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ACCESS TO AND ACCOUNTS OF USING DIGITAL TOOLS IN SWEDISH SECONDARY GRADES. AN EXPLORATORY STUDY

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NOTE: This study is a part of Digitalization Initiatives, and Practices (DIP) research project. Project DIP, a part of Communication, Culture and Diversity (CCD) research platform at the University of Jönköping, is an ethnographic project, focusing on agency at all levels with respect to digitalization in schools.

ABSTRACT

Aim/Purpose	The aim of the study is to explore students' encounters with digital tools and how they account for their experiences of using digital tools within formal education.
Background	While computers have a long history in educational settings, research indicates that digital tools function both as affordances and constraints, and that the role of digital tools in schools continues to be debated. Taking into consideration student perspectives can broaden the understanding of knowledge formation practices.
Methodology	The study is part of a larger ethnographic project, focusing on agency at all levels with respect to digitalization in schools. The present exploratory study is built primarily on interviews with 31 secondary school students at five different schools (15 girls and 16 boys). The analytical framework was a Nexus Analysis, focusing on discourses in place.
Contribution	The paper shows how digital tools are conceptualized as being formed by and fitted into the traditions and habits of the institution, rather than acting

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	as a transformative force to change knowledge formation practices in schools.
Findings	From the students' narrative accounts, the following key themes emerge: (1) Action in contexts, (2) Agency in contexts, and (3) Equality in contexts. The first deals with the use of digital tools in school and the interaction order as it is accounted for in the use of digital tools in schools. The second frames human agency with regards to usage of digital tools and how agency fluctuates in interaction. The third deals with the compensating role digital tools are supposed to play for students who are identified with special needs and for students with divergent backgrounds, especially socioeconomic standards.
Recommendations for Practitioners	For teachers, the recommendation is to engage in dialogue with the students on how and when to use digital tools and the affordances and constraints involved from a student's point of view. For school leaders, the recommendation is to review how organizational structures, culture, and processes hinder or support the development of new practices in digitalization processes.
Recommendations for Researchers	The three key themes that emerged in this study emphasize the need to reflect upon how a panopticon view of contemporary classrooms can be challenged. Involving students in this work is recommended as a means to anchor ideas and results.
Impact on Society	This study is part of a larger project at Jönköping University, focusing on agency at all levels with respect to digitalization in schools. The overall goal is to increase our understanding of how to improve digitalization and implementation processes in schools.
Future Research	Future studies that address digital technologies in schools need to pay special attention to the interaction between students, teachers, and various kinds of tools to map the nature of the education process, with the aim of challenging the panopticon view of the classroom. Future studies need to focus upon processes themselves, rather than accounts of processes.

Keywords: digital tools, nexus analysis, secondary school, digitalization, Sweden

INTRODUCTION

> The year is 1970. The place is a school room somewhere in Sweden. A teletype connected to a central computer through the telephone network stands in one corner. Excited students crowd around to get a glimpse of the rattling printout. [---] But what is it doing? With a simple BASIC program, the class has subdued the Machine.[1] (Björk, 1983, p. 32, our translation)

The late 1960s or the early 1970s can be considered, as this opening quote illustrates, the starting point of the digitalization of the Swedish schools. Sweden as a national context is interesting since it is a country that is considered a leader as far as digital transformation is concerned (Organisation for Economic Cooperation and Development [OECD], 2018); however, even after half a century, the role of digital tools in schools continues to be normatively debated. Here systematic research-based knowledge needs to be considered. The history of using computers in Swedish educational settings is

[1] Original Swedish text: *Året är 1970. Platsen är en skolsal någonstans i Sverige. I ett hörn står en teletype som via telenätet är ansluten till en stordatorcentral. Förväntansfulla elever trängs för att få se en skymt av den smattrande utskriften. [---] Men vad gör det? Klassen har med ett enkelt BASIC-program betvingat Maskinen.*

six decades long. Computer knowledge has been an integrated part of the 1980 national Swedish syllabus for mathematics in compulsory school, for example. However, the history of integrating computers in educational settings is perhaps even longer in some other national settings. In the United States for example, experiments with computers in education were being conducted in the early 1960s (e.g. McGregor, 1965; Suppes, 1966). Here digital tools are reported to have been used in complex ways in educational settings. In 1970, Martin and Norman (as cited in Selwyn, 2011) identified several different areas where computers could be used in education: tutorial and coaching instruction, drill- and practice instruction, problem-solving, dialogue systems, simulation/computer as laboratory, database use, and educational games.

The study presented in this paper contributes knowledge about digital tools in school settings generally, and how students, in particular, understand digitalization initiatives. The study maps the students' accounts of the scope and usage of digital tools in contemporary school settings in the nation-state of Sweden. Fleischer (2017) highlighted that students' perspectives are critical for broadening understandings of knowledge formation processes and tool-handling processes. Thus, the study focuses upon students' reflections regarding their encounters with digital technologies illuminating the nature of their engagement with digital tools in school settings and, in particular, how students account for their experiences of using digital technologies within (and to some extent outside) formal education. This means that the present study maps the range of digital tools that secondary students report having access to and that they account for using in their classrooms. As the students' voices are the foundation for this study, the results might be valuable in policy and implication processes.

The rest of this introduction presents the early and extensive investments in digital technologies in schools in Sweden, highlighting why mapping this national context provides an interesting arena. As discussed in the Theoretical Framing section, taking a sociocultural perspective on students' accounts of the use of digital tools in education calls for a framework that supports analysis of discourses related to interaction. For this, nexus analysis provides a relevant theoretical point of departure. Methodological framings and the nature of the data used are explicated in the section that follows it. The section after that presents the three primary themes that emerge in the analysis and the final section in this paper provides an overarching discussion that brings together the findings.

Digital Tools in Educational Settings. A Background

The early history of computers in school is a history of a few early adopters and enthusiasts. However, computers and other digital tools became increasingly common in Swedish schools at all levels. Today almost all Swedish secondary school students have access to at least one computer at home and nine out of ten use computers in school (OECD, 2015). 75 percent of the students have access to a desktop computer, 95 percent of the students have access to a laptop or portable computer, and 98 percent have access to a mobile phone with internet access (OECD, 2017). The ongoing digitalization of all school level education in Sweden has made explicit the need for relevant knowledge development regarding supportive ways of using digital tools. However, developing knowledge about usage that promotes learning requires mapping its current usage and scope. Given the density of the presence of digital tools in education, mapping the Swedish context provides an interesting case study.

Technology itself has been equated in terms of infrastructures with components such as artefacts or tools, activities or practices, and social arrangements or organizational forms (Lievrouw & Livingstone, 2006). This means that it is difficult to imagine education without technology. Today, technology is often understood in terms of digital technology. As explained further in the Theoretical Framing section, from a sociocultural perspective (Jones & Hafner, 2012; Säljö, 2005; Wertsch, 1998), the term "digital tools" is used here to designate digital technology in classrooms. Thus, the term "tool" implies the usage of technology, while technology refers to artefacts that create affordances for the user to fulfill specific tasks. From a sociocultural point of departure, a tool mediates action, and the

most important tool human beings have access to is language (Säljö, 2005; Wertsch, 1998). By deploying the term "digital tool," we thus not only highlight the mediating character of technology, but also limit a wide range of possible tools that could be in focus.

Many different kinds of digital tools are used in educational settings. Selwyn (2011), for instance, mentions hardware such as computers, handheld devices such as mobile phones and tablets, audio-visual tools such as digital cameras, software such as word-processing programs and presentation programs, and internet-based services. Holmström and Bagga-Gupta (2017), and Bagga-Gupta (2001, 2012), include digital technologies such as computers, laptops, mobile phones, and Smart-boards within technological literacy tools.

Digital literacy, an explicit part of the Swedish curricula and syllabi (The Swedish National Agency for Education, 2016a), is related explicitly with the tools used in education. Jones and Hafner (2012, p. 13) frame digital literacies as "practices of communicating, relating, thinking and 'being' associated with digital media … 'digital literacies' involve not just being able to 'operate' tools like computers and mobile phones, but *also* the ability to adapt the affordances and constraints of these tools to *particular* circumstances" (italics in original). Similarly, The Swedish National Agency for Education (2019) explains digital competences in terms of the ability to understand how digitalization influences society, to use and understand digital tools and media, to have a critical and responsible relationship to digital technology, and to solve problems and transform ideas in action in a creative manner.

While computers have a long history in Swedish educational settings, the integration of digital tools in education is being seen as marginal today. Recent mappings of the use of digital tools in schools indicate that they are primarily used for searching for information, making presentations, and writing essays (The Swedish National Agency for Education, 2016b). While predictions in the 1960s suggested that computers would be especially beneficial for the school subject of mathematics (Suppes, 1966), this development has been slow. For instance, merely 15 percent of the students in Sweden who participated in the 2012 Programme for International Student Assessment (PISA) survey stated that they used computers at least once a week during their mathematics lessons (OECD, 2015). In 2015, 63 percent of secondary school mathematics teachers in Sweden reported that they never, or almost never, used digital tools during mathematics teaching (The Swedish National Agency for Education, 2016b). Furthermore, 96.1 percent of the students in the 2015 PISA survey report that they use a mobile phone, but only 49.7 percent report using a desktop computer, and 78.9 percent report using the laptop at home. Unpacking such official figures gives rise to an important analytical issue: there exists a gap between access to, and educational benefits of, digital tools in relation to an educational discourse that promotes digital literacy.

There also exist differences between the levels of access and usage within the Swedish educational system. In upper secondary schools, about three out of four students are reported as having access to a digital tool, either a laptop or a tablet, all the time in schools (a so called one computer per student, or a "one-to-one" program), while one in four students at the compulsory school level is reported as having access to their own digital tools (The Government of Sweden, 2016).

Many Swedish teachers find it demanding to use digital tools. If students have access to only classroom computers or special computer rooms, which is the situation for most students at the compulsory school level, the usage of these tools becomes contingent on the teacher (Samuelsson, 2010). Given the complexities of the teaching profession, including a lack of central directives, different teachers use digital tools to different degrees (Salavati, 2016; Samuelsson, 2010). Problems of accessing digital tools could in itself create resistance towards using digital tools in classroom settings (Erixon, 2010; Samuelsson, 2010). In a literature review, Bingimlas (2009) identified barriers for the integration of information and communication technology in education and found that while teachers were generally positive towards integrating information and communication technology (ICT)

into education, if they lacked confidence, competence or did not have access to resources, this presented barriers for using ICT. In fact, many teachers highlight the lack of further education as impeding their digital competences (Lindberg et al., 2017; Salavati, 2016).

Previous research on digital tools in Swedish school settings indicates that digital tools function both as affordances and constraints (Gynne 2016; Holmström 2013). Several studies on students' usage of digital tools in upper secondary schools look at "one-to-one" programs (Bergdahl et al., 2018; Fleischer, 2017; Hatakka et al., 2013; Håkansson Lindqvist, 2013 , 2015; Olofsson et al., 2018) and indicate that students consider studying to be more fun and engaging when digital tools are used, digital tools are seen as an affordance for students with special needs, and digital tools are seen as providing an opportunity to cooperate, to find information, and to support the organizing of schoolwork. At the same time, digital tools can become distracting, could cause health problems such as backaches and headaches, and studying processes are reported to become vulnerable to technical problems themselves (Hatakka et al., 2013; Håkansson Lindqvist, 2013).

THEORETICAL FRAMING: A NEXUS ANALYSIS OF DISCOURSES IN PLACE

Approaching digital technology from a sociocultural point of departure, necessitates understanding engagement in social practices as being fundamentally relevant. Tools play a crucial role in sociocultural theory; they are mediational means that facilitate human actions (Wertsch, 1998). Closely related to this theoretical perspective, Nexus Analysis (NA), a branch of discourse analysis, center-stages social action and social practices. NA , used as the overarching theoretical framing in the present study, thus enables a focus on actions and contexts, which Gee (1999) discusses as *capital D* discourses, i.e., an integration of language and other semiotic resources (Gee, 1999; Scollon & Scollon, 2004). Historically NA has been used as an analytical framework in different settings, e.g., policy studies (Hult, 2015; Källkvist & Hult, 2016; Scollon, 2008) and linguistic studies (Lane, 2010; Pietikäinen et al., 2011; Tapio, 2013). With its ethnographic roots, NA datasets typically consist of various types of data, such as audio and video recordings, field notes and documents (compare with Agar, 2008; Hammersley & Atkinson, 2007; Wolcott, 2008). There are examples of alternative types of NA datasets though, such as newspaper archival material (Hult & Pietikäinen, 2014), public signs (Pietikäinen et al., 2011), TV documentary transcripts (Lassen, 2008), and interview recordings (Lane, 2010).

Within a sociocultural framing, all actions are understood as being social, and social actions constitute the core unit of analysis in NA. In such a framing actions are social in that something is an action if others perceive it as an action and that the action is mediated by some means, i.e., the means, or tools, that facilitate a human action. In NA, social action takes place in the intersection between the historical body, the interaction order, and the discourses in place (Figure 1). The historical body, a term borrowed from Nishida (1958), is the personal history and experiences of a person (Scollon & Scollon, 2004). The interaction order, a term explicated by Goffman (1983), frames how people act in relation to other people (Scollon & Scollon, 2004). The discourses in place are all discourses that circulate through the social action under scrutiny (Scollon & Scollon, 2004).

A NA is conducted in three steps: (i) engaging the nexus of practice, (ii) navigating the nexus of practice, and (iii) changing the nexus of practice (e.g., Scollon & Scollon, 2004). The main focus in the first step is to illuminate social actions, identify key actors, and determine the most significant discourse cycles (Scollon & Scollon, 2004). As a researcher, one can engage the nexus emically as an insider, or etically as an outsider. A visiting interviewer is engaging the nexus as an outsider. Navigating the nexus of practice constitutes the main phase in NA. It is during this phase that one maps "the cycles of the people, places, discourses, objects, and concepts" (Scollon & Scollon, 2004, p. 159).

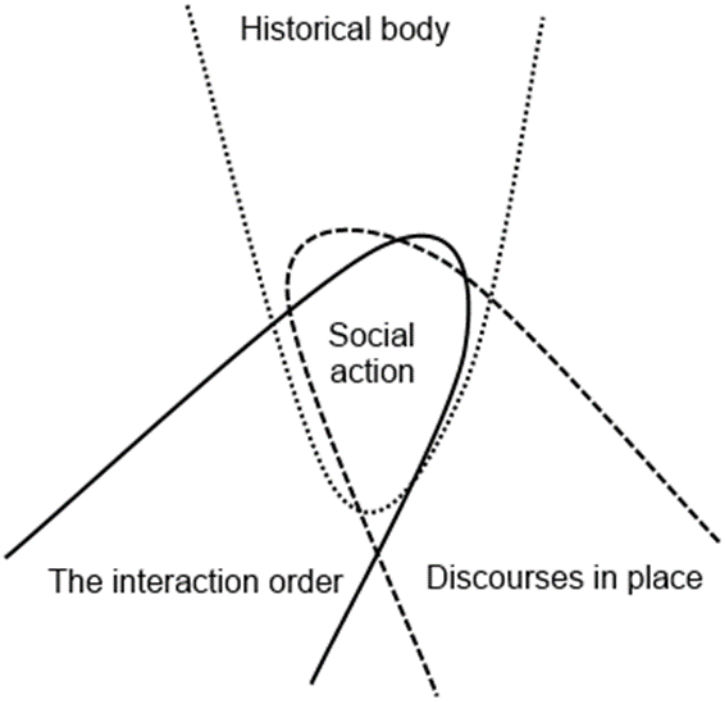

Figure 1. Social action in the intersection between the historical body, the interaction order, and the discourses in place (After Scollon & Scollon, 2004, p. 20)

From the present theoretical framing, interviews constitute a collaboration. Both the interviewer and the interviewee shape the narrative and therefore contribute to changing the nexus of practice. During this process, the interviewee can become aware that a specific issue in focus is important. For instance, when headmasters are contacted to gain access to schools, they become aware of the issue that the researcher has in focus. While changing the nexus of practice is an important dimension of NA, it has not been attended to in the present study.

The layout of classrooms is seen as being important when studying teaching and learning. Thus, for instance, two types of classrooms have been distinguished: a panopticon traditional classroom and a technology-mediated classroom (Scollon & Scollon, 2004). In a traditional classroom, the teacher is the performer and the students are spectators. Here the teacher is framed as having the strongest agency and the one who controls the classroom. The teacher controls access to the classroom and the flow of events in it, and a traditional classroom discourse circulates where the focus is teacher-controlled topics that are normally based on curricula texts. Other features of the traditional classroom include assessments that are conducted with written tests and quizzes, and the front classroom space dominated by the white/blackboard; here the "teacher owns the room space; has wide latitude of using the front third of the space" (Scollon & Scollon, 2004, p. 43).

In contrast to the traditional classroom, the technology-mediated classroom sees technology as being an integrated part of teaching and learning; here agency is understood as being leveled out between teachers and students and discourses emerge both from teachers and from students. In the technology-mediated classroom that Scollon and Scollon (2004) identified in the early 1980s, the students tend to be more experienced as compared to the teacher, and the interaction order is based on face-to-face communication. This implies that technology is more internalized in the students' historical bodies, as compared to that of their teachers.

Interview narratives in the NA tradition are framed in terms of human accounts of their experiences, and the data generated is described in the next section.

ON METHODOLOGY AND DATA

From a sociocultural framing, narrative interview datasets require moving beyond a functional view of interviews and accounts. Such a stance means that interview data does not allow for an analytical scrutiny of what actually transpires in different activities (Block 2017; De Fina 2018; Shuman 2005). Thus, analysis of interviews needs to focus on what people account for with regards to various dimensions of social life. In other words, narratives are more appropriately a "part of cultural modes of communication and social relationships, and [nothing] is told de novo, outside of these modes and relationships" (Shuman, 2005, p. 23). This calls for the need to "abandon the view of stories as containers" and rather understand them as social practices in themselves (De Fina, 2018). Such concerns have been encapsulated through, for instance, the "narrative turn" wherein interviews (and other self-presentation accounts) are understood "as socioculturally-situated co-productions" (Block, 2017, p. 27). These then constitute dimensions of discourses in place and historical bodies in the present study.

Having said this, there is an ethical dimension connected to the use of narrative interview data. This involves, for instance, "claims of entitlement [wherein] both the tendency to draw a sharp opposition between life and narrative *and* the tendency to equate them are problematic" (Schiff et al., 2017, p. 81, emphasis in original). We engage with narrative interview data with students against the backdrop of ongoing classroom ethnographic fieldwork in project Digitalization Initiatives, and Practices (DIP). This means that the latter dataset has been used implicitly during the analysis work and the presentation of our findings.

The present study explores secondary school students' experiences of digital tools, and the rationales for choosing secondary students in general and eighth grade students in particular are threefold. Firstly, in Sweden secondary education is subject based. In primary school, the students have a home classroom with a team of teachers responsible for the students. The homeroom teacher often teaches many subjects. In secondary classes, the students normally have different subjects in different classrooms. This implies that secondary school teachers are subject teachers, while primary school teachers are, to a higher degree, class teachers. Secondly, secondary school up to grade 10 is mandatory, which means that all students participate in education until they turn 16 years. Although, upper secondary school is not mandatory, almost all Swedish 16 to 19 year-olds today also attend this stage of pre-work or pre-university education. They are streamed into upper secondary school programs, either for vocational studies or for preparation for higher education. Thirdly, students who are tasked to participate in the OECD's Programme for International Student Assessment (PISA) survey are fifteen-year-olds, which in Sweden means that they are members of secondary school settings. The PISA survey makes available analysis of different types of statistical data, providing overarching pictures of this age group.

With the intent of identifying crucial social practices, actors, and discourses, i.e., to engage a nexus of practice, eight pilot interviews, with four girls and four boys in eighth grade, were conducted during the autumn of 2015 (Table 1). The first four pilot interviews, henceforth called Pilot School 1, were conducted in a secondary school with about 250 students (seventh to ninth grade, i.e., 13 to 15 years old). The last four pilot interviews, henceforth called Pilot School 2, were conducted in a secondary school with about 150 students. Pilot School 2 is a so-called one-to-one school, were all students have been provided with an iPad by the school authorities. Permission to conduct the interviews was granted by the headmasters and performed by this papers' first author.

Table 1. Features of the student interviews

Interview	School	Length (mm:ss)	Year	Study	Comment
1	1	09:55	2015	Pilot	
2	1	23:19	2015	Pilot	
3	1	28:00	2015	Pilot	
4	1	14:22	2015	Pilot	
5	2	14:35	2015	Pilot	Attends a one-to-one iPad class.
6	2	11:45	2015	Pilot	Attends a one-to-one iPad class.
7	2	12:12	2015	Pilot	Attends a one-to-one iPad class.
8	2	14:08	2015	Pilot	Attends a one-to-one iPad class.
9	1	25:35	2016	Main	Attends the one-to-one iPad class.
10	1	29:19	2016	Main	
11	1	25:14	2016	Main	Brings her own iPad to school.
12	1	27:28	2016	Main	Using a school provided iPad due to Special needs.
13	1	21:17	2016	Main	Student with special needs. Attends the one-to-one iPad class.
14	1	19:24	2016	Main	
15	1	16:59	2016	Main	Explicitly prefer analog tools.
16	1	19:22	2016	Main	
17	2	29:36	2016	Main	
18	2	18:08	2016	Main	
19	2	21:35	2016	Main	
20	2	22:20	2016	Main	
21	2	25:09	2016	Main	
22	2	18:56	2016	Main	
23	2	16:01	2016	Main	
24	2	18:40	2016	Main	Using a school provided iPad due to Special needs.
25	3	30:45	2016	Main	
26	3	22:14	2016	Main	
27	3	18:21	2016	Main	
28	3	17:42	2016	Main	Using a school provided laptop due to Special needs.
29	3	22:07	2016	Main	
30	3	22:27	2016	Main	Explicitly prefer analog tools.
31	3	21:09	2016	Main	Using a school provided laptop due to Special needs.

The pilot study highlighted the following and helped shape the selection of schools for the rest of the data generation:

- The students use several digital tools.
- Writing different kinds of texts and searching for information are two main reasons for using digital tools in schools.
- The students prefer computers for writing and mobile phones for searching for information or learning new words in foreign languages.
- Students report that digital tools make their studies more organized.
- Computers are used in a computer room.
- In some cases, the students have to use their mobile phones, as there is a shortage of printed books.
- Students' usage of digital tools in classrooms is contingent upon their teachers' preferences.
- Students who attend a class where everyone has access to an iPad report using the iPads primarily in school. These iPads seem to have substituted computers and mobile phones for schoolwork both inside and outside school.

In the second phase of NA, navigating the nexus of practice, interviews in the main study were conducted with 23 students, 11 girls and 12 boys, in the eighth grade in 3 different schools in a minor Swedish municipality (Table 1). School 1 had about 500 students, School 2 about 400 students, and School 3 about 200 students in their respective secondary classes (seventh to ninth grade). These three schools represent all the public administrated schools in this municipality. In School 1, the students in one class have iPads provided by the school. Two of the interviewed students attended this class (Table 1). Students with special needs have digital tools, either an iPad or a laptop, provided by the school. Five of the interviewed students had special needs (Table 1). Excluding these, all the interviewed students had access to digital tools in three different ways: computers in the computer rooms, computers in the classrooms, and iPads on a trolley brought to the classroom.

Permission to conduct the interviews was granted by the headmasters and performed by this paper's first author. The students were selected by their homeroom teacher, with gender as a selection criterion. Given that we do not have more information of how the teachers made their selections, a biased selection cannot be ruled out.

Ethical considerations were adhered to during the entire research process. All students were informed about the voluntary nature of their participation, and that they could stop their participation at any time. All participating students and their guardians had signed an agreement form prior to the interviews. The interviews were audio recorded and transcribed by the first author. These transcripts have been analyzed individually and in a few joint sessions by the three authors. The first author has discussed the transcripts in joint sessions with the second author and the data more generally with the third author. The data sessions have also included discussions of the classroom observational data. These contrastive sessions have led to the identification of the key discourses in place that are presented in the next section.

DISCOURSES IN PLACE WITH REGARDS TO DIGITAL TOOLS

Based upon the theoretical-methodological framings deployed in this study, social action is understood as lying at the intersection between the historical body, the interaction order, and the discourses in place. Teachers and students emerge as two key actors in the analysis of the students' accounts of their perceptions regarding their own experiences of engaging with digital tools in educational settings. When reading the students' narrative accounts from the analytical standpoint of NA, three key themes emerge: (1) Action in contexts, (2) Agency in contexts, and (3) Equality in contexts.

The first deals with the use of digital tools in school and the interaction order as it is accounted for in the use of digital tools in schools. The second frames human agency with regards to usage of digital tools and how agency fluctuates in interaction. The third deals with the compensating role digital tools are supposed to play for students who are identified with special needs and for students with divergent backgrounds, especially socioeconomic standards.

Action in Contexts: Social Practices when Using Digital Tools

Navigating the nexus of practice in the narrative interview dataset, i.e., analysis of this dataset, highlights both the range of digital tools that students identify in their learning spaces as well as their accounts of using them. Given the centrality of this first theme and the different examples that illustrate actions in contexts, we present the examples organized in different clusters.

Range of digital tools

While all students seem to use digital tools to some extent, it is only the students in the iPad class in School 1 who have access to digital tools throughout their class time. Normally the teacher has to reserve the computer room or an iPad trolley in advance. Almost all students have access to a mobile phone, but normally the teacher collects these at the beginning of the lesson with the rationale that students can then concentrate on the lectures. In some instances, students can have their mobiles back if they need them for their class work. An overview of the digital tools that students identify in their narratives are presented in Table 2.

Table 2. Overview of the digital tools.

Typology of usage	**Examples of digital tools (*device in use in brackets**)**	**Examples of usage**
Writing	Microsoft Word (*computer*) Notability (*iPad*)	Students write texts. Students take notes.
Presentations	Microsoft PowerPoint (*computer*)	Students do presentations in class. Teachers do presentations in class.
Drilling	Kahoot (*mobile phone*) Glosor.eu (*mobile phone*)	Students play drilling games in various subjects. Students practice words in foreign languages.
Online searching	Google web search (*mobile phone*) Wikipedia (*mobile phone*) Google translate (*mobile phone*)	Students search for facts in various subjects. Students search for words in language education.
Streamed media	YouTube (*computer, mobile phone*) MediaCenter (*computer*) Music playing software (*mobile phone*)	Students watch movies about solving problems in mathematics. Students watch "flippes". Teachers show streamed films in class. Teachers play streamed audio in class. Students listen to music in mathematics class.
Remedial software	Inläsningstjänst**	Students listen to audio versions of textbooks

Typology of usage	**Examples of digital tools (*device in use in brackets**)**	**Examples of usage**
Art creation	Music production software (*iPad*) Movie making software (*iPad*)	Students make music in music class Students make films in various subjects
Meta level usage	Microsoft Word (*computer*) Microsoft Excel (*computer*) Microsoft PowerPoint (*computer*) Software Development Kit (*computer*)	Students learn how to use digital tools in the digital tools subject.
Simulations	Bridge building (*computer*)	Students learn about bridge strength in physics class.
Calculations	Calculator (*mobile phone*)	Students use their mobile phones instead of electronic calculators in mathematics.
Communication	Learning platform (*computer, iPad, mobile phone*) Social media (*computer, iPad, mobile phone*)	Teachers use the learning platform for informing the students of their assignments. The students form Facebook groups to discuss schoolwork. Teachers form Facebook groups for keeping contact with students and parents.

* Students in the iPad class (School 1) use their iPads when they are using digital tools
** Inläsningstjänst is available for students with special needs. Some of these students are provided with laptop computers, and some with iPads.

Students report that writing is the most common practice where digital tools are used, irrespective of whether computers or iPads are deployed.

> I'm writing in Word if it's something you are going to write. Computers are what we use most often for this. (*Jag skriver ju på Word i så fall ifall det är något man ska skriva, eller så. Det är ju oftast det vi använder datorn till.*) (Interview 17)

The ongoing classroom ethnography in the research project Digitalization Initiatives, and Practices (DIP) substantiates these student accounts. The Swedish National Agency for Education (2016b) reports that searching for information is the most common activity connected to the use of digital tools in educational settings. The students' report that the computer was a tool for writing, whilst the preferred tool for searching for information was the mobile phone.

Affordances and preferences

The students also report that using digital tools gives rise to affordances as well as constraints in classroom writing situations. For instance, an affordance related to digital tools means that students do not have to think about their handwriting.

> You can always read what you have written even if your handwriting is really bad. (*Du kan alltid läsa vad du har skrivit även om du skriver jättefult.*) (Interview 13)

Writing is reported to take place in different classroom situations. The students write essays in different subjects, but they also take notes during class. One frequently mentioned affordance was that digital tools made studying more structured.

> Now studying is faster. You sort of don't have to look for your notes. You have everything in the same place. [the iPad] (*Det går snabbare nu att plugga. Liksom du behöver inte leta efter anteckningar. Du har allting på samma ställe [iPaden].*) (Interview 9)

Having the study material inside the digital tool is seen as creating more efficient time management in class.

> First of all, it's very easy to get access to facts if you need something. One gets rid of all the running around. So you like always have it with you. (*Främst, väldigt lätt att tillgå fakta om man behöver något. Slipper springandet framför allt. Så har man den liksom alltid med sig.*) (Interview 10)

> I think we have time for more things, and I think it's more accurately done as compared to before, because now everything is written down in the iPad, and then you don't lose it… notebooks or stuff like that. (*Jag tycker vi hinner mer, och jag tycker det blir noggrannare gjort, för nu blir ju allting nerskrivet i iPaden liksom, och då tappar man inte bort dom… block eller något sådant där.*) (Interview 13)

Some students highlight that digital tools make studying management independent of time and space.

> You can bring it [the iPad] anywhere if you are going to do homework or something like that. (*Den [iPaden] kan man ju ta med sig överallt om man ska göra läxor eller nåt sånt på.*) (Interview 19)

In sharp contrast, some students do not prefer digital tools. Two of the interviewed students, both highly ambitions, explicitly say that they prefer working with pencil, paper, and textbooks.

> – But you prefer writing by hand? (*Men du föredrar och skriva för hand?*)
>
> – Yes. I think it feels better, and I remember more. It sort of sticks in the hand. (*Ja. Jag tycker det känns bättre, och jag kommer ihåg mer. Då liksom sätter det sig i handen.*) (Interview 30)

Irrespective of the nature of the classroom writing activities, some students highlight that digital tools are the tools of the future.

> In the future, primarily digital tools will be used. People will not sit with a pencil anymore. (*I framtiden kommer det mest va digitala verktyg. Man kommer inte och sitta med en penna längre.*) (*Interview 29*)

The same student thinks that it is the school's task to prepare the students for such a future, a task the student does not think is taken care of adequately.

> I don't think they are doing it [prepare for the digital future] so much. (*Jag tror inte dom gör det [förbereder för den digitala framtiden] så mycket.)* (Interview 29)

The analysis of the data highlights that writing constitutes an activity where usage of digital tools is very common; many students report a preference of computers over iPads since the former have larger screens and more manageable keyboards for text writing.

> It's a bigger screen [on a computer] so you see better. … It's easier to write on a computer with a keyboard than to write on [an iPad] screen. (*Det är ju större skärm [på en dator] så man ser ju bättre. … Det är lättare och skriva på en dator med tangentbord än och skriva på [en iPad-]skärm.*) (Interview 26)

Scollon and Scollon (2004) and others like Heath (1983) have argued for the central place of text reading, as well as text writing, in classroom activities. The interviewed students report that they use mainstream curricula textbooks in their classrooms.

> We have different… well like natural science books that we read. (*Vi har ju olika… alltså typ NO så får vi ju böcker och läsa i.*) (Interview 22)

However, some students, notably students with special needs, highlight that they listen to audio recordings of their classroom textbooks, instead of reading them. Interestingly, many students say that they rarely visit the library during the course of their schoolwork.

> I have actually almost never been to the library. (*Jag har faktiskt nästan aldrig varit i biblioteket.*) (Interview 20)

Constraints

Digital tools in different ways make the classroom activities vulnerable. For example, online activities and cloud solutions are dependent on a reliable internet connection.

> It [the biggest problem with digital tools] is that internet isn't up all the time, so then is it really impossible to use the iPad. (*Det [största problemet med digitala verktyg] är ju att internet ligger ju inte alltid uppe, så då är det ju egentligen kört att använda iPaden.*) (Interview 10).

Another constraint with digital tools is that if the students are not using external data storage, data is bound to one device. This means that, if that device is stolen or breaks down, their work gets lost.

> Yes, because just when they [the iPads] were stolen, we were finished with a film which had taken about two weeks to make. (*Ja, för precis när dom blev stulna hade vi gjort klart en film som hade tagit typ två veckor och göra.*) (Interview 29)

Special digital tools subject

A special "digital tools subject" is part of the school curriculum in the DIP project classrooms. Since this subject is not a part of the national Swedish curriculum, it becomes adapted in different ways by different students. The headmaster at School 3 highlighted that a school subject, digital tools, includes word-processing with Microsoft Word, presentations with Microsoft PowerPoint, file system, e-mail program, the learning platform, and how to handle an iPad. Students report that they learn how to use Microsoft Excel, web development and programming within this subject. In the following excerpt one student highlights the difference of this subject from other subjects in school.

> It's not a lesson like the other lessons, but it… sometimes it's rather free most of the time you can do what you want to do. Or it's little different at least. You can learn something new, often something you haven't done before. I have like hardly any knowledge about stuff like that we are working with today. Today we worked with Excel. *(Det är inte en lektion som kanske är lite som alla andra, utan det… ibland är det ofta ganska fria val till vad man kanske vill göra. Eller det är lite olika i alla fall. Man får lära sig nåt nytt, ofta sånt man inte gjort innan. Jag har liksom i stort sett knappt ingen kunskap om såna här grejer vi jobbar med idag. Idag jobbade vi med Excel.*) (Interview 20)

The special digital tools subject has a wide framework, and for many students this subject is their primary opportunity to access a computer at school. As the students want to use digital tools for working with their assignments, they take the opportunity to work with other subjects during the digital tools lessons.

> During the computer lessons we usually like work with schoolwork that has… that we don't have… like this… been able to catch up with. (*Datalektionerna brukar vi mest liksom jobba med skolarbete som har… som vi kanske inte har… så här… kommit ifatt i.*) (Interview 17)

Projects

A central social practice in classrooms relates to reading and writing of a large range of texts. While this is the case in non-digitally infused classrooms, our analysis suggests that this is also the case in a digitally enriched setting. The students report having access to digital tools when they are working with what they call "projects" (Figure 2). This means, among other things, that they do not have access to digital tools that are present inside their classrooms during non-project related schoolwork. A project typically consists of work across a three- or four-week period in a subject like Swedish, where

the class works on an essay (Figure 2). The flow of social practices across time – as illustrated in Figure 2 – highlights that students work on a handwritten manuscript inside their "home" classroom during the first one or two weeks. During the last week, the teacher reserves the computer room, where the students are required to create a digital version of their previously hand-written text.

> The teacher in Swedish says; 'Now we will begin with facts, so you have… You have seven lessons, then we start writing in the computer room'. Then the teacher reserves the computer room already then. (*Läraren i svenskan säger; 'Nu ska vi börja med fakta, så att så har ni… Ni har sju lektioner på er, sen börjar vi skriva i datasalen'. Då bokar ju den läraren datasalen redan då.*) (Interview 10)

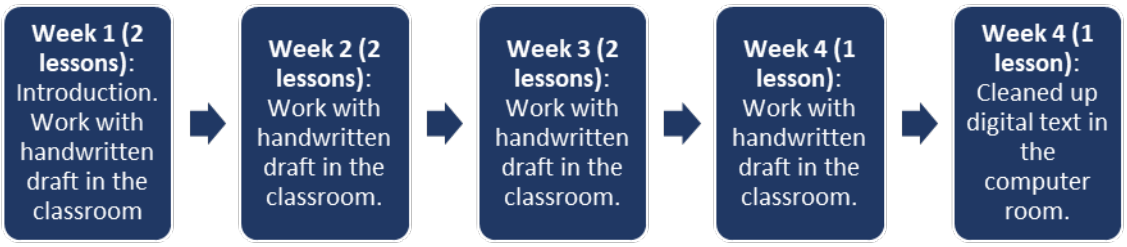

Figure 2. Example of the workflow in a project in the subject of Swedish

Computer rooms

Most students meet digital tools in the computer room of their school. The computer room is shared by all classes in the school, which means that it sometimes is difficult to get access to it.

> In order for us to go into our little computer room to write, they [the teachers] have to reserve it for us. Because there are so many lessons, and there are many who want time there so it's not always possible to find time. (*Ibland får vi gå in i vårat lilla datarum och skriva, då måste dom [lärarna] ju boka tid. För det är ju så mycket lektioner, och många som vill ha tid så det går ju inte alltid och hitta tider.*) (Interview 18)

One student highlights that some teachers reserve the computer room just in case their students want to go there.

> Even if they have a test, they have reserved it [the computer room], although they are not sure that they will be using it. Because they want to be sure of having access to it. (*Även om dom har prov så har dom bokat den [datasalen] fast dom använder inte det. För dom vill va säker typ.*) (Interview 29)

One of the two students in the iPad class highlights that going in a class where all students have access to a digital tool, means that the teacher does not have to reserve the computer room.

> And then we don't have to reserve the computer room, which is good because then we can use the classroom. (*Och då slipper vi också boka datasalen, vilket ju är bra för då kan vi ju använda klass-salen.*) (Interview 9)

Searching for information

Searching for information is a common digital tools classroom practice. Since computers are commonly located in locked computer rooms in schools, teachers sometimes allow students to use their mobile phones for searching the internet. Mobile phones are the preferred digital tool for searching the internet both at home and at school. Here dictionaries are substituted with web searches, Wikipedia, and even Google translate.

> Well there are books [for searching for facts] you can use as well. … They most probably choose the mobile because it's a little faster to get an answer. (*Alltså det finns böcker [att söka efter*

fakta i] som man kan utgå från också, det gör det. … Dom flesta väljer nog mobilen för att det kanske går lite snabbare och få fram svar.) (Interview 25)

Mathematics and music listening

In comparison with the subject Swedish and other school subjects, Swedish secondary school students report that their usage of digital tools seems to be less during mathematics lessons (OECD, 2015; The Swedish National Agency for Education, 2016b).

> Maths is mostly done on paper. (*Matten gör dom flesta på papper.*) (Interview 13)

This statement is reinforced by a student who has access to an iPad all the time in school due to his/her special needs status.

> And you are using it [the school provided iPad] in all subjects? *(Och du använder den [iPaden som skolan tillhandahåller] i alla ämnen?)*
>
> Well, not so much in maths, but… *(Ja, inte så mycket i matten, men…)*
>
> Why not in math? *(Varför inte i matten?)*
>
> Because there I have a book. (*För där har jag en bok.)* (Interview 24)

Students report that teachers deploy digital apps for group drilling games and that the students themselves use digital tools like a calculator app on the mobile phone or for listening to music during mathematics lessons. The latter includes students who are provided with a digital tool due to their special needs status. Mathematics is the only subject where students are allowed to listen to music and where they often listen to music during class time.

> Most often I'm using it [the mobile phone] in math so you can listen to music. (*Oftast så använder jag den [mobiltelefonen] till matten så man får lyssna på musik.*) (Interview 22)

The use of music during mathematics can be related to how the teaching of the subject is organized in Sweden. In these lessons the teacher starts with a short introduction, after which the students work individually (see Bagga-Gupta, 2002) where the interaction order in mathematics lessons has been described in terms of "desk-top lessons." Students report that they are allowed to listen to music during the individual work phases of the mathematics lessons. They also report – an issue substantiated by the classroom data in project DIP – that during the introduction phase, the teacher at times initiates a dialogue with the students where the students are asked to open their books and start working. This directing of the communication order is a typical aspect of mainstream classroom discourse (Scollon & Scollon, 2004).

Teachers engagement with digital tools and alternative modalities

Students also report that teachers substitute the use of writing on whiteboards with PowerPoint presentations, and that the earlier usage of DVD players or tape recorders are substituted with streaming media. Thus, according to student reports – also a routine supported by the ongoing ethnographic fieldwork in other DIP project classrooms – when teachers resort to the use of technological literacy tools, the common options deployed include PowerPoint presentations and streaming of media.

> So, they [the teachers] are showing like PowerPoint on the computer. Films and stuff like that. It's the only thing. (*Så, dom [lärarna] visar ju så här PowerPoint på datorn. Filmer och sånt. Det är ju bara det.*) (Interview 28)

The students' judgements about teachers' use and knowledge of digital vary.

> Do they [the teachers] use digital tools? (*Använder dom [lärarna] digitala verktyg?*)
>
> Not so many, [they] don't know such things. (*Inte så många, [de] kan inte sånt.*) (Interview 23)

Some students think it is tedious when teachers read from the PowerPoint.

> It becomes rather tedious. (*Det går ju ganska långtråkigt.*) (Interview 29)

Others think that it makes it easier to take notes from a PowerPoint presentation

> I think PowerPoint is good. (*Jag tycker PowerPoint är bra.*) (Interview 28)

Some teachers distribute paper handouts of their PowerPoint presentations. It is interesting to note that irrespective of the interaction order during the presentation of the PowerPoint and whether the teacher streams media content during classroom work, teachers tend to conduct whole class teaching where the focus is directed to the front of the classroom. In such a panopticon classroom, the teacher and students are physically separated (Scollon & Scollon, 2004). This is manifested in the rows of desks the students sit on, and the whiteboard in the front of the classroom where the teacher stands.

Some students highlight that some teachers' classroom work with digital tools has an organization wherein they have access to digital tools that represent alternative modalities or formats, like films.

> It [using YouTube in social science] helps very much actually. … It is like having an extra lesson because they are talking so much. (*Det [att använda YouTube i SO] hjälper väldigt mycket faktiskt. … Det är som att ha en extra lektion för att dom pratar så mycket.*) (Interview 18)

The interaction order during lessons where teachers regularly deploy digital tools – as can be noted from the excerpts above – consists of the presentation of PowerPoints or streaming of media, where students are expected to watch and take notes. A different kind of interaction order builds upon the teacher presenting an assignment prior to the lesson, for instance, watching a film or slideshow, from which clips are later scrutinized during class time. Students call such an arrangement "flippes", and this probably builds upon the concept used in the didactic literature "flipped classrooms":

> Flippes are like videos sort of, where a teacher takes from somebody else's [inaudible] YouTube channel maybe … We had about Judaism, and then they have… are making flippes that are presenting the history of Judaism for example, and then she publishes a lot of flippes and then you are watching them when you are studying at home. (*Flippar är som videos typ, där ofta en annan lärare från någon annans [ohörbart] YouTube-kanal har kanske… Vi hade om judendomen, och då har dom… gör dom flippar som berättar om judendomens historia till exempel, och så lägger hon ut en massa flippar och så kollar man på dom när man pluggar hemma.*) (Interview 11)

While Jacob and Matthew (2013) highlight that there is a lack of consensus regarding the concept of the "flipped classroom," they stress that a flipped classroom comprises of both an inside and an outside classroom activity. The inside part is interactive and group-based, while the outside part is computer-based and individual. In line with such an understanding, students report (see above) working both with computers and individually outside the classroom setting, but none of the interviewed students explained how they use "flippes" inside the classroom.

Students who themselves initiate digital searches of mathematic films on YouTube prior to the teacher taking up a specific topic or soon after the teacher has introduced a new topic in mathematics, constitutes another example of this type of interaction order. For instance, a student explains how she uses YouTube in mathematics.

> I can search on YouTube about Maths videos. Like how you calculate this. (*Sen matte kan jag söka på YouTube om videos. Så här hur man räknar ut det.*) (Interview 14)

This student takes an initiative and finds alternative answers to his questions. This also constitutes an example of how students add a new modality or format, film, to already existing modalities or formats, such as printed books and handwritten notes, in classroom settings.

Agency in Contexts: Interaction with Digital Tools

The second theme that has been identified in the analysis relates to agency in contexts. The common interaction order that prevails in classrooms that students describe implies that the teacher is positioned as the actor with the strongest agency. As we have seen in the analyses presented in the first theme, *Social Practices when Using Digital Tools*, it is primarily the teacher who decides when and how digital tools can be used. It is the teacher who controls the students' access to the classroom computers, iPad trolleys, as well as the computer room itself. Students report that the teacher has control inside the computer room as well.

> There [in the computer room] the teacher has more control. (*Där [i datasalen] har liksom läraren mer uppsikt.*) (Interview 17)

The computer room is understood as a learning space in terms of how Scollon and Scollon (2004) envisage a panopticon or a traditional classroom.

Almost all students have access to a mobile phone, but the teachers regularly collect the phones at the beginning of class time. Teachers in all three DIP project schools have agency in that they can collect student mobile phones before the school day or at the start of specific lessons. Such power is conferred on teachers by municipality decrees or the school administration. Not having access to their mobile phones means that it is difficult for students to use the affordances of these tools, for instance, to take pictures of their ongoing work during lessons. This is however easier for the students in the iPad class.

> Yesterday in natural science class, we were working with mirrors to see how it [the light] reflects, and instead of writing about how the rays reflected we just took a picture on the mirror and we saw exactly from there. (*Igår på NO-lektionen, där jobbade vi med speglar så vi ser hur det [ljuset] reflekteras, och i stället för och rita upp i boken då hur strålarna reflekteras så kunde vi bara ta ett kort på själva spegelbiten så vi såg exakt därifrån.*) (Interview 9)

The rationale for collecting the mobile phones is concerned with the disturbing influence that they are seen as having in classroom settings. Mobile phones are understood as being especially problematic when it comes to its incorrect use.

> We are handing them [the mobile phones] in before every class. But then there are many who don't do that. They sort of, just sit there and mess around with them and they aren't doing anything sensible. (*Vi lämnar ju in dom [mobiltelefonerna] innan varje lektion. Sen så är det ju många som inte gör det. Men dom typ, sitter ju bara och tramsar med dom så dom gör ju inget vettigt.*) (Interview 15)

The teachers' agency is also evident during test or examination situations. For instance, in the iPad DIP project classroom, students are required to erase all content on their iPads. The rationale provided for this is to prevent cheating.

> And then, when we are going to have a test, we have to erase all notes that we have taken in for example social science class so [the teacher] can see that we aren't cheating. (*Och sedan när vi ska ha prov, då skriver vi också på iPaden, och är vi tvungna att radera alla anteckningar vi har gjort under till exempel i SO-ämnet så att han ser så att vi inte fuskar.*) (Interview 9)

Within the framework of teachers' agency, they explicitly provide the students with choices. An example of this is when teachers invite students to study some material at home before coming to a specific lesson in the flipped classroom situation discussed earlier. Students report that some teachers also distribute some agency to them by asking them for their input on how the teaching could be conducted.

> When we started this semester we could choose how we wanted to plan the semester, and then we choose to do such [book review and presentation] with iPads. (*När vi började den här terminen så fick vi välja hur vi skulle lägga upp terminen då och då valde vi att göra en sån här [bokrecension och presentation] med hjälp av iPads.*) (Interview 19)

Sometimes the students explicitly attempt to challenge classroom norms about the use of digital tools in the course of their schoolwork. For instance, they report that they try to strengthen their agency by using computers at home for writing tasks and their mobile phones for searching on the internet or drilling during classwork.

> We can sort of nag that we want to do Kahoot. 'Can't we do Kahoot on Monday?', for example. And then maybe… (*Vi kan ju liksom tjata att vi vill köra Kahoot. "Kan vi inte köra Kahoot på måndag?", till exempel. Och då kanske…*) (Interview 10)

Using Kahoot is an example of a digital classroom activity many students think is fun. (Kahoot https://kahoot.com is a quiz application. It is used in various ways in school, but often as a drilling game.) Over all several students find studying more fun with digital tools.

> It is sort of nice using computers I think… Well it will sort of be… Well you could do how you want it yourself and design and things like that. Then it's… That's nice I think. (*Det är väl roligare att använda datorer kan jag tycka… Alltså det blir ju typ… Alltså man får göra hur man själv vill och designa och så här. Sen är ju… Det tycker jag är roligare.*) (Interview 21)

Despite the various ways in which students use digital tools both inside and outside classrooms, they report not having information about newer ways of how digital tools can be used, as the following excerpt illustrates:

> Are there other types of knowledge where the digital tools could play another role? I haven't given it much thought. (*Finns det andra typer utav kunskaper där dom digitala verktygen skulle kunna spela en annan roll? Jag har inte tänkt på det så mycket.*) (Interview 30)

Equality in Contexts: The Compensatory Role of Digital Tools

The final theme that has emerged in the analysis relates to issues of equality and the compensatory role subscribed to digital tools. Five of the 23 students in the interview dataset had been provided with digital tools based upon different special needs status that they were conferred with. These digital tools had been provided by the school and were used both inside and outside school settings. Students with special needs are envisaged as having a "natural" need for being supported by digital tools. Digital tools are seen as compensating a deficit and levelling out differences between students with special needs and able-bodied students. Some affordances of the digital tools are used by all students who have access to digital tools. For instance, one student mentions a feature that is used by students with special needs, but also by students in the iPad class: to audio record, what the teacher says.

> So you can record it [what the teacher says], so you can listen to it and remember it. (*Så kan man spela in det [läraren säger], så att man kan lyssna på det sedan och komma ihåg det.*) (Interview 9)

Students with special needs report being supported by digital tools. One student with special needs says that:

> Yes, it is an enormous difference [to have access to an iPad]. (*Ja, det är ju en enorm skillnad [att ha tillgång till en iPad].*) (Interview 12)

However, and in line with research on support services (see for instance, Bagga-Gupta et al., 2016), and given that students with special needs are often the only ones who are automatically provided with digital tools, the tools themselves become stigmatizing. One student, with a diagnosis of dyslexia, who attends the iPad class in the DIP project, highlights this issue.

> Now it isn't so anymore because the whole class have it [an iPad], but it was little like people saw that, that [student] has problems in school. (*Nu är det inte så för att hela klassen har det [tillgång till en iPad], men det var ju lite det här att folk såg att den där [eleven] har problem i skolan.*) (Interview 13)

All students with special needs, for example students with the diagnosis dyslexia, have access to digital tools like an iPad or a laptop computer that they can use both in school and at home. They can thus take advantage of similar digital affordances like those accessible to other students. However, they also have access to and use software that the other students cannot access or use:

> Yes, I have the best program I sort of ever got, it is… Do you know what Reading Service[2] is? (*Ja, jag har det bästa programmet som jag typ fått fram, det är… Du vet vad Inläsningstjänst är?*)
>
> Yes, right. (*Ja, just det.*)
>
> I find that really good! (*Det tycker jag är jättebra.*)
>
> Yes, in what way? (*Ja, på vilket sätt?*)
>
> That I don't have to read. I don't have to ask my parents to read it for me. Can sit in my room, reading it… (*Att jag slipper läsa. Jag slipper be mina föräldrar läsa det för mig. Kan sitta på mitt rum och lyssna på…*) (Interview 24)

Access to, and use of, digital tools by special needs students in comparison to the other students constitutes a complex issue. The compensating effect of special treatment can be neutralized when all students have access to digital tools. This can be illustrated by the reflections of a student with a dyslexia diagnosis in the project iPad classroom; the student reports a situation of both affordances and constraints given that all the students in her classroom have been provided with an iPad.

> For these who got problems or things like that in school it is a relief that everybody has an iPad, including me and then I know that even others have information about iPad's if anything goes wrong. (*Att för dom som har problem eller sådär i skolan så är det både en lättnad att alla har en iPad och att jag själv får ha en iPad och veta att det är fler som kan mer om iPads än bara själv om det strular.*) (Interview 13)
>
> For some is it good [that the school provides iPads to all students], but it is also disadvantageous for me. Because when I use the iPad, it is faster for me, but now it is faster for them as well, so they still have to wait for me. (*För en del är det ju bra [att skolan delar ut iPads till alla elever], men det är också lite sämre för mig. För jag har ju använt iPaden för det går snabbare för mig, nu går det ju snabbare för dom också, så då får dom ju ändå vänta på mig.*) (Interview 13)

These excerpts highlight that students with special needs get some support through the usage of digital tools, both common tools that are used by everyone and specific tools connected to their functionality issue. The introduction of digital tools for all students is viewed as being positive in that it makes using digital tools a natural part of schoolwork and the issue of stigma for the student using it gets erased. However, this also means that the special needs student misses the advantages they had on account of the access to and use of digital tool.

Some students highlight the compensating role the school needs to have if it is to level out socioeconomic and other disparities. The students report that teachers at times encourage them to use their own private digital tools and that they are themselves keen on using digital tools in schoolwork in order to take advantage of the affordances offered by them. For instance, the possibilities to add new modalities to improve their work, like taking and incorporating photographs and videos in their schoolwork. Pictures and films are memory consuming though, as one student, who uses the private iPad in school points out:

> It would perhaps have been better if I had an iPad from school because a lot is saved on it [her own iPad] and it takes a lot of space… Well everything else as well. Yes, it will be full.

[2] Reading Service (Inläsningstjänst) is a company with a service available for Swedish schools where school books are audio recorded.

> (*Det hade kanske varit bättre ifall jag hade haft en iPad från skolan för att liksom det blir mycket så här sparat på den och då tar det ju mycket utrymme för… Alltså annat också. Ja, det blir fullt.*) (Interview 11)

Another issue that is raised by students in the area of equality is the situation when the students' digital tools are not compatible with the demands made by the school.

> Sometimes you can check on the telephone. But it's a little difficult… I've got a little different… Windows phone, so there aren't so many apps that they [the classmates] use. It's mostly iPhone apps they are using. (*Ibland kan man ju kolla på telefonen och så. Men det är ju lite svårt… Jag har ju så lite annan… Windows-telefon, så då så finns det inte så många appar som dom använder. Det är ju mest iPhone-appar dom använder som.*) (Interview 16)

As highlighted in the introduction, almost all Swedish 15-year-olds have access to the internet at home. However, for different reasons highlighted above, they cannot use private digital tools for schoolwork. Some students stress that the responsibility for the provision of digital tools in schools is related to the fact that not all students have access to private digital tools for schoolwork.

> It's fairer if everybody got one [iPad]. Because all families cannot afford to buy their own iPad. (*Det är mer rättvist om alla får [en iPad]. För alla familjer har ju inte tillgång till att köpa en egen iPad.*) (Interview 10)

This expressed equality issue is further highlighted when using digital tools is envisaged as a prerequisite for getting higher grades:

> We got three lessons in school when we had access to computers but in that time, you can't write so much so if you haven't got a computer at home then… Well, then you can't reach that high [grade]. (*Vi fick tre lektioner i skolan då vi hade tillgång till datorer men på den tiden hinner man inte skriva så mycket så att ifall man inte har en dator hemma så då… Ja, då kan man inte nå så högt [betyg].*) (Interview 30)

For ambitious students, the prerequisite for using digital tools to aim for higher grades can become a constraint since they may not be able to locate suitable material. One student, who explicitly prefers traditional tools, highlights that to a high extent, the information found on the internet is not intended for fifteen-year-old Swedish students.

> In physics or subjects like that, if you are searching then Wikipedia is often the only [place] where it's simple enough for me to understand, because in other pages it's sort of… well it's intended for adult people, and I don't understand them, I don't have that vocabulary that is necessary to understand the text. (*I fysik eller nåt liknande, ifall man söker upp det så är oftast Wikipedia det enda [ställe] där det är så enkelt så att jag själv kan förstå, för att på andra sidor så är det liksom… ja, det är anpassat för vuxna människor, och jag förstår inte, jag har inte det ordförrådet som krävs för att förstå texten.*) (Interview 30)

To sum up, three distinct themes have been identified in the analysis. The final section of this paper discusses these three themes and relates them to the salient aims of the present study.

DISCUSSION

The study presented in this paper explores students' accounts of using digital tools in school. In the analysis of discourses in place, three main themes emerged: (1) Action in contexts, (2) Agency in contexts and (3) Equality in contexts. These illuminate the nature of students' engagement with digital tools in school settings and, in particular, how they account for their experiences of using digital tools within formal education. These three themes, i.e. the discourses in place are further discussed in this final section.

Action in Contexts – The Heavy Historical Body

The social practices of using digital tools are formed by the historical body, in the sense that digital tools are mainly used as substitutes rather than working as a transformative force to change knowledge formation practices in schools. The analysis of the interview data highlights that the students report using a variety of digital tools, including desktop computers, laptop computers, iPads, and mobile phones, in terms of digital objects and artefacts. The classrooms are equipped with projectors and, in some cases, smartboards. These tools are primarily used for writing, searching for information, and for practice drills. The preferred choice among the digital tools is the computer, and the rationale provided is the bigger screens and better keyboards. A reason for this choice could be the textual focus of a traditional classroom discourse. Writing is the primary focus when students use what Bagga-Gupta (2001, 2017) designates discursive-technological tools.

The classroom is an arena for social arrangements. This arena is interwoven with the practices of teaching and education, and this determines if and how digital tools are used in the institutionalized setting. Several discourses circulate in the students' statements, and this is echoed in the fact that "[m]any of the discourses present in an action are 'submerged' into practice by long habit" (Scollon & Scollon, 2004, p. 105). This means that a traditional classroom discourse is largely overt, it is considered the "normal" discourse and is not discussed. It is internalized into the historical bodies of students and teachers. The students have eight years of experience of the Swedish school system and have in many, but not all, cases attended traditional schools. This is emphasized by the fact that some, primarily ambitious, students (e.g., interviews 15 and 30) appear to prefer the traditional classroom. In addition, the teachers' historical bodies are shaped by the traditional school discourse. They have attended school themselves and they have also been formed by teacher education, other teachers, and their own teaching experiences.

When the students discuss digital tools, their narratives illustrate a traditional classroom, rather than a technology-mediated classroom. When digital tools are used, they are used as substitutes for corresponding traditional tools (like paper and pencil or the whiteboard), and in this sense, they do not become a discursive resource (see e.g., Bagga-Gupta, 2001, 2017). Such types of substitutions could be considered what Scollon (2008) calls *a resemiotization* of traditional tools, i.e., a transformation from one state to another. Pencils and papers transform into word processing programs, the whiteboard transforms into a presentation program. However, this is primarily a transformation into new forms, not new ways of teaching and learning. The ways teaching and learning are supposed to be conducted, with pencils and paper, but without mobile phones, have been internalized into the historical bodies of the students and teachers for a long time. Therefore, even when the students have the power to choose when and how to use digital tools, they use them in accordance with the traditional classroom discourse.

The historical body is an un-separable part of all actors, including those who are responsible for scheduling. The Swedish schools could decide themselves how they want to schedule as long as the students got the right amount of total scheduled time. However, traditionally the schedule is divided in subjects with 40 minutes lessons. This tradition is internalized in the historical bodies and reinforce the traditional classroom. In the nation-state of Sweden, use of digital literacy tools is not unproblematic in a traditional classroom where subjects are strictly separated. In these, discourse is "focused on syllabus-defined and teacher-controlled topics" (Scollon & Scollon, 2004, p. 46). Given that usage of digital tools is not a part of the syllabus here, there is no incentive to use them. Therefore, digital tools are used as substitutes for traditional tools to fit the syllabus.

The incentive to make schools fit into contemporary society appears to increase use of newer tools and the special digital tools subject that the students are offered. The consequence is the specialness attached to the usage of digital tools. In everyday work, the students receive opportunities to work with digital tools during the last one or two lessons in a three or four-week long period of what is called project work. The digital tools, generally located in a special computer room or on a trolley, are

not even freely accessible to the teachers. The location of digital tools thus resembles the case of handicraft classrooms and music classrooms. This constrains students' possibilities to engage with the affordances of the tools. As Jones and Hafner (2012, p. 13) stress, "'digital literacies' involve not just being able to 'operate' tools like computers and mobile phones, but *also* the ability to adapt the affordances and constraints of these tools to *particular* circumstances." When the students, and teachers, have to wait several weeks to get access to the computer room or iPad trolley, it constrains their possibilities to adapt the digital tools to everyday work, which in turn has a bearing on their developing digital literacy.

Agency in Contexts – Old Hierarchies and New Orders

In the classroom, the analysis highlights that it is the teacher who has the strongest agency; it is the teacher who decides when and how the digital tools will be used. Students are keen to use digital tools in school; their rationale is that their work benefits in terms of being more structured, becomes easier to administer, and is more independent of time and space when digital tools are used. However, they highlight that when they work with digital tools, these tools are not always adapted for their schoolwork. Students use Google and Wikipedia, and this leads to an awareness regarding issues related to legitimacy of different sources. However, as one student (interview 30) studying German highlights, there is very little material available for lower secondary Swedish students. The Wikipedia articles, as well as other online texts, are written by adults for adults. Moreover, in language studies, the student argues, Swedish secondary school students do not have relevant experiences of reading "real" texts in the target language German.

Teachers in Sweden have a strong agency when it comes to practices of teaching and education. Syllabi and curricula are prescribed by the Swedish National Agency for Education, Skolverket, but it is the individual teacher who interprets and implements these policy documents. The teacher profession is complex, and given the lack of central directives (Salavati, 2016; Samuelsson, 2010), a resistance toward using new technology can be strong. Some degree of common traditions is carried over between generations. Thus, newcomer teachers learn from teachers who are old-timers, both in teachers' education and in the institutional field of school education; this is a natural process of becoming a part of the community of practitioners (Lave & Wenger, 1991). This process, together with the teachers' own experiences of school, shapes teachers' historical bodies.

> Even on their first day of university teaching teachers come to the class with some sixteen or more years of experience in the classroom, many of those years in university classrooms exactly like the one in which they are teaching. Their historical bodies, that is their life experiences, their goals or purposes, and their unconscious ways of behaving and thinking have been formed to a large extent within schools. (Scollon & Scollon, 2004, p. 46)

The nature of classroom practices passes from one generation to another. Several examples of a traditional interaction order can be identified in the students' accounts. By collecting mobile phones at the start of a lesson or by holding on to the key to the computer room – the ultimate signature of the gatekeeper – the teacher controls the interaction order (compare Holmström & Bagga-Gupta, 2017). Another example of how an interaction order from a traditional school is inherited and internalized in the historical bodies is when the students in the iPad class (interviews 9 and 13), have to erase all content on their iPads before a test.

A common expectation in classrooms in the nation-state of Sweden is that students take initiatives and even challenge the teacher's authority. Some students highlight examples of how the interaction order of the traditional classroom is challenged. Sometimes the students take initiatives and propose how they want the teaching to be organized. These initiatives often fit in a traditional classroom style of working though, for instance, when the students want to use their mobile phones for searching the internet or using drilling apps.

Traditionally, the preferred modalities in school settings are print-books and (hand-)written texts. The students increase their repertoires of engagement when they work with digital tools. They search for YouTube films during mathematics lessons, produce their own movies during language education, or stylize their notes. They also audio record lessons or listen to audio recordings of textbooks. The students mix modalities, for example, texts and images. Working with different modalities often means that an alternative interaction order emerges. The initiative to use new modalities often comes from the students, and the students take command of their learning and classroom situations. This interaction order is closely connected to a technology-mediated classroom style (Scollon & Scollon, 2004). This interaction order also illustrates how students engage with digital tools in a creative way. Consequently, creative usage of digital tools is closely connected with a technology-mediated classroom.

Equality in Contexts – The Compensating Role of the School

Swedish schools play a compensatory role in the efforts to create equity for their students. One of the first paragraphs of the national curriculum for compulsory schools reads, "Teaching should be adapted to each pupil's circumstances and needs. It should promote the pupils' further learning and acquisition of knowledge based on pupils' backgrounds, earlier experience, language and knowledge" (The Swedish National Agency for Education, 2011, p. 10). To live up to the demand that "teaching should be adapted to each pupil's circumstances and needs," schools provide digital tools to students who have been identified as having special needs. For these students, digital tools could be considered in terms of compensating tools, i.e., tools that compensate some kind of deficit.

The five interviewed students with special needs indicate that their digital tools are very important for them. The digital tools offer affordances such as extended modalities, like photos and audio and video recordings. However, digital tools are only compensating if they provide an advantage for the students with special needs. As the student in interview 5 highlighted, when all students have access to an iPad, they once again must wait for the student with special needs to complete the tasks, and once again, the student is in a stigmatized position. When the student was the only one with a digital tool, it was clear for everyone that the student had special needs. Now, when the rest of the class have to wait, the student once again feels stigmatized. Bagga-Gupta et al. (2016) problematize the double-edged sword of inclusion and stigmatization in a context of higher education. They highlight the risk that support "gets reduced to a *display of a policy of inclusion*" (p. 15, italics in original). Here it is significant to understand the important role of adults in learning settings. For instance, in their study of a student with a compensating tool for hearing loss, i.e., a cochlea implant (CI), Holmström and Bagga-Gupta (2017) highlight the importance of the behavior of the adults in the classroom. Given the stronger agency that adults have in the classroom, they can control the supportive tools and, perhaps unwittingly, reinforce the stigmatization of the students with special needs. One of the interviewed students, attending the iPad class, who due to special needs had an iPad much prior to the classmates receiving the same, points out that

> The teachers maybe didn't really believe you when you took a test, because then they want to shut down the internet and delete a lot of documents. But you want to keep such stuff … Today when the entire class has iPads it isn't like that anymore, but previously it was a little like people saw that this [student] has problems in school. (*Lärarna kanske inte riktigt tror på en när man gör prov, för då vill dom ju stänga av internet och plocka bort en massa dokument. Sådant där som man vill ha kvar […] Nu är det inte så för att hela klassen har det, men det var ju lite det här att folk såg att den där [eleven] har problem i skolan.*) (Interview 13)

However, needs are not only physical. Several interviewed students highlight the compensating role of the school for socioeconomic disadvantage. As one student put it:

> All families can't afford to buy their own iPad. (*Alla familjer har ju inte tillgång till att köpa en egen iPad.*) (Interview 10)

And families that would have the possibility to buy digital tools must buy tools that are compatible with the demands of the school. This is a key argument for the general digitalization of the Swedish schools.

The interviewed students with special needs, together with other students, highlight socioeconomic differences and stress a compensating discourse. Schools should, they suggest, compensate for learning problems, e.g., related to dyslexia, or for different kinds of other differences. The students with special needs also highlight a stigmatization discourse. In the historical bodies of students with special needs, school often has a negative association.

> I lay with my head on my desk all the time [in seventh grade], so I wasn't even active, so… From my point of view, it [the iPad] has given me a chance to get myself an education actually. (*Jag låg med huvudet på bänken hela tiden, eller så var jag inte ens aktiv, så att… I mina ögon sett så har det nog gett mig en chans att utbilda mig till något tror jag faktiskt.*) (Interview 12)

With access to digital tools, school has turned into something positive. With digital tools, a new interaction order has appeared, where students with special needs have strengthened their agency.

> As I am a curious person, I have… well, helped some others in my class. She [the teacher] finds that supportive, so I have received a lot of praise for that. (*Eftersom jag är en utav dom personerna som är nyfiken och lär mig lätt, så har jag… ja, hjälpt några i våran klass. Det tycker ju hon är ett understöd, så jag har fått mycket beröm för det.*) (Interview 12)

The three key themes that have emerged in this study give rise to the need to reflect upon how a panopticon view of contemporary classrooms can be challenged and a more technologically oriented classroom interaction order be established. Future studies that address digital technologies in schools need to pay special attention to the interaction between students, teachers, and various kinds of tools in order to map the nature of the classrooms before challenging the panopticon view of the classroom and of the education process.

CONCLUSIONS

This study finds that, although schools appear to have come a long way in the digitalization process, it is of crucial importance to understand the underlying dynamics of this process in order to understand the effects of the digitalization process. In this study we found that the usage of digital tools in the classroom was characterized by a mere substitution of traditional classroom technology, dominated by paper, pens, and textbooks. Although the students appreciated working with digital tools, they had difficulties identifying the added value of using them. In addition to this, the teacher controlled how, when, and where digital tools were used. For students with special needs digital tools were reported to have a compensatory effect, supporting their studies. Their advantage, however, seemed to be related to whether their classmates had access to the same digital tools or not.

We conclude that discourses and interaction orders of a classrooms are imprinted in the historical bodies of both students and teachers. In other words, new technology is integrated into old habits. This calls for a well-prepared digitalization process that can attend to, and prevent, marginalization processes. A poorly incorporated or ad hoc digitalization process risks leading to further marginalization of the already marginalized.

REFERENCES

Agar, M. H. (2008). *The professional stranger. An informal introduction to ethnography* (2nd ed.). Emerald Group.

Bagga-Gupta, S. (2001). Diskursiva och teknologiska resurser på visuella tvåspråkiga pedagogiska arenor [Discursive and technological resources in visual bilingual arenas]. *Utbildning & Demokrati, 10*(1), 55-83.

Bagga-Gupta, S. (2002). Explorations in bilingual instructional interaction: A sociocultural perspective on literacy. *Learning and Instruction, 12*(5), 557-587. https://doi.org/10.1016/s0959-4752(01)00032-9

Bagga-Gupta, S. (2012). Privileging identity positions and multimodal communication in textual practices: Intersectionality and the (re)negotiation of boundaries. In A. Pitkänen-Huhta & L. Holm (Eds.), *Literacy practices in transition. Perspectives from the Nordic countries* (pp. 75-100). Multilingual Matters. https://doi.org/10.21832/9781847698414-006

Bagga-Gupta, S. (2017). Going beyond oral-written-signed-irl-virtual divides. Theorizing languaging from mind-as-action perspectives. *Writing & Pedagogy, 9*(1), 49-75. https://doi.org/10.1558/wap.27046

Bagga-Gupta, S., Messina Dahlberg, G., & Winther, Y. (2016). Disabling and enabling technologies for learning in higher education for all: Issues and challenges for whom? *Informatics, 3*(4), 21. https://doi.org/10.3390/informatics3040021

Bergdahl, N., Fors, U., Hernvall, P., & Knutsson, O. (2018). The use of learning technologies and student engagement in learning activities. *Nordic Journal of Digital Literacy, 13*(2), 113-130. https://doi.org/10.18261/issn.1891-943x-2018-02-04

Bingimlas, K. A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science and Technology Education, 5*(3), 235-245. https://doi.org/10.12973/ejmste/75275

Björk, L.-E. (1983). Datorernas intåg i svensk skola [The entry of the computers in Swedish school]. *Nämnaren,1*, 32-35. http://ncm.gu.se/pdf/namnaren/3235_83-84_1.pdf

Block, D. (2017). Positioning theory and life-story interviews: Discursive fields, gaze and resistance. In S. Bagga-Gupta, A. L. Hansen, & J. Feilberg (Eds.), *Identity revisited and reimagined: Empirical and theoretical contributions on embodied communication across time and space* (pp. 25-39). Springer. https://doi.org/10.1007/978-3-319-58056-2

De Fina, A. (2018). *Crossing paths: Storytelling and storytellers in a mobile world.* Keynote at Sociolinguistics Symposium 22, Auckland, New Zealand, Jun2 2018.

Erixon, P.-O. (2010). School subject paradigms and teaching practice in lower secondary Swedish schools influenced by ICT and media. *Computers and Education, 54*(4), 1212-1221. https://doi.org/10.1016/j.compedu.2009.11.007

Fleischer, H. (2017). Students' experiences of their knowledge formation in a one-to-one computer initiative. *Education Inquiry,* 8(2), 123-136. https://doi.org/10.1080/20004508.2016.1275190

Gee, J. P. (1999). *An introduction to discourse analysis. Theory and method.* Routledge.

Goffman, E. (1983). The interaction order: American Sociological Association, 1982 presidential address. *American Sociological Review, 48*(1), 1-17. https://doi.org/10.2307/2095141

The Government of Sweden. (2016). *Digitalization in school - Its influence on quality, equivalence and result in the education* [Digitaliseringen i skolan – dess påverkan på kvalitet, likvärdighet och resultat i utbildningen]. (2015/16:RFR18). https://www.riksdagen.se/sv/dokument-lagar/dokument/rapport-fran-riksdagen/digitaliseringen-i-skolan---dess-paverkan-pa_H30WRFR18

Gynne, A. (2016). *Languaging and social positioning in multilingual school practices. Studies of Sweden Finnish middle school years* [Doctoral thesis, Mälardalen University]. http://urn.kb.se/resolve?urn=urn:nbn:se:mdh:diva-31774

Hammersley, M., & Atkinson, P. (2007). *Ethnography. Principles in practice* (3rd ed.). Routledge.

Hatakka, M., Andersson, A., & Grönlund, Å. (2013). Students' use of one to one laptops: A capability approach analysis. *Information Technology and People, 26*(1), 94-112. https://doi.org/10.1108/09593841311307169

Heath, S. B. (1983). *Ways with words: Language, life, and work in communities and classrooms.* Cambridge Univ. Press.

Holmström, I. (2013). *Learning by hearing? Technological framings for participation* [Doctoral thesis, Örebro University]. http://urn.kb.se/resolve?urn=urn%3Anbn%3Ase%3Aoru%3Adiva-30754

Holmström, I., & Bagga-Gupta, S. (2017). "Va sa han?" Technologies and participation strategies in mainstream school settings. In S. Bagga-Gupta (Ed.), *Marginalization processes across different settings. Going beyond the mainstream.* Cambridge Scholars Publishing.

Hult, F. M. (2015). Making policy connections across scales using nexus analysis. In F. M. Hult & D. Cassels Johnson (Eds.), *Research methods in language policy and planning: A practical guide* (1st ed.). Wiley. https://doi.org/10.1002/9781118340349.ch19

Hult, F. M., & Pietikäinen, S. (2014). Shaping discourses of multilingualism through a language ideological debate. The case of Swedish in Finland. *Journal of Language and Politics, 13*(1), 1-20. https://doi.org/10.1075/jlp.13.1.01hul

Håkansson Lindqvist, M. (2013). Possibilities and challenges for TEL from a student perspective through the uptake and use of digital technologies in a 1:1 initiative. *Education Inquiry, 4*(4). https://doi.org/10.3402/edui.v4i4.23223

Håkansson Lindqvist, M. (2015). Exploring activities regarding technology enhanced learning in a one-to-one initiative. *Nordic Journal of Digital Literacy, 10*(4), 227-245. https://doi.org/10.18261/issn.1891-943X

Jacob, B., & Matthew, A. V. (2013, June 23-26). *The flipped classroom: A survey of the research* [Paper presentation]. The 2013 ASEE Annual Conference & Exposition, Atlanta, Georgia. https://peer.asee.org/22585

Jones, R. H., & Hafner, C. A. (2012). *Understanding digital literacies. A practical introduction.* Routledge.

Källkvist, M., & Hult, F. M. (2016). Discursive mechanisms and human agency in language policy formation: Negotiating bilingualism and parallel language use at a Swedish university. *International Journal of Bilingual Education and Bilingualism, 19*(1), 1-17. https://doi.org/10.1080/13670050.2014.956044

Lane, P. (2010). "We did what we thought was best for our children": A nexus analysis of language shift in a Kven community. *International Journal of the Sociology of Language, 2010*(202), 63-78. https://doi.org/10.1515/ijsl.2010.014

Lassen, I. (2008). The Red Gold: Analysing a nexus of practices. *Critical Discourse Studies, 5*(1), 1-19. https://doi.org/10.1080/17405900701768851

Lave, J., & Wenger, E. (1991). Situated learning. Legitimate peripheral participation. Cambridge University Press. https://doi.org/10.1017/cbo9780511815355

Lievrouw, L. A., & Livingstone, S. (2006). Introduction to the updated student edition. In L. A. Lievrouw & S. Livingstone (Eds.), *The handbook of new media.* SAGE. https://doi.org/10.4135/9781446211304.n1

Lindberg, J. O., Olofsson, A. D., & Fransson, G. (2017). Same but different? An examination of Swedish upper secondary school teachers' and students' views and use of ICT in education. *The International Journal Of Information and Learning Technology, 34*(2), 122-132. https://doi.org/10.1108/ijilt-09-2016-0043

McGregor, G. C. (1965). *Computer assisted instruction.* R. I. State Department of Vocational Education

Nishida, K. (1958). *Intelligibility and the philosophy of nothingness. Three philosophical essays* (R. Schinzinger, Trans.). East-West Center Press. https://doi.org/10.2307/1397422

Organisation for Economic Cooperation and Development. (2015). *Students, computers and learning: Making the connection.* http://www.oecd.org/publications/students-computers-and-learning-9789264239555-en.htm

Organisation for Economic Cooperation and Development. (2017). *PISA 2015 results (Volume III): Students' well-being.* https://www.oecd.org/education/pisa-2015-results-volume-iii-9789264273856-en.htm

Organisation for Economic Cooperation and Development (2018), *OECD reviews of digital transformation: Going digital in Sweden.* https://doi.org/10.1787/9789264302259-en

Olofsson, A. D., Lindberg, O. J., & Fransson, G. (2018). Students' voices about information and communication technology in upper secondary schools. *The International Journal of Information and Learning Technology, 35*(2), 82-92. https://doi.org/10.1108/ijilt-09-2017-0088

Pietikäinen, S., Lane, P., Salo, H., & Laihiala-Kankainen, S. (2011). Frozen actions in the Arctic linguistic landscape: A nexus analysis of language processes in visual space. *International Journal of Multilingualism, 8(*4), 277-298. https://doi.org/10.1080/14790718.2011.555553

Salavati, S. (2016). *Use of digital technologies in education: The complexity of teachers' everyday practice* [Doctoral thesis, Linnaeus University]. http://lnu.diva-portal.org/smash/get/diva2:1039657/FULLTEXT01.pdf

Samuelsson, U. (2010). ICT use among 13-year-old Swedish children. *Learning, Media & Technology, 35*(1), 15-30. https://doi.org/10.1080/17439880903560936

Scollon, R. (2008). *Analyzing public discourse. Discourse analysis in the making of public policy*. Routledge.

Scollon, R., & Scollon, S. W. (2004). *Nexus analysis. Discourse and the emerging Internet*. Routledge. https://doi.org/10.4324/9780203694343

Selwyn, N. (2011). 'It's all about standardisation' – Exploring the digital (re)configuration of school management and administration. *Cambridge Journal of Education, 41*(4), 473-488. https://doi.org/10.1080/0305764x.2011.625003

Schiff, B., McKim, A. E., & Patron, S. (2017). *Life and narrative: The risks and responsibilities of storying experience*. Oxford University Press.

Shuman, A. (2005). *Other people's stories: Entitlement claims and the critique of empathy*. University of Illinois Press.

Suppes, P. (1966). The uses of computers in education. *Scientific American, 215*(3), 206-220. http://search.ebscohost.com/login.aspx?direct=true&AuthType=cookie,ip,uid&db=eric&AN=ED027549&site=ehost-live

The Swedish National Agency for Education. (2011). *Curriculum for the compulsory school, preschool class and the recreation centre 2011*.

The Swedish National Agency for Education. (2016a). *Account of the mission to suggest national IT strategies for the school system - Changes in curricula, course syllabi, subject syllabi and diploma goals* [Redovisning av uppdraget om att föreslå nationella it-strategier för skolväsendet – förändringar i läroplaner, kursplaner, ämnesplaner och examensmål]. https://www.skolverket.se/om-skolverket/publikationer/sok?_xurl_=http%3A%2F%2Fwww5.skolverket.se%2Fwtpub%2Fws%2Fskolbok%2Fwpubext%2Ftrycksak%2FBlob%2Fpdf3668.pdf%3Fk%3D3668

The Swedish National Agency for Education. (2016b). *The usage of IT and IT competence in school. IT follow-up of the Swedish National Agency for Education 2015* [IT-användning och IT-kompetens i skolan. Skolverkets IT-uppföljning 2015]. https://www.skolverket.se/publikationer?id=3617

The Swedish National Agency for Education. (2019). Changes and digital competence in control documents [Förändringar och digital kompetens i styrdokument]. https://www.skolverket.se/temasidor/digitalisering/digital-kompetens

Säljö, R. (2005). *Lärande & kulturella redskap. Om lärprocesser och det kollektiva minnet* [Learning & cultural tools. On learning processes and the collective memory]. Norstedts akademiska förlag.

Tapio, E. (2013). *A nexus analysis of English in the everyday life of FinSL signers: A multimodal view on interaction* [Doctoral thesis, University of Oulo].

Wertsch, J. V. (1998). *Mind as action*. Oxford University Press.

Wolcott, H. F. (2008). *Ethnography. A Way of Seeing* (2nd ed.). AltaMira Press.

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