerned the consent given by the participants. As one of the studies went on for a prolonged period, the participating teachers and I got to know each other, which may have resulted in them feeling they could discuss various kinds of topics with me. Sometimes, I reminded them of my presence and that they were free to say if they did not want me to quote them. Additionally, I have tried to be sensitive to the participants' work situations and to meet them at times that suited their schedule rather than mine. During individual and focus group interviews, I made an active decision to mainly use sound recordings and fieldnotes, and not film the activities, in order not to interfere too much with the situation. These were some of many iterative and judgement-based decisions (Hammersley & Traianou, 2012) on my part regarding how to interact with the participants.

CHAPTER 6

PAPER SUMMARIES

This thesis comprises four papers with empirical findings based on three studies. In this chapter, I provide brief summaries of the papers outlined in table 2 and describe how each paper has led to the next.

Table 2

Overview of the four papers comprising this thesis

Paper 1	Making their own sense of students' digital competence. Teacher negotiation and its implications for democracy and (in)equality	Based on study 1	Peer-reviewed journal article
Paper 2	Teachers' dilemmatic spaces connected to students' net-based out-of-school activities	Based on study 2	Peer-reviewed journal article
Paper 3	Teachers' negotiation of the cross-curricular concept of student digital competence	Based on study 2	Peer-reviewed journal article
Paper 4	Platform bureaucratization as pedagogy - a tacit school subject in highly platformized classrooms	Based on study 3	Under review

6.1 PAPER 1: MAKING THEIR OWN SENSE OF STUDENTS' DIGITAL COMPETENCE. TEACHER NEGOTIATION AND ITS IMPLICATIONS FOR DEMOCRACY AND (IN)EQUALITY

Peer-reviewed journal article, published as:

Löfving, C. (2023). Making their own sense of students' digital competence. *Nordic Journal of Digital Literacy*, 18(3), 145-157. <https://doi.org/10.18261/njdl.18.3.2>

This paper offers an introduction to the ethnographic research comprised by the three studies that are part of this thesis, which aims to contribute to a deeper understanding of how teachers make sense of student digital competence and how it is catered for in digital-infused teaching practices. The aim of this paper is similar, namely, to gain knowledge of how teachers, who can be regarded as having some professional digital competence themselves, and who work at schools where students are provided with access to laptops, make sense of and negotiate student digital competence. Hence, it sets out to explore teachers' accounts on the subject, and to better understand what questions are important to them. This knowledge was important to be able to further design the ethnographic research.

By outlining different understandings of what digital competence may entail concerning various aspects of skills, literacy, and Bildung, partly understood as citizenship, the paper showcases how the concept is rather loose in its contours. There is a research gap in how this concept, which is not easy to define once and for all, is negotiated by teachers, and how it is catered for in schools (Erstad et al., 2021; Svendsen & Svendsen, 2021). Research is therefore needed, since it has been argued that catering for digital competence has democratic implications, as well as implications for reducing inequality among students and in society (Godhe et al., 2020; Pagani et al., 2016; Samuelsson, 2014). However, if this is the case, teachers' accounts on digital competence needs to be researched, something this paper engages in through the research questions: "What digital competence do teachers describe as crucial for their students to develop in education?" and "How do teachers describe the way in which they cater for their students' digital competence?"

Drawing on data from semi-structured interviews with ten teachers working in either primary or secondary schools from the north to the south in Sweden, the theory of sensemaking (Weick, 2001) offers an analytical perspective which is backed up by the analytical frameworks of digital citizenship (Choi, 2016) and the policy framework of “Digital Competence Framework for Educators” (DigCompEdu) (Redecker & Punie, 2017) (appendix, Figures 2 and 6) to better understand what conditions there are when comparing policies and practice. The results indicate that the teachers mainly consider the concept of digital competence in terms of *technical knowledge and usage*, and *responsible and critical awareness*. Democratic values, such as digital rights, participation, engagement, and critical resistance, as expressed in various policy frameworks, are not as common to cater for.

The paper discusses how constraining conditions are exemplified by various regulations, for example, the “European General Data Protection Regulation” (GDPR), which the teachers feel obliged to consider, as well as by a caution not to let their students experience any bullying while engaging in online spaces. Another identified constraining condition is how teachers build their accounts of digital competence and digital technologies on what they find to be useful in their own every-day lives, rather than referring to knowledge about students’ digital competence. Even if they touch upon students’ experiences, they do not elaborate deeply on the subject. Moreover, the teachers state that they seldom discuss such questions with colleagues, and thus, they have to make their own sense of how to cater for students’ digital competence. The paper further discusses what consequences a narrow perspective on student digital competence can bring and problematizes how, in the long run, neglecting to teach students how to navigate in a digital-infused society may restrain democratic values and increase digital inequality.

As this paper sets out to gain a basic understanding of how teachers make sense of student digital competence and how it is catered for in digital-infused teaching practices, a research gap and a question for further research is how teachers in digital-infused schools make sense of catering for student digital competence in the school organization while considering students’ previous experiences. This is followed up in the next two papers of this thesis.

6.2 PAPER 2: TEACHERS' DILEMMATIC SPACES CONNECTED TO STUDENTS' NET-BASED OUT-OF-SCHOOL ACTIVITIES

Peer-reviewed journal article, published as:

Löfving, C., Godhe, A.-L., & Lundin, J. (2023). Teachers' dilemmatic spaces connected to students' net-based out-of-school activities. *The International Journal of Information and Learning Technologies*, 40(1), 62-72. <https://doi.org/10.1108/IJILT-03-2022-0042>

Since paper 1 indicated that teachers seldom participate in discussions in the school organization on how to cater for student digital competence, and the participating teachers only briefly touched upon the relation between students' digital out-of-school experiences and schoolwork, paper 2 follows up those threads. The aim of the paper is "to investigate and describe the complex and dynamic dilemmas teachers are facing connected to students' net-based out-of-school activities" (p. 63). Here, *net-based* refers to what I in the thesis have chosen to describe as digital-infused, meaning that digital-related issues such as using the internet often entails analog activities. These activities are seldom either digital or analog, but a mixture of both. Initially, the paper discusses how students can find extensive information out-of-school and may expect similar conditions in school, which can cause various dilemmas (McWilliam, 2016). Another dilemma could occur when or if students bring their net-based out-of-school activities to school (Gurung & Rutledge, 2014). Following the related research, the paper sets out to investigate these questions by examining teachers' accounts of students' net-based out-of-school experiences and schoolwork in three different municipalities, represented by one lower secondary school each (grades 6–9, age 12–15). By interviewing 41 teachers divided into five focus groups, the paper pays attention to teachers' pedagogical discussions as being part of the arrangements in school organizations. However, the discussions were arranged by me as a researcher to gain an understanding of what similar pedagogical discussions in a school organization could entail, and to gain insights into what values, norms, and disagreements there are among the teachers (Duarte et al., 2015; Joyce-Gibbons et al., 2018).

The analyzed data seek to answer the research question: “What dilemmatic spaces are outlined by teachers in lower secondary schools in Sweden concerning their students’ net-based out-of-school activities?” The theory of sensemaking is used to analyze how teachers make sense of their teaching practices in relation to net-based activities, and the theory of dilemmatic spaces (Fransson & Grannäs, 2013) is used to further analyze the results. These indicate that teachers face various dilemmas related to *negotiations of content* and *negotiation of professional identity* in the classroom-teaching practices.

The first theme, *negotiations of content*, concerns constraints in how to deal with out-of-school content versus school content, that is, when students sometimes ask about things experienced in their out-of-school activities, which the teachers feel they must consider and respond to. Further, it concerns having to deal with an abundance of digital content, licenses and how to counteract regulations, while trying to bridge a knowledge gap between the students. The teachers guess that this knowledge gap is produced as some students heavily engage in information-seeking out-of-school, while other students do not. This can complicate teaching since “[t]here is no one [student] in the middle” (B17) (p. 67) anymore, according to one teacher. Another dilemma is how to generate motivation for lesson content when students are used to exciting digital content out-of-school.

The second theme, *negotiation of professional identity*, concerns how the teachers compare themselves with how digital resources often offer a more fun way of explaining things to students, how teachers’ reliability can be questioned by students who can easily compare with resources on the internet what the teachers have told them. Further, the theme concerns the dilemma of always being reachable through various online resources and how to handle this.

The paper discusses how the teachers’ ideas related to the two themes varies, which is often the case in dilemmatic spaces where there is seldom not just one way of acting (Honig, 1994). Some teachers find ways of relating to some aspects of students’ out-of-school activities, while others find it harder. The dilemmas refer to considerations of how to restrict or allow various content in the teaching practices, and, consequently, how this affects their teaching and their professional identities to varying

degrees. This, in turn, is a contribution to the understanding of what constraining conditions there are for teachers to cater for student digital competence and how they must continuously deal with upcoming issues ad hoc in their teaching practices. The knowledge is to be relevant for policy makers, school leaders and teachers in their decisionmaking. For further research, there is a need to more specifically attend to the research gap on how pedagogical and didactical decisions are made when net-based, or digital-infused, activities are ever-present, something which is followed up in papers 3 and 4.

6.3 PAPER 3: TEACHERS' NEGOTIATION OF THE CROSS-CURRICULAR CONCEPT OF STUDENT DIGITAL COMPETENCE

Peer-reviewed journal article, published as:

Löfving, C. (2023). Teachers' negotiation of the cross-curricular concept of student digital competence. *Education and Information Technologies*, 1-20. <https://doi.org/10.1007/s10639-023-11800-x>

This paper builds on data from study 2, as was also the case for paper 2. However, in paper 3, the aim is to consider teachers' understandings of students' digital experiences as an important part of teachers' sensemaking processes. The paper sets out to discuss how digital competence, being both a policy concept (Stopar & Bartol, 2018) and a boundary object that means different things to different people (Olofsson et al., 2021; Star & Griesemer, 1989), continuously needs to be negotiated in a changing society (Erstad et al., 2021). Drawing on research acknowledging there sometimes being a conflict between teachers' and students' digital-infused experiences (Aagaard, 2015; Chou & Block, 2019) the paper asks: "How do teachers engage in sensemaking on the cross-curricular concept of digital competence in relation to their students' net-based out-of-school activities?" (p. 1520). Here, the sensemaking process refers to how teachers retrospectively talk about students' digital experiences and how they account for and justify their own teaching when interviewed in focus groups in the school organization.

The analyzed results from the focus group interviews indicate that the teachers engage in themes on *critical awareness*, *tool management*, *creativity*, and *avoidance of digital usage*, no matter what subjects they teach, but not specifically on democratic digital citizenship, a theme mentioned in policies on digital competence. The themes become part of the boundary object of digital competence and provide, so called, “bridges” between the teachers’ various understandings.

Although the teachers provide examples of what they consider the students must develop further in relation to the four identified themes, it is not always catered for in their teaching, and when it is, each teacher often encounters it individually from her/ his pre-understanding. Digital competence is thus discussed as a cross-curricular school subject in relation to the themes but handled differently in every subject. If the teachers discuss those issues, it is often about what students are not supposed to do when using digital technologies: “Yes, limiting their use. That is what we work a lot with, I guess.” (B4) (p. 1532).

The paper discusses the problem of school organizations not facilitating teacher discussions on how to cater for student digital competence. Hence, students must adjust to individual teachers’ professional digital competence (PDC), which varies among teachers. The results contribute to an understanding of digital competence as a tacit, narrow, and technical-instrumental teaching object seldom organized for. This knowledge is important for policy makers, school leaders, and teachers when actively planning how to cater for student digital competence in education, rather than trusting that this competence is catered for by others. However, while the paper provides valuable knowledge on teachers’ accounts of digital competence, there is a research gap concerning how digital competence is enacted and catered for in teaching practices in classroom settings. This is further investigated in paper 4.

6.4 PAPER 4: PLATFORM BUREAUCRATIZATION AS PEDAGOGY - A TACIT SCHOOL SUBJECT IN HIGHLY PLATFORMIZED CLASSROOMS

Löfving, C., Bergviken Rensfeldt, A., & Hillman, T. (2024). Platform bureaucratization as pedagogy - a tacit school subject in highly platformized classrooms. (Submitted manuscript under review)

Paper 4 investigates how platform bureaucratization can be understood as a tacit subject in highly platformized classrooms. While the papers 1 - 3 contributed to the ethnographic understanding of digital-infused teaching practices, paper 4 deepens the understanding of these teaching practices. Drawing on the fact that digital platforms are extensively used in teaching practices today, the paper first discusses whether these platforms causes a radical pedagogical shift or not, and how much influence platforms have on pedagogical decisions as different scholars have different opinions on this (Hangartner et al., 2024; Kerssens & van Dijck, 2022; Selwyn et al., 2018). As Dussel (2021) proposes that all school infrastructures influence pedagogy, the paper asks: What pedagogies are produced in highly platformized classrooms?

The setting for the ethnographic study is a Swedish lower secondary school, where we examined how a plagiarism-detection-tool integrated in a digital platform was used during a sequence of episodes divided into two lessons and how the teacher interacted with the tool while instructing the students on its use. The analytical theory of sense-making (Weick, 2001) was used to analyze the interactions. Moreover, the theoretical concept of platform pedagogies was additionally used (Perrotta et al., 2021; Sefton-Green & Pangrazio, 2021), paying attention to the following analytical concepts: *textualization*, that is, adjusting texts to meet the needs of the platform applications, *templatization*, that is, specifically how the platform software application presents content, which may make its various features become part of the pedagogy, and *trainability*, that is, how the use of the platform software application calls for getting to know how to use the various features, either explained in what is displayed in the software application or by someone else (Sefton-Green, 2022).

The results provide an understanding of how both teachers and students engage in time-consuming tasks where students are to learn how to use platform features, often differently instructed in different subjects. The analysis indicates how the use of the plagiarism detector feature to assess students' assignments, reflects an understanding of digital technologies as considered non-biased and as trusted to evaluate students' assignments, without being questioned for what the technologies might miss. Moreover, programmed time stamps are examples of platform features that may steer pedagogy in certain directions, if teachers do not have the time or knowledge to adjust the time stamps to the pedagogy they consider constructive. The results indicate a compliance with the trainability of platform functions where textualization, and templatization become part of the pedagogy. The results further indicate that there is a new tacit school subject identified as *platform bureaucratization*. It is understood as generic and cuts across various school-subjects, but is not treated as a subject or discussed, hence its tacit appearance.

The paper discusses how there is a pedagogical shift towards more instrumental and rule-based tasks in education, maybe at the expense of deeper learning. Therefore, platform bureaucratization needs to be recognized and collectively made sense of among teachers if they are to engage in how to approach and organize for it, as well as how to make room for other aspects of digital competence that are needed for participation in education and a digital-infused society. The paper contributes with knowledge of teachers' day-to-day activities that are not always recognized, and is valuable for policymakers, school leaders and teachers who engage in organizational and pedagogical curricular questions on student digital competence.

6.5 SUMMARY OF THE FOUR PAPERS

To sum up, the four papers, based on three studies, are to contribute to the aim of the thesis, which is to contribute to a deeper understanding of how teachers make sense of student digital competence and how it is catered for in digital-infused teaching practices. The results will be further discussed in chapter 7, where there are additional suggestions for future research.

The overarching research question: “How is the emerging policy concept of digital competence accounted for and enacted by teachers in digital-infused teaching practices?” is answered: In study 1, it became evident that teachers’ accounts of student digital competence mainly concern technical knowledge and usage of digital devices, and of digital applications and their content to facilitate schoolwork. This result is not related to any specific school year, school subject, or site where these practices were situated. Moreover, it concerns responsible and critical awareness, which includes awareness of dangers, source criticism, and avoidance of digital technologies. In study 3, this became even more evident as I observed lessons and talked to teachers in-between lessons, although it is not explicitly mentioned in paper 4 deriving from the study. When teachers in study 2 discussed student digital competence in focus groups, they touched upon similar themes, but also, the theme of creativity, which the teachers could see traces or lack thereof in students’ digital-infused out-of-school activities. However, they did not engage in any discussion on how to further cater for student digital competence.

Apparently, student digital competence is not often discussed or planned for. Instead, it is mainly attended to ad hoc when students ask how to handle digital technologies, or when the teachers explain how to use digital technologies, something that became obvious during study 3. However, drawing on teachers’ accounts of student digital competence, it does not seem to be as common to attend to themes of digital rights, participation, engagement, and critical resistance, as expressed in various policy frameworks. Neither is explicitly attending to democratic digital citizenship. Summing up, the four constituent papers highlight how, apart from what teachers catered for during lessons, they seem to identify different aspects of student digital competence that students need to develop, but their accounts and enactment do not reveal that they think it is their responsibility to cater for this. Each teacher thus encounters student digital competence individually from her/his pre-understanding of what digital competence entails.

The overarching research question: “What conditions enable and constrain catering to student digital competence in teaching practices?”, is also answered by the results deriving from the three studies and presented in the four papers. Here, the constraints are presented, and enabling factors

are thought of as opposites to those. One constraining factor is how teaching practices are regulated by policies, for example, the GDPR, which the teachers need to consider when deciding what digital software applications to use or not, or how to counteract the regulations. At the same time, there is an abundance of digital resources, which can both enable and constrain their work and workload. Some resources are incorporated into the platforms, sometimes decided by appointed teachers or others working at other levels in the organization. School leaders and people working in the municipality try to counteract teachers' dilemma of having an abundance of resources to consider by informing them about available resources. However, teachers may have varying needs, not always aligning with others' ideas. Instead, the large number of resources allows teachers to engage in negotiations with themselves, some colleagues, or on social media about what digital technologies to use and how, focusing on school subject content in their teaching practices, while there is less space for negotiations of student digital competence per se. Some digital resources are thought to be problematic, and as teachers are expected to look after students' well-being, they sometimes avoid resources which they guess would let their students experience being bullied by others.

Another concern is out-of-school content versus school content, that is, when students sometimes ask about things from their out-of-school experiences, which the teachers sometimes feel is out of their knowledge but must consider. Further, teachers may find it hard to handle engagement with lesson content when students are used to exciting digital content out of school. And so, the abundance of content is not only an enabler of teaching practice activities, but also a constraining factor.

Another identified constraining aspect is how teachers build their accounts of digital competence and digital technologies on what they find to be useful in their own every-day lives, rather than referring to knowledge about students' digital competence. Even if they touch upon students' experiences, they do not elaborate deeply on the subject. While student digital competence is accounted for as a cross-curricular school subject in relation to the here identified themes, it is handled differently in every subject. If the teachers discuss those issues, it is often about what students are not supposed to do when using digital technologies. And so, limiting students' use of digital technologies for purposes other than schoolwork has become a major aspect of student digital competence in their teaching.

The individual aspect includes how teachers' identities are part of their professional roles. It concerns how teachers compare themselves with how digital resources often offer a more fun way of explaining things to students, and how teachers' reliability can be questioned by students who can easily compare with resources on the internet what the teachers have told them. Further, the theme concerns the dilemma of always being reachable through various online resources and how to handle that. Digital technologies as part of infrastructure may affect teachers' individual well-being in various ways, both positive and negative, something that was evident in all three studies. Still, discussions on teachers' experiences and interpretations of student digital competence and how to further cater for this competence are seldom facilitated in the school organizations.

How the papers contribute to the aim and overall thesis research questions is outlined in Table 3.

Table 3

How the papers contribute to the aim and overall thesis research questions

Thesis aim: To contribute to a deeper understanding of how teachers make sense of student digital competence and how it is catered for in digital-infused teaching practices. Thesis RQ1: How is the emerging policy concept of digital competence accounted for and enacted by teachers in digital-infused teaching practices? Thesis RQ2: What conditions enable and constrain catering to student digital competence in teaching practices?			
Paper 1	Aim: To gain knowledge on how teachers, who can be regarded as having some professional digital competence themselves, and who work at schools where students are provided with access to laptops, make sense of and negotiate their students' digital competence.	RQ1: What digital competence do teachers describe as crucial for their students to develop in education? RQ2: How do teachers describe the way in which they cater for their students' digital competence?	Thesis RQ: RQ1 & RQ2
Paper 2	Aim: To investigate and describe the complex and dynamic dilemmas teachers are facing connected to students' net-based out-of-school activities"	RQ1: What dilemmatic spaces are outlined by teachers in lower secondary schools in Sweden concerning their students' net-based out-of-school activities?	Thesis RQ: RQ2
Paper 3	Aim: To consider teachers' understandings of students' digital experiences as an important part of teachers' sense-making processes.	RQ1: How do teachers engage in sensemaking on the cross-curricular concept of digital competence in relation to their students' net-based out-of-school activities	Thesis RQ: RQ1 & RQ2
Paper 4	Aim: To examine how platform bureaucratization can be understood as a tacit subject in highly platformized classrooms.	RQ1: What pedagogies are produced in highly platformized classrooms?	Thesis RQ: RQ1 & RQ2

CHAPTER 7

DISCUSSION

In this chapter, to contribute to a deeper understanding of how teachers make sense of student digital competence and how it is catered for in digital-infused teaching practices, I discuss the knowledge contribution of the thesis, identified research gaps for future research, and practical and pedagogical implications and suggestions for future research. Embedded is a discussion about methodological limitations which derives from my own reflexivity.

7.1 CATERING FOR STUDENT DIGITAL COMPETENCE AS PART OF THE SCHOOL CURRICULUM

This thesis and its constituent studies, involving teachers and in some cases other personnel from 14 digital-infused schools around Sweden, fills an identified research gap on how teachers cater for the emerging policy concept of *student digital competence*. While there are examples of related research where teachers address student digital competence (Eynon, 2022; Gouseti et al., 2023; Ilomäki et al., 2023; Livingstone & Sefton-Green, 2017; Midtlund et al., 2021; Siddiq et al., 2016b; Wood et al., 2020), this thesis takes a broader organizational perspective when analyzing how student digital competence is accounted for and enacted in teaching practices as part of school curricula. Thus, the thesis acknowledges but additionally moves beyond questions of how teachers engage in their own professional digital competence (PDC) (Aagaard & Lund, 2020; Ertmer, 1999; Ertmer et al., 2012; Hatlevik, 2017; Krumsvik et al., 2016; Ogodo

et al., 2021; Svoboda et al., 2020; Tondeur et al., 2017; Tømte et al., 2023). Consequently, the understanding provided by this thesis of what student digital competence may become, as part of the enacted curriculum and a broader context, adds to the body of research on school digitalization in the field of curriculum studies (Priestley & Philippou, 2018).

A contribution of this thesis is how it demonstrates how student digital competence has become a *vague, narrow* and *technical-instrumental* object in today's education, which is why a broad range of aspects of student digital competence tend to be neglected. This refers to how it is catered for as a subject-specific and cross-curricular concept in school organizations, where the cross-curricular notion is in accordance with how European policies and the Swedish national curricula express digital competence (European Commission, 2020; National Agency for Education, 2022a, 2022b). The thesis highlights how the cross-curricular aspects are individually, continuously, and differently accounted for and enacted by individual teachers in most school subjects, often ad hoc, hence its cross-curricular nature. The often tacit practice is captured by the concept of "catering for", instead of "teaching about" student digital competence. The latter indicates more planned activities in relation to student digital competence than has been identified in the constituent studies.

Today, subject-specific aspects of digital competence like programming or understanding aspects of AI are emphasized in Swedish national curricula as they are part of the core content of the syllabi of subjects (National Agency for Education, 2022a, 2022b, 2024a). This thesis highlights how additional subject-specific aspects of student digital competence are also catered for by individual teachers, even though these aspects are not specified in the Swedish national curricula, as exemplified by a quote from a teacher interview: "I try to say that all language teachers need to teach how to use the German double s, or the upside-down question mark in Spanish, or those... We must take on a responsibility to teach [how to use the keyboard for] those kinds of things" (paper 1, p. 151).

However, apart from catering for these subject-specific aspects, teachers individually and differently approach similar aspects of student digital competences, identified in this thesis as *technical aspects*, *source criticism*, and *avoiding dangers in relation to digital technologies*. Since the identified aspects are often attended to ad hoc, the constructive

alignment between the teaching object, the teaching activities, and the assessment of the same (Biggs, 1996) is seldom negotiated in the school organization. Consequently, students encounter different instructions on these aspects of digital competence in different school subjects. This understanding of student digital competence complements and adds to the research of Ilomäki et al. (2023) and Ilomäki et al. (2016), as it demonstrates situated examples of what student digital competence may entail when accounted for and enacted in education, and as reported on below.

Catering for **technical aspects** produces a new and tacit cross-curricular subject of *platform bureaucratization*, identified as tacitly incorporated into the other the school subjects. Platform bureaucratization is here related to and critically approaching platform pedagogies (Sefton-Green, 2022). The teachers in study 3 of this thesis dedicate the first part of almost all lessons where digital platforms are used to explaining where to find material on the platforms, how to adjust the work to fit a platform template, and how to upload assignments. These activities tend to be differently catered for by different teachers. As new software applications are constantly being developed, some of which are incorporated into educational digital platforms, teachers often individually encounter and have to make sense of these new applications, an activity that transforms into teaching routines manifested in, for example, educational sequences. One example was when, in 2022, generative large language models (LLMs) were made public in a way that had not been experienced before and caused a huge awareness of LLMs in media around the world. In a focus group interview (June 19, 2023) a teacher explained that he had experimented with a generative LLM to make a list of words he thought could be useful in a school subject, and he was now thinking of if he would let the students use the LLM. The example indicate that student digital competence has become a technical-instrumental object mainly individually catered for by teachers. Consequently, technical aspects have become a major part of today's school curricula. The empirical examples provided in this thesis complements and adds to the research of critical data-literacy-scholars like Eynon (2022), who raises questions about how the purpose and role of education may change when data usage is dealt with rather than discussed, and when there may be less time to enact a curriculum

engaged in knowledge acquisition, socialization into norms and values, and subjectification in relation to a wide range of aspects, and where students' hopes, dreams, and engagement in society is encouraged.

Catering for **source criticism** is also identified as approached individually by teachers in most school subjects, making it a cross-curricular aspect of digital competence. For example, if there is a confusion among the students about what is meant by source criticism, one teacher may instruct them to “handle sources critically. Take everything with a grain of salt” (paper 4, p. 10). Another teacher may ask whether the students have “talked about source criticism in their Swedish lessons” (paper 4, p. 10), indicating that it is not obvious if and in which school subject this competence has been catered for. When students asked a teacher in physical education if they could trust some information they had encountered out-of-school in social media, the teacher closed the discussion by telling them to “prove that it is a good source” (paper 3, p. 1528). How to prove such a thing was not part of the interaction between the students and the teacher. Moreover, the examples here provided on source criticism seldom involved what ethical, or biased issues technologies may entail, which indicates that catering for student data literacies tends to be neglected (Pangrazio & Sefton-Green, 2020).

The results complements and adds a situated understanding to the research of critical data literacy scholars like Pangrazio and Sefton-Green (2020) of what critical literacy aspects that are not often catered for in digital-infused teaching practices. Instead, most teachers engage in catering for bringing up source criticism as something students need to consider, while being unclear about how they are to accomplish this. Pangrazio (2023) argues that in data-infused education, it is not enough to engage in how to validate sources, or to be able to critically read a text. Instead, she calls for a curriculum that pays attention to critically understanding what is hidden behind the interfaces of various software applications, and how people's digital traces are configured into data points. Although this thesis agrees with the call, and with how Pangrazio and Sefton-Green (2022) emphasize the need to cater for data literacies in education, the thesis has a slightly different take, as it engages in many and various aspects of student digital competence in education, not only data literacies.

Catering for **avoiding dangers in relation to digital technologies** relates to questions about well-being and how students can reduce the digital parts of their digital-infused activities: “We might talk about what they are not supposed to do on the computers.” (B11)(paper 3, p. 1532). This statement is in line with discourses and debates on what negative consequences digitalization may have, which is why a digital backlash has been identified in digital-infused teaching practices in some countries around the world (Albris et al., 2024). In Sweden, the Swedish Minister for Education has expressed concerns that digitalization has gone too far and that digital technologies may not be suitable for facilitating knowledge acquisition (Edholm, 2022). The results of this thesis demonstrates a similar narrow take on digital competence, and complements and adds a situated understanding that it may be hard for education to answer the call from Biesta (2020) that education is to cater not only for qualification, but additionally for socialization and subjectification. Instead, the results demonstrate that education tends to let students encounter what Krumsvik (2024a) refers to as “[t]he complexity around the digital Bildung arenas that the pupils participate in [...]” (p. 57) mainly on their own. Consequently, by catering for avoiding dangers in relation to digital technologies, there is a risk that a curriculum catering for digital citizenship, or digital Bildung is suppressed. The enacted catering for student digital competence thus seems far removed from the policy expectations expressed in various frameworks on digital competence (appendix, Figures 1-6).

Drawing on how differently teachers cater for the identified themes of technical aspects, source criticism, and avoiding dangers in relation to digital technologies, the studies constituting this thesis complement and add to the research of Olofsson et al. (2021) on how to understand digital competence as a boundary object, that is, an object differently understood within specific areas. Hence, the results further adds a situated understanding to the research of Olofsson et al. (2021) and Erstad et al. (2021), who have compared how digital competence is perceived in relation to national curricula in the Nordic countries. Moreover, the results complement and add to the research of Tømte et al. (2020), who states that digital-infused practices are mainly concerned with administrative and technical questions.

However, and considering these results, what are the implications of this kind of vague, narrow and technical-instrumental sensemaking around student digital competence? It is argued here that by not catering for a broad range of student digital competence already when students are young, students are left on their own. Examples of such aspects are democratic digital citizenship, including digital rights, participation, engagement, and critical resistance (Choi & Cristol, 2021), as well as concerning legislative and ethical aspects of digital competence (Gudmundsdottir et al., 2024; Hakimi et al., 2021), including, for example, data- and AI-literacies (Krumsvik, 2024a; Pangrazio & Sefton-Green, 2020). This is not to say that teachers should not continue catering for technical aspects (including platform bureaucratization), source criticism, and avoiding dangers in relation to digital technologies. However, this thesis argues that student digital competence needs to be thoughtfully catered for.

When methodologically reflecting on the research question “How is the emerging policy concept of digital competence accounted for and enacted by teachers in digital-infused teaching practices?”, it may be challenged for being too broad. I am aware of that the question cannot capture all teachers’ accounts and enactment in all digital-infused practices. The data material derives from 14 digital-infused schools with a prominent focus on lower secondary grades in Sweden, and only one study was conducted for a longer period in one of the schools. However, the thesis does not claim that it will define how student digital competence is catered for everywhere or once and for all. Instead, it offers an understanding of how student digital competence may be catered for in digital-infused education - an understanding which others may find similarities with or question, and it encourages others to investigate their situated practices as being part of their contexts with the results of this thesis in mind.

Another reflection is that when using a theoretical perspective, in this case, the theory of sensemaking, there is a risk that the theory limits what results are generated. Concerning sensemaking, the theory primarily focuses on teachers’ accounts and enactment, not what they leave out, either deliberately or not. To counteract this dilemma, I have compared teachers’ accounts and enactments with ideas expressed in policies, and I have turned to other personnel in the school organization and outside of it to get a broader picture of the researched practices. Still, there are perspec-

tives this thesis does not capture, for example the perspectives of students and their parents. Further, the theory of sensemaking may have offered only some guidance when analyzing the empirical data, which is why, for example, the theory of platform pedagogies was helpful for theoretically defining the cross-curricular subject of platform bureaucratization. In study 3, observations, fieldnotes, informal conversations, texts and walk-throughs generated an understanding that would not have been gained if only interviews had been used as part of the methodology. Consequently, the way the research has been designed has contributed to these results, but, of course, within the limitations. The results should be read with this in mind.

7.2 UNDERSTANDING THE CONDITIONS FOR CATERING FOR STUDENT DIGITAL COMPETENCE

Another contribution of this thesis is how to understand what conditions there are for catering for student digital competence in teaching practices. The broad and abductive sensemaking-approach of this thesis understands pedagogy, didactics, teachers' agency, and identity formation as part of a curricular context influenced by various conditions (Priestley et al., 2012). Based on the results, these conditions are here identified as *policies* and *prevailing discourses*, *school development strategies*, *digital technologies*, and *how students' out-of-school activities are made sense of*. By investigating context-specific conditions, this thesis thus considers, complements, adds to, and moves beyond the body of research on digital competence that focuses on teachers' beliefs (see Ertmer et al., 2012; O'Neal et al., 2017; Prestridge, 2017; Sadaf & Johnson, 2017; Tondeur et al., 2017). The question is whether these identified conditions are the only ones and whether they fully answer to the research question "What conditions enable and constrain catering for student digital competence in teaching practices?" I would say, of course not. As conditions here are considered context-specific (Priestley & Philippou, 2018), there must be additional or other examples. However, this thesis does not claim to define all the conditions that enable and constrain catering for student digital competence. Instead, it offers an understanding of what prominent conditions could be identified based

on the data generated in the three constituent studies. Others are encouraged to find similarities with, or question, these conditions when they investigate practices in their situated contexts.

To begin with **policies** as a conditioning factor; transnational and national policies on digital competence only briefly mention what digital competence may entail (Álvarez-Martínez-Iglesias et al., 2021), which is why teachers have little guidance in how to make sense of them. In the Swedish national curricula (National Agency for Education, 2022a, 2022b), the concept of digital competence is something all teachers are expected to cater for in the various school subjects. However, the results of this thesis indicate that the topic does not seem to be much considered as teachers are occupied with attending to national tests, assessments and evaluation work. Teachers are to engage in meeting the knowledge criteria for the various school subjects which are stipulated in national curricula, and to design teaching activities in alignment with those criteria and various teaching objects (Biggs, 1996). However, digital competence is seldom part of these criteria. None of the teachers in the comprising studies referred to any frameworks on digital competence, and they just briefly touched upon how digital competence is expressed in national curricula in the interviews and observations. When five teachers in study 3 were shown two frameworks (appendix, Figures 1 and 6) to discuss and reflect on, they stated that they had never seen them before (focus group interview June 19, 2023). The results indicate that transnational or national policies on how to cater for student digital competence are seldom considered in the school organization.

Regulations, such as the European General Data Protection Regulation (GDPR), are mainly taken into account by ICT-advisors when a digital software application is to be purchased or implemented in a digital platform. However, the GDPR has an immediate impact on teaching practices, since teachers individually engages in an abundance of digital software applications. Thus, they often have to make sense of digital technologies on their own. This result complements and adds to the research of Gustafsson (2022), who demonstrates how teachers in larger municipalities, which have centralized their facilitation of issues related to school digitalization, often need to individually make sense of what

digital technologies to use and for what purposes. The results of this thesis further indicate that some teachers avoid using various software applications in order not to violate any regulation, others may use them without consent from other levels in the organization, while others use software applications while trying to act in accordance with the regulation. Consequently, policies and regulations are often differently attended to by teachers, if attended to at all. For example, in one of the schools (study 3), all teachers were to write on the classroom whiteboard what the lesson and aim of it would be about, and how long the lesson would last. During the 13 months of ethnographic research, most teachers tried to attend to this policy even if some expressed doubts. Several of them had developed other ways of working based on their sensemaking of the activity. Teachers' own experiences and out-of-work activities became important when the teachers came to motivate, or justify, their sensemaking. They then referred to ideas that were part of various **discourses**, for example, what negative consequences there may be due to digitalization, and why they sometimes wanted to reduce access to digital technologies in their teaching practices. This aligns with the identified digital backlash in digital-infused teaching practices in some countries around the world (Albris et al., 2024), for example in Sweden (Edholm, 2022). However, some teachers expressed how they individually engage in social media to learn about aspects relating to student digital competence. Hence, ideas presented in research, (social) media, or by EdTech companies, and which align to what resonates with the individual teacher's PDC, may become certain kinds of policies that justify teachers' individual enactment (Weick, 2001). Consequently, and considering previous research by Wood et al. (2020), there is a risk that this kind of individual PDC limits what aspects of student digital competence are catered for by education.

School-development strategies can be considered another conditioning factor. When collegial meetings and provided information concern topics which do not align with what teachers consider valuable for their teaching practices, the strategies may become a constraining factor. An example is when personnel at the municipality level try to enable teachers' work by providing information, guidance and ideas through meetings or online information, ideas that the personnel guess will be helpful (study 3). Similarly, principals may try to facilitate discussions on

pedagogical and didactical issues they hope will be of importance. However, the constituent studies demonstrate that the collegial meetings on digital-related questions seldom concern how to cater for student digital competence. The, so called, temporary bridges that are part of negotiating boundary objects of different kinds (Star & Griesemer, 1989), can thus be considered weak when it comes to student digital competence. Another strategy is when principals appoint teachers to help their colleagues with digital-related issues. A constraining factor is when teachers have different schedules and may not find time to collaborate. One teacher, who was appointed to help his colleagues with a digital platform, Vklass, (study 3) expressed that it could be hard to find time for this assignment as there was no specific time provided.

Moreover, and as discussed regarding policies, the strategies are not always in line with what the teachers consider to be helpful. One example is when I asked a teacher (study 3), who had been a teacher for almost ten years, and was known to use digital technologies as part of his teaching practices, to show a webpage where the municipality provided information and advice on digital-related issues. The teacher was not sure what webpage I meant. "I don't think I have looked at it before." He stated that he thought the information was too general as it aimed to support the whole municipality. Instead, he relied on colleagues who posted ideas in the Teams [one of the digital platforms] channels. While scrolling, he noticed some information about AI in education which caught his attention for a while, but then he had to attend to something else and closed the webpage (study 3, walk-through, March 24, 2023).

This thesis complements and adds a situated perspective on constraining and enabling conditions outlined in the research of Pangrazio et al. (2022). They emphasize the importance of collective and active sense-making among teachers and students on specifics like how data are being represented in platforms. This thesis thus contributes by showing how student digital competence is often a neglected part of teacher PDC, not mainly due to uninterested teachers but to various constraining conditions within school development strategies. The knowledge is important for expanding the discussion on school development strategies in relation to teacher PDC, making it a concern for the school organization rather than only for the individual teacher. Further, the knowledge complements

and adds to the research of Skantz-Åberg et al. (2022), who have mapped and demonstrated various aspects of teacher PDC and how differently the concept is often understood.

Another conditioning factor concerns **digital technologies**. Even if teachers in Sweden use textbooks in their teaching practices, they often also use digital content provided through digital platforms, or content they have found online. The abundance of digital content on multiple sites and various webpages could be regarded as an enabling factor in teachers' work. However, since there is a constant stream of new platform software applications for teachers to learn, and several digital-related questions to attend to, this thesis demonstrates that teachers struggle to individually make sense of how to use the digital technologies and for what purposes. As previously mentioned, teacher PDC becomes an individual matter. Thus, while one teacher exclaimed: "I love Teams!" (study 3, focus group interview June 19, 2023), the teachers additionally expressed how hard it could be to make sense of the platforms and the software applications. Sometimes the teachers decide to use other EdTech products than those provided by the school organization. Although it takes time to search for content and to figure out how to use it, the enactment indicates that teachers cherish their pedagogical and didactical professional competence in designing their teaching practices. However, the results further indicate that teachers struggle between how much they should rely on their own expertise and how much they should adjust to the provided material in the digital platforms (study 3). Since teachers individually take on the responsibility to educate themselves on how to use digital technologies and to instruct their students in how to navigate the digital platforms, technical usage tends to be prioritized for the sake of knowledge acquisition. The results of this thesis thus demonstrate that in-service training on digital-related issues organized by schools seems scarce, why the results complement and add to the research of Krumsvik et al. (2016), who have stated that continuous ICT education is important if teachers are to reach higher levels of PDC. The results further complement and add to the research of Williamson (2017), by providing situated and empirical examples demonstrating how the school curriculum is made when teachers engage in digital software applications provided by EdTech companies. Consequently, the results additionally complement and add to the research

of Sefton-Green and Pangrazio (2021) on conditions related to platform pedagogies.

Another conditioning factor for catering for student digital competence is **students' digital-infused out-of-school activities**. The teachers in the constituent studies are aware of the impact from digital-infused out-of-school activities on teaching practices. However, and as reported in papers 2 and 3, teachers express doubt about whether students' experiences are to inform what digital competence to cater for, and they do not regard it to be their responsibility to cater for a broader range of student digital competence needed in a digital-infused society. Instead, the results demonstrate that teachers experience dilemmas concerning the pressure to be digitally competent or as fun as digital resources, which may affect their agency and professional identity (Engeness, 2021). Consequently, when teachers compare themselves to digital resources, they sometimes feel inferior, or questioned by students who know more than they do in certain areas. Moreover, they find it hard to teach about aspects of digital competence as there seems to be a huge gap between students who they consider digitally competent and the ones who seem not to be. Since the teachers find it hard to be as "fun" as they figure the content to be that students often encounter online, they express how they struggle to motivate the students to engage in schoolwork. One example is when a teacher said: "Some of them have watched some strange experiments on YouTube and ask if we can do the same in school. [. . .] And I do not think I have to do that. But sometimes, there are some cool things you can do" (A15) (paper 2, p. 66). Another teacher expresses this dilemma of trying to stay relevant as a teacher when competing with material provided online: "You come to the classroom and stand there with your little jar of baking powder" (B21) (paper 2, p. 68). These comments express a duality between out-of-school content and teaching practice content, and thoughts about whether students' out-of-school activities should be copied into teaching practices or not, exemplified by a rhetorical question by a teacher: "Can't they just have their TikTok? [...]" (paper 2 p. 1531). Further, teachers may feel stressed if always reachable through various chat functions or social media (study 2, paper 2).

Subsequently, not engaging in knowing more about students' out-of-school activities, or dismissing the same, can be an understandable

approach based on these conditions. This knowledge of what dilemmas teachers may face in relation to attending to students' digital-infused out-of-school activities complements and adds to the research of Wernholm (2021) who advocates that students' previous experiences should be considered in education to facilitate students' identity formation, and to the body of research on students' digital-infused out-of-school activities (see Álvarez-Martínez-Iglesias et al., 2021; Gouseti et al., 2023; Paulsen & Tække, 2019; Wernholm, 2021).

7.3 IDENTIFIED RESEARCH GAPS FOR FUTURE RESEARCH

This thesis has put student digital competence as an important part of teacher PDC on the agenda. However, the research part of curriculum studies that focuses on how to cater for broad aspects of student digital competence is in its infancy, and further research is needed which considers students' ideas on how school curricula can cater for their digital competence, as they are considered credible and competent contributors to such knowledge (MacKenzie, 2024). Moreover, further research is needed on what implications there are when student digital competence *is* catered for in teaching practices, that is, when students have had their say, and measures have been taken in how teachers' sensemaking activities are organized for, as suggested in the next section of this thesis. Such research could benefit from comparing various contexts transnationally and nationally, as there are contextual diversities between countries regarding how to consider student digital competence (Gouseti et al., 2023).

7.4 PRACTICAL AND PEDAGOGICAL IMPLICATIONS AND SUGGESTIONS FOR THE FUTURE

This thesis takes a post-critical approach when not only defining what dilemmas can be identified in education but discussing how to enact the future (Selwyn, 2024). Drawing on the discussion in the former sections and the notion that there will continuously be new digital technolo-

gies to consider in education and in society, teaching practices will most certainly continue to be emergent rather than static or stable (Nicolini, 2012; Priestley & Philippou, 2018; Schatzki, 2002; Weick, 2009). The practical and pedagogical implications for the future provided here, are to be relevant for policymakers on a national level, and other stakeholders outside of the local school organizations, as well as for school leaders (including school facilitators like school librarians and ICT advisors) and teachers, as they are all part of how the school curriculum is made. The suggestions aim to be a durable approach of organizing for teachers to catering for student digital competence, mainly considering negotiated and reflected activities part of teaching practices (Weick, 2001) as well as part of students' digital-infused out-of-school activities (Pangrazio, 2019).

The first implication is an awareness of the importance of continuously *bringing the purpose of education to the table*, as this purpose is negotiated differently in different times (Biesta, 2013). This also speaks to how teaching practices can be considered “made” rather than static or given. In a time when digital technologies are sometimes considered either “bad” or “good”, and where some thinks that catering for student digital competence is in opposition to teaching students how to read and write, as has lately been the case in Sweden (Edholm, 2022), there is a need to consider various purposes of education and what time-consuming activities do not serve the best interest of the negotiated purposes. Drawing on the ideas of Biesta (2020), student digital competence can be understood from the educational aspects of knowledge acquisition, socialization into norms and values, and subjectification, which means growing as a person and being able to make informed decisions as a citizen in society. If one of the purposes of education is to be facilitating equal conditions for students to reduce inequality (Pagani et al., 2016), and prepare them for participation in a digital-infused society both now and in the future (Willbergh, 2015), education is to fill the gap between those who lack aspects of digital competence and those who have learnt more from their digital-infused out-of-school activities (Fraillon, 2024). This as opposed to letting digital competence being a vague idea, not catered for in a planned way, as this is both time-consuming and may be confusing for both students and teachers, as indicated by this thesis.

The second implication concerns *cross-curricular aspects of student digital competence*. If these are to be a specific concern in school curricula, they need to be specifically mentioned in policies and national curricula on student digital competence [in countries where better suited: student digital literacies]. This is not to say that student digital competence is to be a school subject in its own right, only that it needs to be acknowledged more specifically than today. The vagueness of the concept of *competence* suggests that some aspects may need to be referred to as knowledge or skills as part of identified teaching objects. This means that some aspects could become didactical teaching objects as part of constructive alignment (Biggs, 1996), even though not all aspects could be captured by numerical assessment (Trigueros-Cano et al., 2022). However, if policymakers try to attend to these issues by producing new and vague frameworks or, conversely, checklists where specific competences are to be ticked off, there is a risk that contextual circumstances are neglected (Lundh et al., 2013; McGarr et al., 2021; Starkey & Yates, 2022). This leads to the next implication.

Attending to these aspects ensures that the identified themes of this thesis, namely, *technical aspects* (including *platform bureaucratization*), *source criticism*, and *avoiding dangers in relation to digital technologies* are catered for. However, if the themes are to cater for democratic values, meaning *digital rights*, *participation*, *engagement*, and *critical resistance* (Choi & Cristol, 2021), it needs to involve *legislative* (Gudmundsdottir et al., 2024) and *ethical aspects* (Hakimi et al., 2021), as well as *data-* and *AI-literacies* (Krumsvik, 2024a; Pangrazio & Sefton-Green, 2020), which may speak to digital Bildung, and may be helpful when practicing digital citizenship as part of education. Additionally, what can be thought of as a *technical “basic” digital competence* needs to be catered for. This includes knowing how to handle *file systems*, *word processing software*, *naming conventions*, *hyperlinks* and *whether they can be trusted to click on* – knowledge that today is seldom specifically catered for, as demonstrated in this thesis.

A third implication concerns how *teachers and school leaders need PDC* to cater for a broad range of aspects of student digital competence. However, there is no chance that every teacher or school leader can keep up with all the emerging digital technologies as part of teaching practices. Consequently, they cannot be expected to cater for a broad range of stu-

dent digital competence without training. Today, there is an abundance of online material provided by various stakeholders, and the huge number of unstructured resources has here been identified as sometimes being too time-consuming and not always helpful to the teachers. Nevertheless, training is needed (Krumsvik et al., 2016). But supporting conditions cannot be a one-size-fits-all since teacher PDC differs (Gouseti et al., 2023). Thus, it is suggested here that online, structured and asynchronous in-service training on various aspects of digital competence will be provided in a digital platform governed by a national organization that is fit for the purpose. There need to be updated tracks and levels which teachers can choose from based on their individual PDC. However, drawing on the results of this thesis, teacher PDC cannot only be teachers' individual concern, not if a broad range of aspects of student digital competence is to be catered for as part of the school curriculum. Consequently, the fourth implication will be of particular importance.

The fourth implication concerns enabling school development strategies on how *school curricula should be considered and negotiated based on activities that are part of teaching- and out-of-school practices*, not only based on policies produced somewhere else. This concerns how these practices relates to dilemmas, agency and identity formation, recognized as part of dilemmatic spaces rather than spaces where problems are either hidden or dealt with once and for all (Engeness, 2021; Fransson & Grannäs, 2013; Priestley et al., 2012). When school leaders or other facilitators oversee the organizing of the school curricula, they are encouraged to visit the various spaces where the teaching practices take place. If teaching practices are understood as dilemmatic spaces rather than spaces of doing "right or wrong", school leaders and the various facilitators are here encouraged to learn from the practices, organize for teachers to visit each other's practices, and showcasing that no one can be an expert on all matters. To be curious of the various teaching practices in school, and to pay an interest in student digital-infused out-of-school activities, is to encourage "sense" and "making" based on what matters for the teachers and their students.

However, the identified concerns about aspects of digital competence need to be negotiated in relation to expectations expressed in policies. This opens the way for joint sensemaking where teachers' professional-

ism is valued, and where they are invited to retrospectively interpret what they are already doing, as “intentions often follow rather than precede action” (Weick, 1976, p. 4). The procedure is to facilitate holding on to activities that works well and engaging in what could be done differently without blaming anyone for not doing enough (Weick, 2009). It is a bottom-up approach meeting a top-down approach, not the other way around. This approach involves making sense of the teaching practices by negotiating the various complexities and understandings of the individual so-called maps into more comprehensive maps (Weick, 2001). The teachers who meet the same students in their various teaching practices need to know in what ways the cross-curricular aspects of digital competence are catered for in the organization, as a teacher in physical education can get a question from the students relating to, for example, source criticism, even though it is specifically catered for in another school subject. Facilitating time for sensemaking activities between teaching practices could, potential, provide dedicated time to teach students how to read and write, and to cater for their digital competence in a planned way.

CHAPTER 8

CONCLUSION

The aim of the thesis is to contribute to a deeper understanding of how teachers make sense of student digital competence and how it is catered for in digital-infused teaching practices by asking “How is the emerging policy concept of digital competence accounted for and enacted by teachers in digital-infused teaching practices?” and “What conditions enable and constrain catering for student digital competence in teaching practices?” The aim has been achieved through three ethnographic, multi-sited, and interrelated studies that constitute this thesis. The studies were conducted in, and in relation to, 14 Swedish primary, lower-secondary, and upper-secondary schools, mainly grades 6-9 (age 12-15). Teachers (studies 1 and 3) and other personnel (study 3) were individually interviewed, and teachers participated in focus group interviews (study 2 and 3). Other research methods were observations, fieldnotes, informal conversations, text and walkthroughs (study 3). The generated data were qualitatively analyzed using practice theory represented by the theory of sensemaking.

The results demonstrate that in digital-infused schools where teachers are used to handling digital technologies in their teaching practices, where school leaders encourage digitalization, and where there are collegial learning and various support exists regarding digital infrastructures, software, and pedagogical issues of how to approach aspects of digitalization in education (Håkansson Lindqvist & Pettersson, 2019; Pettersson, 2018a), teachers individually approach how to cater for student digital competence. They are expected to mainly keep up to date with how to use digital technologies in their teaching practices on their own, as part of their professional digital competence (PDC). This generates *vague, narrow, technical-instrumental* and *cross-curricular* aspects of what student digital competence is catered for in digital-infused education, here

identified as *technical aspects*, *source criticism* and *avoiding dangers in relation to digital technologies*. The heavy engagement in instructing students during lessons about how to use digital platforms for schoolwork generates a new, tacit, and cross-curricular school subject of *platform bureaucratization*.

The thesis discusses how the cross-curricular nature may cause confusion among the students when, for example, being instructed differently on how to validate whether information or a source could be trusted, or where to find or upload information on digital platforms. Moreover, the heavy engagement in *platform bureaucratization* may reduce the time that could be used to cater for broad aspects of student digital competence in a planned way. Consequently, aspects of *digital Bildung* and *digital citizenship* were not as evident in the empirical data. *Policies* and prevailing *discourses*, *school development strategies*, *digital technologies*, and *how students' out-of-school activities are made sense of* were identified as conditioning how student digital competence was catered for. These conditions are mainly considered to be constraining due to certain activities. However, opposite activities are considered as enabling and, thus, guiding what in this thesis is suggested for the future.

Practical and pedagogical implications and suggestions for the future involve *negotiating the purpose of education* concerning how student digital competence can be understood in relation to qualification, socialization and subjectification (Biesta, 2013). Further, it involves individual, online, structured, asynchronous, and nationally organized *in-service training for teachers and school leaders* on aspects related to digital competence. However, to counteract making teacher PDC only an individual matter, an important suggestion is to *facilitate and organize for sensemaking between teachers, school leaders and facilitators such as school librarians and ICT advisors, and transnational and national stakeholders*. The collegial practices are encouraged to *continuously identify what aspects of student digital competence are catered for* in the school organization, and what enabling and constraining conditions there are to consider. Thus, this thesis contributes with a bottom-up and organizational perspective to enable catering for a broad range of aspects of student digital competence, since students here are considered as young people participating in digital-infused society and education at a young age, rather than waiting until adulthood.

CHAPTER 9

SWEDISH SUMMARY

Den svenska sammanfattningen beskriver de viktigaste delarna i avhandlingen med titeln “Catering for Student Digital Competence - Teachers navigating the complexities of digital-infused education” [På svenska “Att tillgodose elevers digitala kompetens - lärares navigering i en digitaliserad skola”]. Sammanfattningen utgår från texten i avhandlingens kapp samt de tre studier som mynnat ut i fyra vetenskapliga artiklar.

Digitaliseringen i skolan är idag påtaglig på många håll i världen, däribland i Sverige, där studierna i denna avhandling har bedrivits. Det höga utvecklingstempot har i sin tur medfört olika förväntningar på vad digitaliseringen ska syfta till, ibland uttryckt genom olika policyer. När ny digital teknik såsom digitala plattformar och mjukvara ständigt utvecklas och införlivas i skolan (Bergviken Rensfeldt & Hillman, 2023; Pothong et al., 2025), möter lärare kontinuerligt nya förväntningar. Lärarna är både en del av dessa förväntningar och en pedagogisk och didaktisk länk mellan andras förväntningar och eleverna i klassrummet (Kansanen, 2009). Lärarna är därmed en del av den läroplan som genereras genom de aktiviteter som sker, de materiella förutsättningar och det stöd som finns inom skolorganisationen, samt de idéer som framhävs av aktörer inom och utanför organisationen (Priestley & Philippou, 2018). Då avhandlingens empiriska studier fokuserar på undervisningspraktiker inom en skolorganisation, placerar jag avhandlingen inom forskningsfältet curriculum studies, läroplansstudier, specifikt inriktat mot skolans digitalisering, närmare bestämt hur lärare i undervisningspraktiker tillgodoser elevers digitala kompetens och vilka villkor som begränsar och möjliggör detta. Läroplansstudier inbegriper således undervisningspraktiker med dess

didaktiska innehåll, värderingar och normer, men även lokala, nationella och internationella frågor om utbildningsmål och pedagogik (Priestley & Xenofontos, 2021; Wahlström & Sundberg, 2018)

Även om digital kompetens uttrycks i svensk nationell läroplan för grund- och gymnasieskola som något vilket alla lärare har att förhålla sig till (National Agency for Education, 2022a, 2022b), finns det ingen exakt överenskommelse om vad sådan kompetens innebär. Inom vissa skolämnen fokuseras aspekter som källkritik, programmering och artificiell intelligens (AI), men i övrigt finns få beskrivningar om vad digital kompetens kan tänkas innebära. En gemensam nämnare inom både forskning och policyer är att det handlar om de färdigheter som krävs för att kunna använda digital teknik på ett meningsfullt sätt inom både arbete, skola och fritid. En annan gemensam nämnare är att förstå bakomliggande fenomen kring digitaliseringens roll i samhället, och att kunna motivera sig att aktivt och ansvarsfullt delta i en värld där digital teknik finns integrerat (Ilomäki et al., 2016, s. 670-671, samt bilaga 1-6). Digital kompetens har en nära koppling till liknande begrepp, så som digital literacitet. Båda begreppen är förknippade med olika former av kunskaper, färdigheter, värderingar, attityder och krav när det gäller olika aspekter kopplade till digitalisering, även om det kan finnas vissa skillnader inom och mellan begreppen (Ferrari et al., 2012; Gouseti et al., 2024; Ilomäki et al., 2023; Marín & Castañeda, 2023).

Det finns de som hävdar att skolans uppdrag främst är att kvalificera eleverna för särskilda uppgifter, examina och en framtida arbetsmarknad, det som Biesta (2020) beskriver som "kvalifikation", eller att fostra elever in i vissa sätt att vara, beskrivet som "socialisation". Andra hävdar att ett viktigt uppdrag för skolan är att möjliggöra för elever att ta egna beslut och växa som människor, beskrivet som "subjektifiering" (Biesta, 2020). Det senare kan liknas vid vad som beskrivs i termer av digital bildning, det vill säga, att kritiskt kunna delta fullt ut i en samtid influerad av digital teknik (Krumsvik, 2014, 2024a). Olika idéer om skolans uppdrag kan därmed tas i beaktande, och olika utbildningsmål kan både samverka och konkurrera. Vissa idéer får fäste som diskurser inom samhället och utbildningspolitiken, varför policyer om digital kompetens bör förstås som något som ständigt görs, snarare än att de uttrycker faktiska förhållanden (Pinar, 2015; Priestley et al., 2021). Lärarna är därmed en del av ett

kontinuerligt läroplansarbete där idéer begripliggörs, det vill säga, aktiviteter tolkas utifrån en specifik situation och dess vidare kontext, vilket kan leda till en fortsättning av aktiviteten eller till en ny aktivitet (Mikulec & Ermenc, 2016). På engelska uttrycks ett sådant begripliggörande genom teorin om sensemaking vilket syftar på aktiva handlingar där kognitiv förståelse är inflätat i aktiviteter eller kan utvecklas i efterhand (Weick, 1993), något som är en viktig teoretisk utgångspunkt i denna avhandling.

Lärares sensemaking kan förstås som en aktiv en del av de processuella, situerade, och sociala aktiviteter som sker i och i anslutning till klassrummet, vilket utgör skolans undervisningspraktiker där lärarna antingen instruerar sina elever, förbereder, eller följer upp de olika aktiviteterna (Nicolini, 2017; Schatzki, 2018).

I syfte att bidra till kunskap om hur lärare begripliggör elevers digitala kompetens och hur sådan kompetens tillgodoses i digitalt integrerade undervisningspraktiker, undersöker denna avhandling hur lärare både beskriver och praktiskt går tillväga när de tillgodoser elevers digitala kompetens. Kunskapen är tänkt att bidra till forskningsfältet läroplanstudier, curriculum studies (Priestley et al., 2012), när det gäller skolans digitalisering, och är därmed tänkt att vara till gagn för lärare, skolledare, pedagoger med särskilda uppdrag inom skolans digitaliseringsarbete, samt beslutsfattare vilka arbetar på olika nivåer med att direkt eller indirekt tillgodose elevers digitala kompetens. De övergripande forskningsfrågorna är:

RQ1: Hur begripliggör lärare det framväxande policybegreppet digital kompetens inom digitalt integrerade undervisningspraktiker?

RQ2: Vilka möjliggörande och begränsande villkor kan identifieras när det gäller att tillgodose elevernas digitala kompetens i skolans undervisningspraktiker?

9.1 RELATERAD FORSKNING

Begreppet digital kompetens kan förstås som föränderligt snarare än statiskt (Ilomäki et al., 2016) och mot en bakgrund där olika idéer kan få olika mycket utrymme (Pinar, 2015). Inom forskning som behandlar begreppet i relation till undervisningspraktiker fokuserar en ansenlig del på lärares uppfattningar och självvärdering av sin egen professionella digitala kompetens (PDC) (Aagaard & Lund, 2020; Ertmer, 1999; Ertmer et al., 2012; Hatlevik, 2017; Krumsvik et al., 2016; Ogoto et al., 2021; Svoboda et al., 2020; Tondeur et al., 2017; Tømte et al., 2023). En mindre del fokuserar på lärarnas redogörelser för elevernas digitala kompetens (Godhe et al., 2023; Gouseti et al., 2023; Sofkova Hashemi, 2024). Det finns även exempel på studier som beaktar elevernas perspektiv och aktiviteter i ett samhälle vilket genomsyras av digitalisering (Álvarez-Martínez-Iglesias et al., 2021; Paulsen & Tække, 2019; Wernholm, 2021). Dock verkar det finnas utrymme för kompletterande forskning som tar upp skolans roll när det gäller att tillgodose en bredare rad av aspekter av elevers digitala kompetens, däribland att kunna delta i ett demokratiskt samhälle där digital teknik är integrerat i vardagen (Eynon, 2022; Krumsvik, 2024b). Dessutom finns behov av att beakta vilka villkor som möjliggör eller begränsar sådana praktiker (Ertmer, 1999) för att komplettera de studier som idag fokuserar på lärares individuella roll (Kerssens & de Haan, 2022; Wood et al., 2020). De villkor som hittills har identifierats som möjliggörande handlar om välfungerande infrastruktur (Olofsson et al., 2020), tid för lärare att sätta sig in i digitaliseringsfrågor, stöttande skolledare (Ertmer, 1999), kontinuerlig fortbildning inom digital kompetens (Krumsvik et al., 2016), samt att lärare får möjlighet att dela sina erfarenheter och dilemman med kolleger i en stöttande miljö (Fransson, 2016). Denna avhandling identifierar dock ett forskningsgap när det handlar om att förstå villkoren för att tillgodose elevers digitala kompetens i undervisningspraktiker där digitaliseringen har pågått under flera år och infrastrukturen fungerar tämligen väl, där lärarna har schemalagda möten för att diskutera med varandra och där skolledare uppmuntrar användningen av digital teknik som en del av lärarnas professionella digitala kompetens.

9.2 PRAKTIKTEORI MED FOKUS PÅ LÄRARES SENSEMAKING

För att undersöka undervisningspraktiker används praktikteori, vilket intresserar sig för socialt situerade, processuella, materiella och återkommande aktiviteter, det vill säga praktiker, och hur de formas i ett visst sammanhang (Nicolini, 2017; Schatzki, 2018). Som en del av praktikteori används teorin om sensemaking av organisationsteoretikern Weick (2001, 2006, 2009), men även Orlikowski (2007), för att närmare undersöka de aktiviteter som tillsammans skapar föränderliga läroplaner i föränderliga organisationer, eftersom nya förväntningar och krav ständigt uppstår i dess spår. I sådana föränderliga organisationer förstås lärare som aktiva subjekt, agenter, istället för som objekt vilka passivt genomför policyer som har förhandlats fram av andra (Ball, 2015; Priestley et al., 2017). Sensemaking bidrar med att förstå lärares arbete som något annat än att förutsätta att lärare alltid tänker ut och överväger varje sekvens i en aktivitet innan den sker, eller att de i varje situation följer manualer till punkt och pricka. Istället sker ofta ett begripliggörande under eller efter en aktivitet, vilket formar framtida aktiviteter och därmed skolans läroplan (se Weick, 2009).

9.3 METODOLOGI

Avhandlingen har en kvalitativ etnografisk ansats, där de kvalitativa aspekterna fokuserar på människors erfarenheter och hur de engagerar sig i, begripliggör och skapar praktiker i egna sociala sammanhang och i relation till andras praktiker (Hine, 2007; Silverman, 2016). För att operationalisera praktikteori i analysen av lärares aktiva begripliggörande av sina undervisningspraktiker, använder jag teorin sensemaking (Weick, 2001, 2006, 2009). I avhandlingens tre studier har jag använt ett brett spektrum av metoder som svarar mot avhandlingens syfte och den etnografiska ansats där teorin om sensemaking är tänkt att generera viktig kunskap: enskilda intervjuer och fokusgruppsintervjuer, återkommande observationer där jag har skrivit fältanteckningar och samlat bilder och texter för vidare analys. Ytterligare en metod har varit så kallade walk-throughs, där lärare har berättat om olika aktiviteter som visats på deras datorskärm. Forskningen har bedrivits inom skolår 1–9 och på gymnasiet i 14 svenska kommunala

och fristående skolor, även om ingen uppdelning sker i analysen vad gäller huvudmannaskap. Största delen av studierna har dock bedrivits i år 6–9, då dessa år är de sista inom det obligatoriska skolväsendet, något som kan innebära en sista chans för elever att utveckla digital kompetens genom undervisningen. Genom det internationella forskningsprojektet, “Reconfigurations of Educational In/Equality in a Digital World” (RED), finansierat av Riksbankens Jubileumsfond (anslag GI19-1500), fick jag möjlighet att bedriva självständiga studier genom att återkommande besöka en av de svenska skolorna i projektet under en längre tid. Olika miljöer kan bidra till ökad etnografisk förståelse kring ett fenomen (Hine, 2015; Marcus, 1995), något som har varit min ambition då jag har utfört tre studier inom ramen för denna sammanläggningsavhandling.

9.4 SAMMANFATTNING AV TRE STUDIER PRESENTERADE I FYRA ARTIKLAR

Artikel 1: Making their own sense of students’ digital competence. Teacher negotiation and its implications for democracy and (in)equality

Vetenskapligt granskad och publicerad som:

Löfving, C. (2023). Making their own sense of students’ digital competence. *Nordic Journal of Digital Literacy*, 18(3), 145-157. <https://doi.org/10.18261/njdl.18.3.2>

Studie 1 beskrivs i artikel 1 och fungerar därmed som en introduktion till den etnografiska sammanläggningsavhandlingen där syftet är att bidra till kunskap om hur lärare begripliggör elevers digitala kompetens och hur den tillgodoses i undervisningspraktiker där digital teknik finns tillgängligt. Syftet med studie 1 är liknande, nämligen att få kunskap om hur lärare, vilka själva kan anses ha viss professionell digital kompetens och arbetar på skolor där eleverna har tillgång till digitala verktyg, begripliggör elevernas digitala kompetens. Forskningsfrågorna är följande: 1) Vilken digital kompetens beskriver lärare som viktig att tillgodose i undervisningspraktiken? och 2) Hur beskriver lärare att de tillgodoser elevers digitala kompetens? Frågorna undersöktes genom individuella intervjuer med tio

lärare, vilka undervisade i allt från år 1 till gymnasiet på olika platser i Sverige. Intervjuerna genomfördes med hjälp av en video-tjänst, Zoom, främst på grund av den rådande pandemin Covid-19. Analysen visar att lärarna beskriver begreppet digital kompetens i termer av *teknisk kunskap* och användning samt *ansvarsfull och kritisk medvetenhet*. Demokratiska värden som digitala rättigheter, delaktighet, engagemang och kritiskt motstånd, vilket uttrycks i både teoretiska ramverk om digitalt medborgarskap (Choi, 2016) och policyramverk (se bilaga, Figur 1-6), är inte lika vanligt att referera till. I artikeln diskuteras olika regleringar, till exempel den europeiska dataskyddsförordningen (GDPR), eller lärares oro för vad elever kan råka ut för på digitala forum, kan begränsa lärarnas möjlighet att tillgodose vissa aspekter av elevers digitala kompetens, så som att låta eleverna kommunicera med hjälp av digitala verktyg. Ytterligare en begränsning är indikationen att lärarna bygger sina uppfattningar och undervisningspraktiker på sin egen professionella digitala kompetens PDC, snarare än på kunskap om elevernas nätbaserade erfarenheter, och att lärarna sällan får möjlighet att diskutera sådana frågor med kollegor. Artikeln problematiserar vad dessa begränsningar kan innebära för eleverna och deras kompetens att navigera i ett samhälle som genomsyras av digital teknik. I förlängningen kan det finnas en risk för ökad digital ojämlikhet mellan elever och att frågor om demokratiska värden, så som inkludering och tillgänglighet även i sociala och nätbaserade sammanhang, inte anses angå skolan och dess undervisningspraktiker.

Artikel 2: Teachers' dilemmatic spaces connected to students' net-based out-of-school activities

Vetenskapligt granskad och publicerad som:

Löfving, C., Godhe, A.-L., & Lundin, J. (2023). Teachers' dilemmatic spaces connected to students' net-based out-of-school activities. *The International Journal of Information and Learning Technology*, 40(1), 62-72. <https://doi.org/10.1108/IJILT-03-2022-0042>

Studie 2 följer upp indikationerna i studie 1, nämligen att lärare sällan deltar i diskussioner om hur de kan tillgodose elevers digitala kompetens, och att lärarna relaterar aspekter av digital kompetens till egna erfarenheter snarare än till kunskap om elevernas nätbaserade erfarenheter. Syftet

med studien som presenteras i artikel 2 är att undersöka och beskriva de komplexa och dynamiska dilemman lärare ställs inför i relation till de nätbaserade aktiviteter som elever deltar i utanför skolan genom att besvara 1) Vilka "dilemmatic spaces" beskrivs av lärare på högstadieskolor i Sverige i relation till elevers nätbaserade aktiviteter utanför skolan? Genom att intervjua 41 lärare (där de flesta skolämnena var representerade), uppdelade i fem fokusgrupper, fördelade på tre skolor, uppmärksammas lärarnas pedagogiska diskussioner som en del av deras undervisningspraktik.

Analysen genererade två teman oberoende av skolämne: *förhandlingar om kunskapsinnehåll* och *yrkessidentitet*. Det första temat handlar om hur lärarna uttrycker en osäkerhet inför att kunna svara på de av elevernas frågor som har uppstått genom deras nätbaserade aktiviteter. Lärarna upplever dessutom att de behöver överbrygga en ökande kunskapsklyfta mellan eleverna, vilken de menar beror på att vissa elever tar reda på information på sin fritid medan andra inte gör det. Dessutom menar lärarna att de själva behöver ha kunskap om och kompetens att använda en stor mängd digitala verktyg och tjänster, samt känna till frågor som rör licenser, på ett helt annat sätt än tidigare. Det andra temat, yrkessidentitet, handlar om hur lärarna jämför sig med nätbaserade resurser, vilka ofta erbjuder ett, som lärarna uttrycker, roligare sätt att förklara kunskapsinnehåll för eleverna. Det handlar även om hur lärarnas tillförlitlighet kan ifrågasättas av eleverna, som i sin tur kan jämföra vad lärarna säger med ett överflöd av annan information. Vidare handlar temat om att alltid vara nåbar via olika nätbaserade resurser och hur lärarna hanterar det.

Artikel 2 diskuterar vidare utifrån teorin om dilemmatic spaces hur det sällan enbart finns ett sätt att agera i en viss situation (Honig, 1994). Det exemplifieras genom lärarnas ämnesöverskridande men skilda sätt att ta sig an ovanstående dilemman. Kunskapen är ett bidrag till förståelsen av vilka villkor som kan begränsa lärares möjlighet att tillgodose elevernas digitala kompetens, men öppnar även för studier om vilken kompetens som tillgodoses inom lärarnas undervisningspraktiker i förhållande till deras kunskap om elevers nätbaserade aktiviteter.

Artikel 3: Teachers' negotiation of the cross-curricular concept of student digital competence

Vetenskapligt granskad och publicerad som:

Löfving, C. (2023). Teachers' negotiation of the cross-curricular concept of student digital competence. *Education and Information Technologies*, 1-20. <https://doi.org/10.1007/s10639-023-11800-x>

Artikeln bygger på empirisk data från studie 2 där 41 lärare i årskurs 6–9 intervjuades i fokusgrupper. Syftet är att betrakta lärarnas begripliggörande av elevernas nätbaserade erfarenheter som en viktig del av lärarnas sensemaking. Detta utifrån vetskapen att digital kompetens kontinuerligt behöver förhandlas i ett föränderligt samhälle (Erstad et al., 2021). Forskningsfrågan: Hur engagerar sig lärare i sensemaking kring det ämnesöverskridande begreppet digital kompetens i relation till sina elevers nätbaserade aktiviteter utanför skolan? bygger på resultatet som presenterades i artikel 2 och där elevers digitala kompetens delvis framstod som ämnesöverskridande.

Analysen, som utgår från teorin om boundary objects, visar hur lärarna diskuterar vissa ämnesöverskridande teman som därmed utgör så kallade "broar" mellan lärarnas olika uppfattningar (Star & Griesemer, 1989). De identifierade temana handlar om elevers *kritiska medvetenhet* kring digitaliseringsfrågor, elevers *hantering av digitala verktyg*, elevers *kreativitet*, samt hur elever borde *undvika att använda digital teknik*, och *de faror lärarna identifierar som kopplade till sådan teknik* i större utsträckning än de förutsätts göra idag. Även om lärarna ger exempel på vad de anser att eleverna behöver vidareutveckla i förhållande till digital kompetens inom de fyra identifierade temana också utanför skolan, uttrycker lärarna att det inte är deras uppgift att tillgodose sådan kompetens. Om lärarna diskuterar vad de själva kan göra, handlar det mer om att instruera eleverna om vad de inte ska göra när de använder digital teknik, och att: "Ja, att begränsa användningen. Det är väl det vi jobbar mycket med, antar jag." (B4) (s. 1532).

Artikel 3 problematiserar att det sällan organiseras för lärare att diskutera och planera hur de kan tillgodose elevers digitala kompetens över ämnesgränser och att eleverna måste anpassa sig till enskilda lärares PDC, vilken varierar mellan lärare. Vidare påvisas ett forskningsgap när det gäller hur digital kompetens faktiskt tillgodoses i skolans undervisningspraktiker, något som studeras vidare i studie 3 och behandlas i artikel 4.

Artikel 4: Platform bureaucratization as pedagogy - a tacit school subject in highly platformized classrooms

Manuskript inskickat till vetenskaplig tidskrift, nu under vetenskaplig granskning.

Även om resultaten från studie 1 och 2 bidrog till den etnografiska förståelsen av digitala undervisningspraktiker, fördjupar studie 3, artikel 4, förståelsen av konkreta aktiviteter. Studien genomfördes i en svensk högstadieskola under 13 månader år 2022–2023. Digital teknik är integrerat i skolan som har tillgång till flera digitala plattformar och eleverna i årskurs 6–9 är försedda med varsitt digitalt verktyg. Då forskning går isär i frågor om huruvida digitala plattformar orsakar en radikal pedagogisk förändring och hur mycket inflytande de har på lärares didaktiska och pedagogiska val (Hangartner et al., 2024; Keressens & van Dijck, 2022; Selwyn et al., 2018), undersöks här: Vilken pedagogik skapas i undervisningspraktiker med hög grad av digitala plattformar?

En stor mängd data analyserades. Datamaterialet hade genererats från observationer, fältanteckningar, individuella intervjuer och fokusgruppsintervjuer, text- och bild-insamling, informella samtal och walk-throughs, där lärare hade visat hur de använder digitala plattformar. Efter flera omgångar av tematisk analys av hur lärare tillgodoser elevers digitala kompetens, och där hela datamaterialet användes, blev ett tema särskilt framträdande. Temat handlar om hur lärare interagerar med både digitala plattformar och elever inom sina undervisningspraktiker. En av episoderna i materialet valdes ut för att analyseras i detalj. Episoden visar hur en lärare instruerar sina elever om en plagieringskontroll integrerad i en digital plattform, samt hur eleverna ska hitta information och ladda upp texter på plattformen. En senare sekvens inom samma episod visar hur läraren beskriver verktyget i objektiva termer för eleverna och motiverar hur verktyget har fått bedöma deras texter. I analysen kompletterades teorin om sensemaking (Weick, 2001) med teorin om platform pedagogies (Sefton-Green, 2022; Sefton-Green & Pangrazio, 2021) för att tydligt rikta uppmärksamheten mot den digitala tekniken.

Analysen visar hur det utbredda användandet av digitala plattformar och dess olika applikationer genererar ett nytt, tidskrävande och osynligt

skolämne, här kallat *plattformsbyråkrati*, vilket är integrerat i de andra skolämnena. I undervisningen hanteras digital teknik som en opartisk och sällan ifrågasatt materialitet, betrodd att utvärdera studenternas uppgifter. Analysen visar vidare att programmerade förinställningar i de digitala plattformarna kan komma att bestämma när inlämningsuppgifter ska lämnas in, vilket i sin tur kan komma att styra pedagogiken i vissa riktningar. Det sker i de fall som lärare inte har tid eller kunskap att anpassa inställningarna till den pedagogik de själva anser stämma bättre överens med en viss undervisningspraktik. Artikeln diskuterar hur det sker en pedagogisk förskjutning mot mer instrumentella uppgifter i skolan. Eftersom resultatet visar att plattformsbyråkrati idag fungerar som ett påtagligt men osynligt skolämne inom skolans befintliga skolämnen, föreslås att ämnet erkänns som en del av skolans undervisningspraktiker. Även om det inte nödvändigtvis behöver bli ett eget skolämne, behöver det kollektivt begripliggöras, så att lärare kan få möjlighet att göra medvetna, didaktiska och pedagogiska val när det handlar om att tillgodose den digitala kompetens som elever behöver för att kunna vara en del av dagens skola och samhälle.

9.5 DISKUSSION

Trots att digitaliseringen av skola och samhälle idag är påtaglig på många håll i världen, saknar elever aspekter av digital kompetens, eller digital literacitet (Fraillon, 2024). Ett framträdande bidrag i denna avhandling är kunskap om hur svensk skola utifrån rådande villkor tillgodoser vissa delar av elevers digitala kompetens, men utelämnar andra delar, och att det sker mer eller mindre ad hoc i de flesta skolämnena, undantaget i de fall kompetensen är specificerad i en nationell kursplan. Avhandlingen bidrar även med kunskap om betydelsen av skolans organisation och dess vidare kontext för vilka villkor som kan möjliggöra eller begränsa att elevers digitala kompetens tillgodoses i skolans undervisningspraktiker.

Analysen visar hur lärare begripliggör det framväxande policybegreppet digital kompetens inom undervisningspraktiker där digital teknik är integrerat, genom att lärare oavsett skolämne fokuserar på *tekniska aspekter, elevers förståelse av källkritik, samt vilka faror eleverna kan komma att råka ut för när de använder digital teknik*. Ofta berörs dessa teman mer eller

mindre ad hoc när lärare och elever ställs inför olika dilemman i undervisningspraktiken, eller när en lektion startar och läraren behöver instruera sina elever om hur de kan navigera de digitala plattformar som används. Även om det finns en enhetlig policy inom skolororganisationen om hur digitala plattformar bör användas, tenderar varje lärare att använda sin professionella kompetens för att anpassa användandet. Förfaringssättet gör att eleverna kontinuerligt instrueras i hur de kan navigera de digitala plattformarna i de olika skolämnena. Det skapar i sin tur ett osynligt skolämne, här kallat *plattformsbyråkrati*, vilket blir en del av de flesta undervisningspraktiker, och vilket påverkar både didaktik och pedagogik (Sefton-Green, 2022; Sefton-Green & Pangrazio, 2021).

Därmed genereras ytterst lite utrymme att tillgodose de aspekter av elevers digitala kompetens som uttrycks i forskning (Choi, 2016; Ilomäki et al., 2023; Ilomäki et al., 2016) och olika policyramverk (se bilaga, figur 1-6), till exempel vad gäller det som kallas *digitalt medborgarskap*, *digital bildning*, som tillsammans med det närliggande begreppet *subjektifiering* handlar om elevers kompetens att aktivt men kritiskt engagera sig i ett samhälle integrerat av digital teknik och genom det få möjlighet att växa som människa (Biesta, 2020; Krumsvik et al., 2016; Krumsvik, 2014). Avhandlingen diskuterar att elevers digitala medborgarskap, digitala bildning och subjektifiering kan komma att tillgodoses av andra aktörer än skolan, eller inte alls, och problematiserar hur det kan bidra till digital ojämlikhet. Vidare visar analysen att de villkor som begränsar, men även skulle kunna möjliggöra för lärare att tillgodose olika aspekter av elevers digitala kompetens, kan relateras till *policyer* och rådande *diskurser*, *skolutvecklingsstrategier*, *digital teknik*, och *hur lärare kan förstå elevers nätbaserade aktiviteter utanför skolan*.

Policyer om digital kompetens är sällan detaljerade och det finns en osäkerhet bland lärare om vad elevers digitala kompetens innefattar, samt när och hur sådan kompetens bör tillgodoses. Vilken digital kompetens för elever som lyfts fram av beslutsfattare och genom rådande diskurser grundar sig sällan på elevers nätbaserade aktiviteter, utan snarare på vuxnas egna aktiviteter eller vad de antar att elever ägnar sig åt. Även om det finns en vision när det gäller digitalisering inom en skolororganisation, likväl som kollegialt lärande och stöd avseende infrastrukturer, programvaror och pedagogiska frågor (Håkansson Lindqvist & Pettersson, 2019; Pettersson,

2018), visar analysen att dessa sällan tar sin utgångspunkt i det som sker i de olika undervisningspraktikerna. Dessutom berör de sällan vilken digital kompetens som eleverna har tillägnat sig utanför skolan, eller vilken kompetens de behöver för att delta i samhället här och nu. Istället lämnas lärare att själva tillgodose de aspekter av elevers digitala kompetens som läraren finner vara viktiga. I ett sådant arbete kan lärare ibland vända sig till kollegor eller personer via sociala medier för att begripliggöra vilka digitala applikationer som didaktiskt och pedagogiskt skulle kunna användas, och om de går att använda utifrån regler kring personuppgifter, det vill säga GDPR. Den stora mängden digital teknik påverkar både lärarnas identitet och yrkesroll, något som även elevers tillgång till nätbaserad information gör, samt lärarnas ovisshet om vilken digital kompetens som eleverna besitter och behöver. Kunskapen om sådana villkor är viktig för att kunna ta sig an de utmaningar som kan uppstå i digitalt integrerade undervisningspraktiker.

Utifrån avhandlingens kunskapsbidrag föreslås att elevers digitala kompetens synliggörs som ett kunskapsobjekt på olika nivåer av utbildningsväsendet och diskuteras i relation till skolans uppdrag när det gäller elevers kvalifikation, socialisation och subjektivering (Biesta, 2020; Eynon, 2022). Det innebär även att det i policyer, såsom nationella läroplaner, tydligare bör skrivas fram hur elevers digitala kompetens kan tillgodoses även i unga år i förhållande till det som här identifierats som *tekniska aspekter* (inklusive *plattformsbyråkrati*), *källkritik* och *vilka faror [och positiva erfarenheter] elever kan uppleva när de använder digital teknik*. Dessutom bör de kompetenser som idag sällan tillgodoses skrivas fram tydligare. Det gäller *demokratiskt digitalt medborgarskap*, det vill säga *digitala rättigheter*, *deltagande*, *engagemang* och *motstånd* (Choi & Cristol, 2021), samt *rättsliga* och *etiska aspekter* kopplade till digital kompetens (Gudmundsdottir et al., 2024; Hakimi et al., 2021), vilket även omfattar *data-* och *AI-literacitet* (Krumsvik, 2024; Pangrazio & Sefton-Green, 2020).

För att lärare ska kunna undervisa om olika aspekter av digital kompetens föreslås en nationell skolutvecklingsstrategi som innefattar att lärare och skolledare får tid att ta del av och genomföra fortbildning vilken tillgodoser kunskap inom digital kompetens. Utbildningen bör ta hänsyn till varje lärares och skolledares befintliga, professionella, digitala

kompetens, varför utbildningen föreslås ske individuellt, digitalt, asynkront och i olika spår, vilka kan uppdateras i takt med att digitaliseringen i samhället fortskrider.

Denna avhandling har dock visat att det inte är tillräckligt att varje lärare utvecklar egen professionell digital kompetens om elevers digitala kompetens ska kunna tillgodoses på ett strukturerat sätt. Om skolan som organisation ska kunna undvika de fallgropar som här har uppmärksamats, bör skolledare kontinuerligt besöka och ta del av vad som sker i skolans undervisningspraktiker för att kunna organisera för att lokala och kollegiala diskussioner kommer till stånd, diskussioner vilka tar sin utgångspunkt i befintliga aktiviteter men även relateras till olika policyförväntningar. Detta för att skapa fungerande läroplaner i det arbete där lärare idag ofta lämnas ensamma att hantera frågor om digitalisering och digital kompetens. Lärares digitalt integrerade undervisningspraktiker kan därmed komma att bli en synlig del av skolans organisation, vilken i sin tur är en del av andra nivåer i utbildningssystemet och delvis påverkas av nationell och internationell politik (Priestley & Philippou, 2018; Weick, 2009). Ytterligare forskning föreslås för att närmare studera ett sådant arbete, samt för att studera elevers perspektiv inom området.

Slutligen, denna avhandling har bidragit med kunskap om att lärare inte ensamma kan göras ansvariga att tillgodose alla aspekter av elevers digitala kompetens. Deras uppdrag påverkas av en långt vidare kontext. Det sägs att det krävs en by för att uppfostra ett barn. På samma sätt krävs det begripliga policyer och en fungerande skolorganisation för att digitalt integrerade undervisningspraktiker tillgodose att elever får kunskaper och kompetenser att läsa, skriva, räkna och att kunna hantera de digitala verktyg som är en del av både skolan och det samhälle de lever i.

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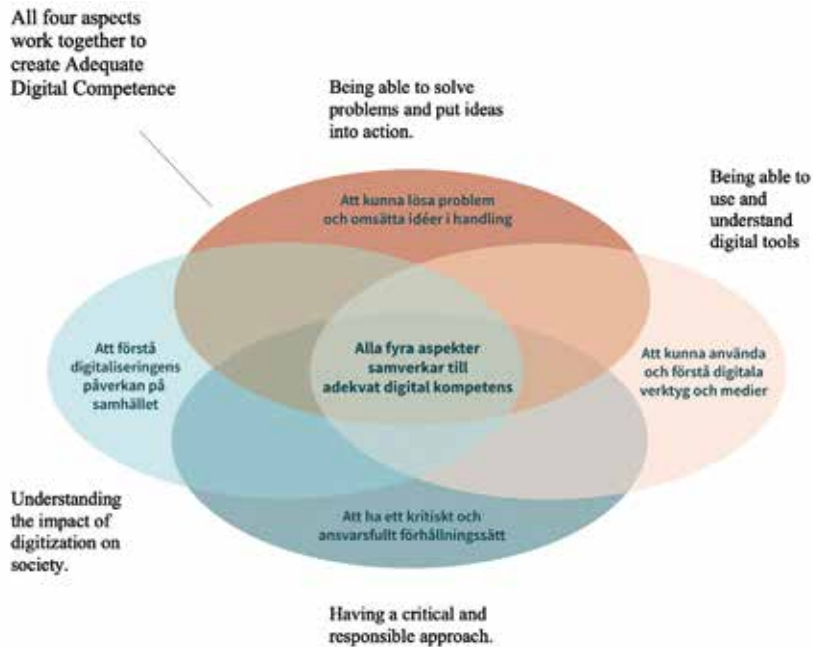
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APPENDIX

FIGURES SHOWING FRAMEWORKS

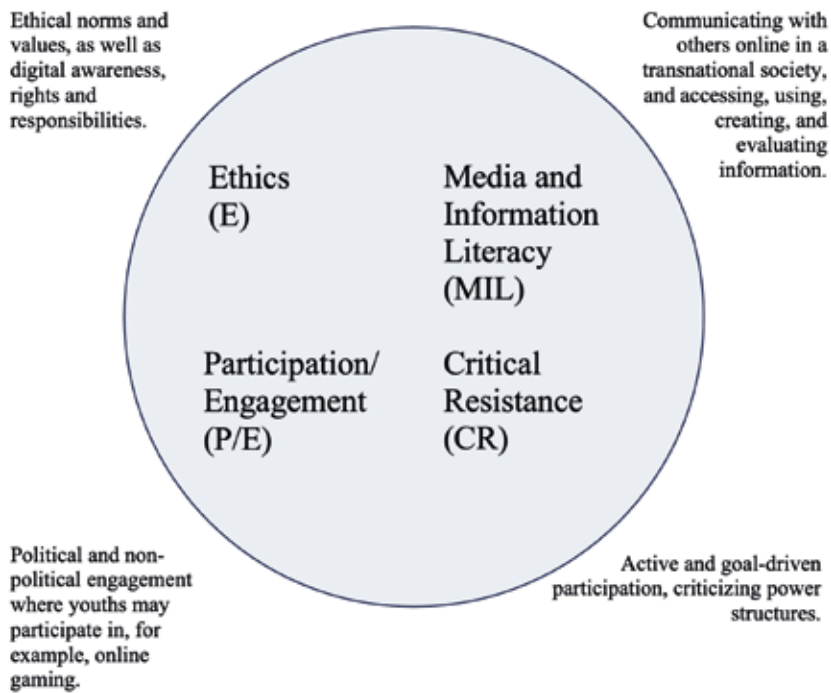
Figure 1

The Swedish framework Fyra aspekter av digital kompetens (Four Aspects of Digital Competence)



Note. The original picture is published by the Swedish National Agency for Education (2020) and is here used with their permission. (Nov 18, 2024, [2024SK70917]). The English text has been added by the author to explain the Swedish text, and should not be considered part of the picture.

Figure 2
Four Categories of Digital Citizenship



Note. The figure is made by the author and based on the framework of Choi (2016)

Figure 3
AI competency framework for students

Competency aspects	Progression levels		
	Understand	Apply	Create
• Human-centred mindset	• Human agency	• Human accountability	• Citizenship in the era of AI
• Ethics of AI	• Embodied ethics	• Safe and responsible use	• Ethics by design
• AI techniques and applications	• AI foundations	• Application skills	• Creating AI tools
• AI system design	• Problem scoping	• Architecture design	• Iteration and feedback loops

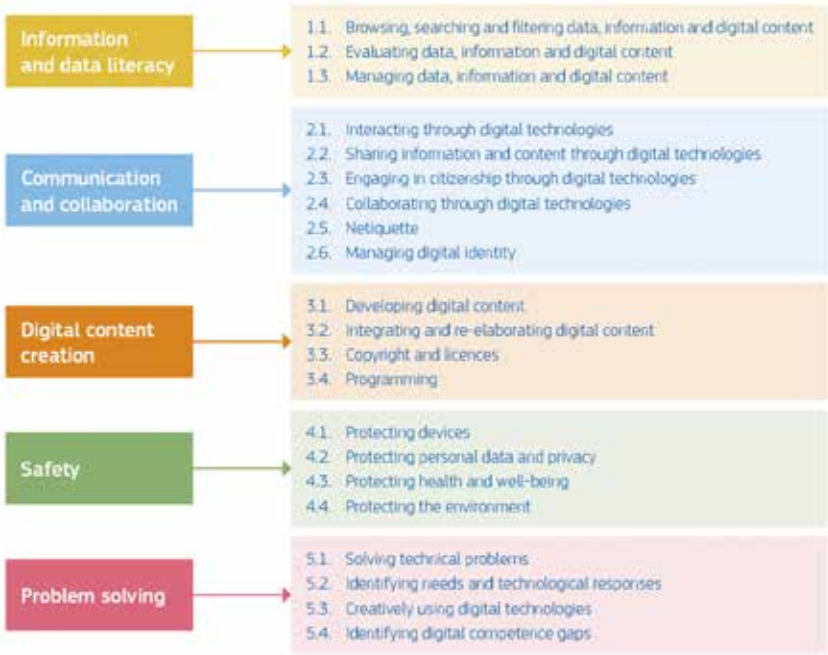
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Figure 4
AI competency framework for teachers

Aspects	Progression		
	Acquire	Deepen	Create
1. Human-centred mindset	Human agency	Human accountability	Social responsibility
2. Ethics of AI	Ethical principles	Safe and responsible use	Co-creating ethical rules
3. AI foundations and applications	Basic AI techniques and applications	Application skills	Creating with AI
4. AI pedagogy	AI-assisted teaching	AI–pedagogy integration	AI-enhanced pedagogical transformation
5. AI for professional development	AI enabling lifelong professional learning	AI to enhance organizational learning	AI to support professional transformation

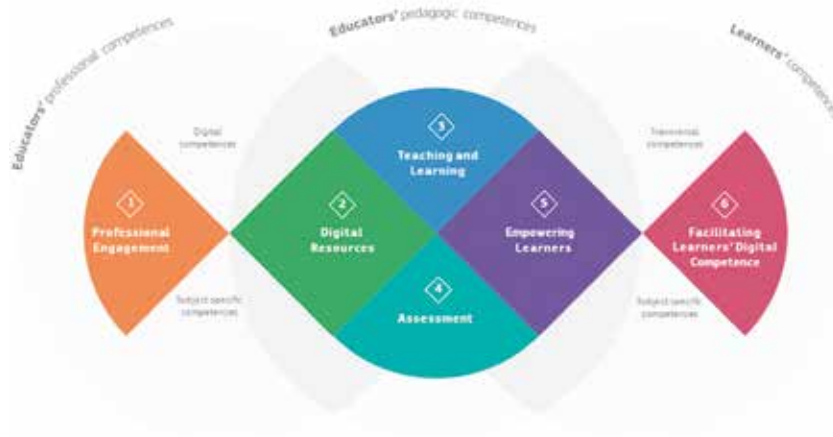
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Figure 5
The DigComp 2.2 conceptual reference model part of the Digital Competence Framework for Citizens



Note. The framework DigComp2.2 (Vuorikari et al., 2022) is used under the Creative Commons Attribution 4.0 International (CC BY 4.0) licence (<https://creativecommons.org/licenses/by/4.0/>) with permission based on the Commission Decision 2011/833/EU of 12 December 2011 on the reuse of Commission documents (OJ L 330, 14.12.2011, p. 39).

Figure 6
DigCompEdu Areas and Scope



Note. The framework DigCompEdu (Redecker & Punie, 2017) is used under the Creative Commons Attribution 4.0 International (CC BY 4.0) licence (<https://creativecommons.org/licenses/by/4.0/>) with permission based on the Commission Decision 2011/833/EU of 12 December 2011 on the reuse of Commission documents (OJ L 330, 14.12.2011, p. 39).

