



“It must not disturb, it’s as simple as that”: Students’ voices on mobile phones in the infrastructure for learning in Swedish upper secondary school

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Abstract Drawing from a survey and focus group interviews, this study explores how Swedish upper secondary students reason about the usage of their personal mobile phones in school. As a contribution to the debate around the mobile phone’s role in school, we present the students’ own voices relative to the question of regulating mobile phone use. We use the notion of infrastructure for learning (Guribye and Lindström 2009) to analytically approach the social and technological dimensions of the students’ narratives on their use of mobile phones in school practice. The students’ narratives present an intricate account of students’ awareness and concern of the implications of mobile phone presence in school. The students describe that the mobile phone is both a tool that facilitates their school work and a distraction that the teachers pursue. In school, the students are balancing their mobile phone usage with the teachers’ arbitrary enforcement of policy. Despite this process, the mobile phone is becoming a resource in the students’ infrastructure for learning. The findings from this study add to the limited body of research on the use of mobile phone in upper secondary school from a student perspective.

Keywords Mobile phones · Infrastructure for learning · Upper secondary school · Students’ perspective · Bring Your Own Device (BYOD)

1 Introduction

Digital technologies such as desktop computers, laptops and tablets are technologies that schools have continuously made investments in (Perselli 2014). At present, as

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much as three out of four upper secondary students in Sweden are provided with access to a personal computer by their school (Skolverket 2016a). However, the technology distributed by the school is not the only technology that upper secondary students have access to. Nearly every student in Swedish upper secondary schools have access to a personal smartphone, in their own possession (Alexandersson and Davidsson 2016). Generally, the presence of students' personal technology in school has not been appreciated. School settings have proven to be arenas in society that are not receptive and tolerant to the use of mobile phones (Ling 2004). The presence of mobile phones (including smartphones) in school has been followed by debate and discussions on what schools should make of the technology. Despite that some schools or individual teachers have occasionally opened up for use of the mobile phone for school work, it is well documented that the mobile phone has turned out to be a controversial technology in schools (e.g., Campbell 2006; Gao et al. 2014; Thomas and O'Bannon 2014). Rather than picking up on possible educational applications, the recurring suggested means to cope with the presence of mobile phones in secondary schools in many countries has been to ban them (Kukulska-Hulme et al. 2011; O'Bannon and Thomas 2015; Ott 2014). Nevertheless, students keep on bringing their mobile phones to school.

In this paper, we address this controversy from the perspective of the students. Drawing upon the notion of infrastructure as a layered and relational ecology of tools and actions (Star and Ruhleder 1996), we examine the presence of students' mobile phones in school. Infrastructure can be understood as two part, first there is a universal service infrastructure, open to all citizens, second there are work oriented infrastructures, open only to participants in specific practices (Hanseth and Lundberg 2001). In educational practices, the work oriented infrastructure is an infrastructure for learning that consists of "a set of resources and arrangements – social, institutional, technical – that are designed to and/or assigned to support a learning practice" (Guribye and Lindström 2009 p. 112). When students bring their mobile phones to school, they are bringing a technology into school without any formal affiliation to school's infrastructure for learning. Nevertheless, any technology existing within an infrastructure is bound to have impact on the infrastructure (Guribye 2005). Hence, the presence of mobile phones in school should not be neglected.

Most previous research about mobile phones has focused on teachers' use and beliefs of mobile phones, and on higher-education. This paper builds on an understanding that, in education, students are also essential stakeholders shaping the practice (Parsons 2017; Tallvid et al. 2012). In Sweden, the importance of students' influence is even stipulated in the upper secondary curriculum, which state that schools should include and encourage students to participate in the design of their education (Skolverket 2011). Nevertheless, students' opinions and reasoning around their use of mobile phones for learning in school are rarely presented in the public debate or in research. Therefore, in this study we explore how Swedish upper secondary students reason about their usage of mobile phones in school. The overarching aim of our study is to contribute to the understanding of how students' use of the mobile phone in school impact their school practice, and provide an insight into how students reason about managing mobile phones on the boundary of the infrastructure for learning in school. Since upper secondary education is a concern for many stakeholders (in

2013, 98,5% of the Swedish adolescents (Skolverket 2014) attended upper secondary education) we argue that it is important to study upper secondary school students' perceptions regarding all aspects of their school practice, in particularly their reasoning about the controversial issue of mobile phone use as a resource in the infrastructure for learning.

This paper is organized as follows: first we provide a background of related research on students' use of mobile phones in school. In the method section, the survey and the focus group interviews which make up the data in the study are presented more in detail. In the third section, we present significant survey data and outtakes from the focus groups. Based on students' reasoning about the use of mobile phones in school, we use the notion of infrastructure as an analytical tool to understand the conflicts around the mobile phone in school. In the final section, we make some concluding remarks on the infrastructuring of the mobile phone in school.

2 Background

Mobile phones have become necessities to both adolescents and adults in all socio-economic groups. In the lower income groups, the mobile phone is even the most common technological platform to own (Katz et al. 2014). This has had impact on school as well. Already years before the era of the smartphone, mobile phones were acknowledged as mediating usage both potentially beneficial and potentially destructive to school work (Sharples 2002). Benefits with banning have occasionally been presented in previous research (see e.g., Beland and Murphy 2015). However, research on mobile phones for learning has mainly focused on the technology's potentially beneficial impact on education and learning processes. Rather than studying mobile phones in mundane school practice, the studies carried out on the utilization of mobile phones for learning have often been experimental or quasi-experimental, promoting informal learning (Sung et al. 2016; Wu et al. 2012). In addition, there is research that has a more pragmatic approach to the mobile phone in formal education. This strand acknowledges the difficulties with the managing of mobile phones in school, but also the need for stakeholders to actively engage in the integration of this technology so important for students in their everyday lives. In the following section, we present research on various aspects of the perils, prospects, and pragmatic reasoning around mobile phones in school.

2.1 Perspectives on mobile phones in school settings

Research show that functions of the mobile phone, enabled by its connectivity and portability, which are appreciated in society outside of school, can enable cheating and disturbances in the education in school (Campbell 2006). American high-school students responded to a multi choice survey that they were disturbed by the ringing in school, and worried about the possibilities for cheating, cyberbullying and sexting mediated by the mobile phone (Thomas and Muñoz 2016). For the coping with students' use of mobile phones in school, there are research that argue for the abolishment of mobile phones in school. It has been suggested that the freedom to interact with the world outside of the classroom, that comes along with students' use of

their mobile phones in education, could cause too much reformatory pressure on the traditional school organization for it to be permitted (Philip and Garcia 2015). Fear of changes in the traditional organization of teaching has been the motor when schools have formulated policies for banning as a means to handle the fact that students bring their mobile phones to school (Pachler et al. 2013). It has been argued that since students do not want to give up their mobile phones while being in class, any policy on banning mobile phones in college classrooms must be firmly enforced by the educators (Tindell and Bohlander 2012). However, teachers must be aware of risks with the enforcement of rules. In classrooms where there is a policy regulating the use of mobile phones, teachers must choose what is most disturbing during class: the confrontational enforcement of a prohibition, or the students' use of mobile phones (Berry and Westfall 2015). An undesirable consequence in classrooms where the mobile phone is strictly forbidden is that a student's use of the mobile phone can become an intentional subversive challenge of the teacher's authority (Kukulka-Hulme et al. 2009). This is a tension or conflict that could be mirroring the fact that students and teachers are viewing mobile phone usage in opposing ways (Garcia 2012; Lindberg et al. 2016). University faculty perceive mobile phones as more distracting and less appropriate to use in education than students do (Baker et al. 2012). Neither do Swedish upper secondary students seem to acknowledge the problems of mobile phones as being as severe as teachers do (Skolverket 2016a). In fact, it seems like students even in secondary school are actually rather aware of when to use and when not to use their mobile phones. Most often the mobile phones are used in between assignments, and neither teachers nor students do necessarily perceive them as nuisances (Olin-Scheller and Tanner 2015). In school environments where there are no structured pedagogical use of mobile phones, low achieving students' test scores seem to benefit from banning mobile phones. It appears that low-achieving students struggle more with self-control and distractions from mobile phones than high achieving students do (Beland and Murphy 2015). When encouraged to use the mobile phone as a tool for learning, college students do not necessarily find distractions mediated by the mobile phone to be an issue. On the contrary, students can feel that the mobile phone benefits their learning since its use can function as a motivational factor (Tessier 2013). Using the mobile phone in education can be a means for educators to make teaching and learning more authentic and personalized, and hence more relevant to adolescents (Roberson and Hagevik 2008). It has even been suggested that it is the responsibility of the faculty to design their teaching in accordance with the technology that students prefer (Baker et al. 2012).

Aspects of materiality have impact on the use of the mobile phones during class. Both students and teachers can perceive mobile phones, even when used in silence during class, as more disturbing than computers used in silence (Baker et al. 2012).

Sweden, as many other countries, has expanded the legislation (SFS 2010:800) allowing for teachers and schools to implement stricter rules to cope with the presence of mobile phones in school (Kukulka-Hulme et al. 2011; Ott 2014; Skolinspektionen 2016). However, the signals from the Swedish policymakers are ambiguous. They sanction schools to totally ban the use of mobile phones during school hours, and at the same time they state that mobile phones could be used in education (Skolinspektionen 2016; Skolverket 2016b).

With few exceptions, it is not until recently that the presence of the mobile phone in schools has started to be formally acknowledged as an opportunity to facilitate learning as part of movement towards a Bring Your Own Device (BYOD) approach (Thomas and Muñoz 2016; Skolverket 2016b). Research that acknowledges such practice, approaches the mobile phone more as a factor to be dealt with pragmatically.

College students are not unaware of difficulties with mobile phones in formal learning contexts. Students share the understanding that faculty have expressed: that mobile phones can be distractive in a school context. However, the students do not to the same extent consider those distractions to affect their academic performance (Berry and Westfall 2015). Reaching beyond the actors directly present in the physical school environment, parents can also be involved in both potentially supportive and distractive uses. Hence, there is a need for families to discuss appropriate mobile phone usage in and out of school (Keengwe et al. 2014). In addition, Katz et al. (2014) point to the fact that students in classrooms where mobile phones are banned still use their mobile phones for sending text messages during lessons. Instead, they suggest that a school culture that acknowledges technology utilization in their curriculums and defines rules and encourage technology appliance can in fact stimulate knowledge acquisition. In order to open up the classrooms to the potential of the mobile phone, students need to learn how to use their mobile phones for educational purposes, and educators need professional development (Humble-Thaden 2012; Pachler et al. 2009). No matter what the research regarding mobile phones in school suggests, the mobile phone has become an important resource in the universal service infrastructure. It has an impact on schooling, both when neglected and when adopted into practice.

3 Method

This study builds on data from a survey and focus groups interviews with upper secondary school students. The study was conducted with students from two schools in the west of Sweden, during the fall and winter of 2015–2016. One of the schools was situated in a midsized city and the other was situated in a larger city. We began by conducting a survey with over 200 students, which was then used as a guide in selecting the sample for four focus group interviews. In the following, we describe the details of this process.

3.1 The survey

The intended sample of students for the focus groups, was guided by the questionnaire ($N = 206$, response rate 100%) to contain students with diverse perceptions of mobile phones in school, including an equal distribution over the school years, gender, and user type (Table 1). The questionnaire measured how much the students used their mobile phones for school work in school (response alternatives were: *never*, *at least once per month*, *1–3 times per week*, *more than 3 times per week*, and *daily*. For the analysis, the categories *1–3 times per week* and *more than 3 times per week* have been merged into the category *weekly*). The students were also asked to in text describe perceived hindrances for mobile phone use in school. The students voluntarily responded to the questionnaire online, during a lesson three - four months before the focus group interviews.

Table 1 Comparison of background data between the population and the sampled focus groups

		Questionnaire respondents <i>N</i> = 206	Focus group participants <i>n</i> = 19 (except for User type <i>n</i> = 17)
Gender	male	55,3%	52,6%
	female	43,2%	47,3%
	other	1,5	0%
Mobile phone	smartphones	99%	100%
	basic mobile phone	1%	0%
Bring the mobile phone to school everyday	yes	98,5%	100%
	no	1,5%	0%
User type	Beginner ^a	0,5%	0%
	Normal ^a	17%	17,6%
	Habitual ^a	60,7%	58,8%
	Expert user ^a	21,8%	23,5%

^aBeginner: I need a lot of help when I am using digital technology; Normal user: I manage well on my own; Habitual user: I can do most things, and what I cannot do, I can learn on my own; Expert user: I know most things and a little extra (Haglund 2013)

3.2 The focus group interviews

The focus group interviews were semi-structured, guided by a moderator using an interview guide with open-ended questions to support the discussion (Halkier and Torhell 2010; Morgan 1997; Wibeck 2001). The questions in the interview guide were:

- Which are the rules concerning mobile phones in your school?
- Should students be allowed to use their mobile phones in school?
- How do you use your mobile phones for school work in school and at home?
- What impact have mobile phones had on your school work achievements, perceived benefits/disadvantages?
- What do your parents think about your use of mobile phones in school and at home?

Prior to the focus group interviews, the participants were asked to read a newspaper column authored by a Swedish media personality (Schulman 2015) as a stimulus material to provoke discussion. The author of the column is clearly arguing in favour of banning mobile phones from schools in general, not only from classrooms. The column was chosen since it mirrors the typical debate on mobile phones in Swedish schools in Swedish newspaper articles (cf. Ott 2014). The author's arguments could potentially have influenced the discussions in the focus groups. However, the aim of using a stimulus material in this study was to get the students to respond to the ongoing debate, and the results should be understood as students responding to the discussion around what to make of the mobile phone in school.

3.3 The sample

The night before one of the days appointed for two of the focus group sessions, a blizzard hit one of the cities and hindered the students to come to school. Therefore, the intended sample had to be extended by additional students that were recruited voluntarily at the last minute. Consequently, the study is partly build on a convenience sample (Cohen et al. 2013). However, the final sample was still representative for the population (Table 1). Of the students participating in the focus groups, two participants were absent when the questionnaire was distributed, hence there is no data regarding self-assessed user type for two of the participants. The rest of the background data could be gathered from those two participants' statements during the focus group interviews.

The participants ($n = 19$) were distributed differently between the focus groups (Table 2). Focus groups #1, #2 and #3 contained members with different ages and from different classes but the same school. In focus group #4, the participants were all classmates in the last year.

A couple of weeks before each focus group session the participants were informed about the purpose of the study. The participants in the focus groups were all in the ages between 16 and 19 years, and therefore old enough to give their written informed consent to their voluntary participation in the study. The research followed the ethical codex of the Swedish research council (Vetenskapsrådet 2011), and the empirical data has been treated accordingly. All focus groups were audio-recorded. Focus group #1 and #2 were also documented by an additional researcher taking notes.

The recordings have been transcribed in full. The audio-recordings, the transcriptions and the notes taken by the additional researcher during focus groups #1 and #2, have been actively listened to and read through repeatedly. The transcribed data was analyzed using a qualitative, thematic analysis (Wilkinson 2011) searching for patterns and variations in the students' narratives of their managing of mobile phones. Excerpts of the transcription that could be classified into emerging categories were selected. These categories were: tools, students, learning objectives, rules, community, roles of teachers and students. For the visualization of potential patterns, the selected excerpts were then pinned up on a wall, category by category. In this process four broad themes emerged: the role of the mobile phone in the students' lives, reasoning around the mobile phone in classroom practice, negotiating the use of a potentially distractive and disturbing technology, and reasoning around prohibition.

For the analysis, selected survey data and a synthesis of the four focus groups are discussed. To illustrate especially significant findings, we use anonymized excerpts (Exc) from the focus groups. All excerpts presented in the result section have been translated from the transcribed Swedish verbatim to English, by the native Swedish speaking authors.

Table 2 Distribution of participants in the four focus groups

Focus group	#1	#2	#3	#4
Participants	3	6	4	6

4 Results and discussion

This study examines Swedish upper secondary students own reasoning about the usage of mobile phones in school. Since our data is generated from students' own narratives, we cannot make any certain conclusions of how mobile phones are actually used in school practice. However, students can be quite accurate in their self-rating of both their on-task and off-task use of potentially distractive technology in education (Ragan et al. 2014).

The students' narratives on their usage of mobile phones in school display that the students can reason around both potential benefits of mobile phone use in school and potential disadvantages of the same. The students acknowledge that out-side of school their mobile phones ubiquitously enable numerous of activities, and services in their day-to-day life. The students also describe how they in school use their mobile phones for school relevant work on many occasions, regardless of the current local policy in school. This means that students are actors in the boundary between the universal service infrastructure and the infrastructure for learning manifested through teachers, legislation and local policy.

In this section, we present data from the survey and the focus groups. With the notion of infrastructure for learning (Guribye and Lindström 2009) we discuss the social and technological dimensions of students' use of the mobile phone. We will first present and discuss: the role mobile phones play in the everyday life of the students', then; how the students perceive mobile phones and their use in school, after that; students' positions in the implicit negotiations of mobile phones into the infrastructure for learning, and finally; reasoning around prohibition.

4.1 The role of the mobile phone in students' lives

In all four focus groups the most distinctive properties of the mobile phone that emerged were its mobility, connectivity, and ubiquity. The use of the mobile phone enhanced the students' own mobility, flexibility, and individuality both in school and at home. In the focus groups, all of the students stated that they occasionally used the mobile phone for school work in school to some extent. The results from the survey also support that the mobile phone was regularly used by the students in the schools for a number of school related uses, according to their own statements (Table 3).

In comparison to the statistical data, focus group interviews can provide insights into the sources of complex behaviours and motivations (Halkier and Torhell 2010; Morgan 1997; Wibeck 2001). In the focus groups, some students stated that they used the mobile phone just to check the time or the schedule, while other students used it for more advanced purposes. School related uses of the mobile phone were of broad range: accessing the school's learning management system, the possibility of browsing for information, calculation, translation of words, note taking when not having a notebook, or organization of the school day, for example through the use of the calendar and social media groups. The mobile phone was also used for leisure activities in school, such as listening to music, browsing for information, gaming, entertainment, communication and social media. As one of the students summarized the use of the mobile phone, it was used 'for most things' (Henry, #1).

Table 3 Students use of mobile phones for school work in school (%)

<i>n</i> = 187	Never	Monthly	Weekly	Daily
Cooperation with classmates by social media	8	11	23	57
Translation of words	12	12	25	51
Editing picture and sound	9	18	27	45
Connecting the computer to the Internet	15	24	25	35
Recording picture and sound	23	27	17	33
Looking at pictures	36	20	24	21
Cooperation with classmates by phone or video call	36	24	18	21
Taking photos for school assignments	28	35	19	18
Reading lesson notes	37	31	16	16
Writing texts for school assignments	40	28	18	15
Browsing the Internet for information	49	21	14	15
Using the calculator app	50	24	12	15
Communication with teachers	53	20	13	14
Accessing material produced by the teacher	59	24	7	11
Accessing the LMS	66	17	9	8
Cooperation with classmates by text	75	12	8	6
Looking at information films on the Internet	71	16	8	5

The students gave several accounts that the mobile phone was with them everywhere, anytime, and, this of course includes school. While sleeping, they kept the mobile phone by the side of their bed. One student stated that no matter if she used her mobile phone or not, the mere awareness of having it available made her happy (Elsa #2). Being constantly reachable was described by students as providing them with a sense of personal security. One of the most common arguments for having a mobile phone in school was that the mobile phone made it possible for their parents to stay in touch with them during the school day. However, since the students were aware of the conflicts regarding their access to and use of mobile phones during school hours, such an argument could be an expression of students' knowledge of valid arguments to motivate their access to the mobile phone while being in class.

Drawing from the data, we argue that it is fair to say that mobile phones are resources in students' universal service infrastructure. The mobile phone is also the portal node to the social networks where much of students' socializing are taking place (Veyrat et al. 2008). Elsa (#2) and Jennifer (#3) even described themselves as to some degree addicted to their mobile phones, and being without the mobile phone was not an option. Addiction to mobile phones has also been reflected in research (Samaha and Hawi 2016). From the infrastructural perspective, this addiction like condition following in the deprivation of the mobile phone can be understood as a breakdown in the infrastructure that they depend on. That breakdown makes the students aware of the devices' significance for their social life and ultimately for their well-being.

4.2 Reasoning around the mobile phone in classroom practice

In the focus group discussions, most students described that the mobile phone had positively influenced their education. However, the students did also talk of pitfalls and situations when the mobile phone was used for other purposes than school work. It appears that such distractive utilization was specifically tempting when the education was perceived as boring, not demanding enough, uninteresting, or when a student got stuck and had to await the teacher's assistance. The students' narratives align with what Olin-Scheller and Tanner (2015) conclude from observing secondary students; the mobile phones are used in the gaps between different school assignments. The students in the focus group described that at those times they routinely picked up the mobile phone, and did not always manage to get back to school work again. However, as an argument to support the access of mobile phones despite the distractions, the students acknowledged that before there were mobile phones in the classroom the gaps in the school work could be triggers to other kinds of disturbing behaviour, for example yelling and talking in class. That did still occur, and two students admitted that there could be a lot of talking in the classroom, even more so when the mobile phones were not at hand.

Exc:1

Maria: If people are sitting with their mobiles it is often totally quiet.

Anna: Yes, because then everyone is sitting and looking in the mobile, and then you don't really disturb anyone. (#3)

Distractive behaviour and lecture resistance are no new phenomena that were introduced into the classroom by the mobile phone. Rather the distractions mediated through the mobile phone in the classroom continue as an ordinary, yet disturbing tradition of school practice (Hassoun 2015). But as Maria and Anna (see Exc:1) suggest, on a collective level use of mobile phones do not necessarily disturb, but instead can calm down the classroom environment. The possibility to gain focus by shutting out turmoil from a noisy environment by listening to music, is one example of an appreciated feature. Another appreciated feature was the camera. On some occasions, the students stated that teachers could encourage them to use their mobile phones to take a photo of the white board. When using the music player or the camera to support learning, the use of the mobile phone has been assigned with a pedagogical purpose. In that moment, the mobile phone is becoming a resource in the infrastructure for learning, and the students' narratives presented more examples of when the mobile phone was used to benefit the school work.

Some students claimed that they had already started to develop uses of the mobile phone that were being supportive of learning in school. These students meant that they could regulate their use of the mobile phone in accordance with what they perceived as accepted behaviour. The students also described their use as being supportive to their school work when the mobile phone was used as a means to move further when being stuck. In those situations, the mobile phone mediated input that assisted the students to re-engage in the school work, and to remain active in their learning. Authenticity of

(Roberson and Hagevik 2008), and motivation for- and involvement in learning (Tessier 2013) have been beneficial aspects put forth in research regarding mobile phones in education.

Exc:2

Jenny: I think we learn very much from having the phone available, so that we can browse for things and if we get to a discussion it might be standing still for all of us. No one has any answer, then Tyrone can browse for the answer and the we can sort of, uhu, then new ideas sort of grow to all of us, like ok, uhu! (#4)

This practice was generally initiated by the students themselves and involved the use of external sources of information (online), collaborations through social media and the opportunity to engage in school work independent of the physical or temporal circumstances. This could not have been possible in a classroom where the mobile phones would have been kept away from the students by the teacher. These situations could be considered from a socio-cultural perspective as gateways to the zone of proximal development (Vygotsky 1978) by providing the required support for the students' development. When the students had reached as far as they could on their own, they turned to the teacher for assistance to continue their learning. Since students shared their teacher with the rest of the class, they had only limited access to their teacher. As Ragan et al. (2014) suggests, students instead of waiting to be assisted by the teacher, use technology to access additional information. When students in the focus groups do this, they develop their own personal infrastructures for learning, in which the ubiquity of the mobile phone enables new learning practices. These practices challenge the teacher's role as a source of knowledge in the infrastructure for learning.

4.3 Negotiating the use of a potentially distractive and disturbing technology

The mobile phones' presence in the infrastructure for learning in school is bound to have impact on the practice enabled by the infrastructure. That impact has often been perceived as disturbing and distractive. To the students, it was not so much the mobile phone in itself that disturbed the education. What was disturbing depended on in what manner, for what purpose and in which context, the mobile phones were used. The students' responses to the open-ended questions, in the survey, concerning their perceptions of hindrances for using the mobile phone for school work show that the perceived hindrances can be organized into four main categories: distractions, which the use of social media, gaming and texting are all variations of; the teacher; limitations with the software or hardware of the mobile phone, and the fourth category of seeing no hindrances. The responses varied between just a word "the teacher" to full sentences of reasoning: "That the teacher thinks that you do anything but school work. I mean that you are texting when you are taking notes related to school work". Worth noticing is that suggested problems with sexting and cyberbullying (Thomas and Muñoz 2016) was not mentioned in the students' responses. Cheating was mentioned once, but in the context of teachers wrongfully believing that the students were cheating. Table 4 shows the frequency of responses that could be classified into the emerging categories.

Table 4 Frequency of students mentioned hindrances for using the mobile phone for school work in school

Hindrances (<i>n</i> = 212)	Number of mentions
Distractions (Social media, gaming & texting)	109
The teacher	43
Technological limitations	26
No hindrances	16

For the individual student to be able to relate to the mobile phone without being distracted by the functions it enables, some of the students in the focus groups suggested that school and parents need to educate the new generations of mobile phone using students in appropriate ways of using the mobile phone for learning in school. Teaching appropriate ways of use was expressed as preferred over prohibition of the mobile phone.

Exc:3

Olga: But if you learn from an early stage not to do it and to stay focused on the work. And when you use your mobile you don't use it for social media. If you learn that, that way, I don't think that there will be any problems. You, you get it in early that you have to adjust to the environment and the technology that exist there today. (#1)

[...]

Efram: As said before, it is better to just take what you've got and make something positive from it. (Olga: Yes.) And sort of, start from the beginning and learn from that you are small, that you absolutely shall not do it. You transform it to a positive thing. That it helps the school subjects that you browse for information instead. And maybe create more digital learning resources. (#1)

The students did not talk of infrastructure, but what they suggested was the formal integration of the mobile phone to school's infrastructure for learning. However, all students did not agree. In the focus groups, there were diverse opinions on what was seen as responsible mobile phone usage and what was potentially distractive and disturbing usage. During lectures, it seems that the problem with distractions were more urgent than during school assignments carried out individually or in groups. The students generally described that it was impolite to the teacher to use the mobile phone during lectures, even if it was beneficial to the student's own learning. As a student, you are supposed to pay respect and listen to the teacher, who is a lesser contested (social) resource in the infrastructure for learning. However, this opinion was divided. Some students claimed that when they used their mobile phone during class and lectures they were browsing for extra information on the topic that the teacher was lecturing on. These students did not think that they were acting disrespectfully. However, the teacher was not an uncontested authority. One thing that was certainly perceived as disturbing was when the teacher interrupted the lecture to tell a classmate who was looking at the mobile phone to put it away.

Exc:4

Sam: There are always some students who have a tendency to take out the mobile, and always be told by the teacher. And even if it doesn't matter that much that the teacher tells them of for a second, it kind of disturbs the lecture. That is disturbing.

Tim: But I don't understand, if it is muted and this person is sitting and ignoring the teacher, well it (the teacher) can find it difficult but I still believe that it (the teacher) should be able to hold a lecture, without to having to tell a student that the student is fidgeting with the mobile.

Sam: Well, I still think it is disrespectful not to pay attention to the teacher. (#4)

From Sam's reasoning, it became clear that even when the mobile phone usage was driven by interest for school work it could be perceived as disturbing. Cultural values of school and technology have a high impact (Pachler et al. 2009), and from the focus groups there is no unilateral response to be found, to what responsible usage is.

One example where the aspects of materiality discussed by Baker et al. (2012) is active is in the students' discussions of the relation between computers and mobile phones. When the schools' computers were not functioning for some reason, the students could use their mobile phones instead, as a back-up resource to support their school work. Sometimes they were even encouraged by their teachers to do so. However, since they did not want to be regarded as disobedient, the students were cautious when using the mobile phone on their own initiative. Despite the fact that some teachers encouraged them to use the mobile phone, the students in both the focus groups and the survey (Table 4), described how teachers intuitively would make the assumption that when a student was using a mobile phone in class, the student was not occupied with school work. Referring to the stimulus material the students did not believe that adults could really relate to the situation of the youth and their utilization of the mobile phone, and regarded it as 'some kind of a toy' (Eric #2).

Exc:5

Keith: When the teacher sees a mobile they think you do something completely different, but with a computer they always just think that you are taking notes. (#4)

Some students agreed with teachers' understanding that the mobile phone was used for leisure activities rather than for learning: 'I think that, in school, you are not there to fidget with your mobile, you are there to learn' (Sam: #4). However, that statement could also be a reflection of this particular student's personal struggle with his mobile phone usage in school and at home.

The interaction among the students participating in the focus groups can produce insights and data that would most likely not be obtained as efficiently with other types of research methods (Morgan 1997). An example of this was when the students in focus group #4 engaged in an extended discussion on whether computers are used only for

school work during the lessons, it turned out that computers also are used for activities that are not school work related. The discussion ends with the following sequence:

Exc:6

Tim: But should we ban computers then as well you mean?

Sam: No, but computers are most often used as a sort of tool for taking notes. A mobile could be that as well, but it is not many who do that. (#4)

It was not only the mobile phone but also computers that were appointed as being potentially destructive to the school work. It seems that the problematic materiality of the mobile phone is related to the connectivity of the technology. Which is even more evident from another student's statement on the possibility to integrate mobile phones to school practice.

Exc:7

Vivianne: [...] If we should start to do school work with the mobile phones? I don't think that is a good idea.

Moderator: Why not?

Vivianne: In my classes, I see people looking at YouTube on the computers every day. And then they are falling behind in every subject (#3).

Vivianne acknowledges that when her peers had access to technology that was connected to the Internet they were not able to take responsibility for their schoolwork. However, the specific problem of misuse was more associated with the mobile phone than with the computer. As a technology without a formal purpose in the schools' infrastructure for learning the mobile phone holds the potential of being futile to the ongoing practice enabled by the accepted infrastructure of learning (Guribye 2005). In the present study, none of the two schools did formally encourage any educational use of mobile phones. In fact, the students at both schools expressed an ambivalence on the existence of a particular policy at their own school. Nevertheless, the students perceived the existence of some implicit guidelines for the use of mobile phones in school. One student summarized the core of the implicit guidelines after a brief discussion: 'It must not disturb; it is as simple as that' (Eric #2).

4.4 Reasoning about prohibition

From the focus group interviews it appears that the students believed that their teachers were generally opposing the mobile phone in the classroom, as they perceived the mobile phone as destructive for education. This was a belief that was shared by many of the students who pointed to the need for some rules regarding the mobile phone in the classroom. As social resources in the infrastructure for learning the local policies did not seem to be clear enough to wholly enable the practices it should enable

throughout the infrastructure for learning. The students described a present situation where different teachers had different rules for the use of the mobile phone during lessons. There were individual teachers that sometimes encouraged the students to use their mobile phones during lessons, mostly for browsing for information. At one of the schools, some of the teachers occasionally collected the students' mobile phones at the beginning of the lesson and kept them in a special container at the teacher's desk throughout the class. According to the students, that was because those teachers felt there were too much disturbances with mobile phones available to the students. The students had mixed feelings about giving their mobile phones away. Some students stated that they could stay better focused on school work during lessons when their mobile phones were kept at the teacher's desk. However, the students acknowledged that even when the teacher asked them to hand in their mobile phones, all of their peers did not do it. Some students also expressed that the collection of the mobile phones was an unnecessary act. Since it sometimes could happen that the very same teacher who had collected the mobile phones at the beginning of the class, later on, during the same lesson encouraged the students to use their mobile phones in connection to a school work related task. Despite that extra struggle, the students expressed more acceptance towards the teacher's collection of the mobile phone, than towards confiscation, which they did not think was motivated. The students in the focus groups had occasionally experienced having their mobile phone confiscated by teachers, and the students could generally comprehend why they had gotten their mobile phone confiscated. However, the consequences of outstepping the rules were not as appreciated, and if a teacher wants to achieve increased focus from the students on schoolwork, confiscation of mobile phones might even have the opposite effect, as one student described her experience of having her mobile phone confiscated:

Exc:8

Elizabeth: [...] if you consider that they confiscate the mobile from you, the only thing you will think about is the mobile. It is better to have it next to you, then you can concentrate better. (#2)

Confiscation as a response to individual students' use of the mobile phone was not always carried out individually by the teachers. Sometimes confiscation was carried out collectively in the whole class. Those occasions were specifically aggravating. When teachers collected the obedient students' mobile phones, which they sometimes used for school work, before or during the lesson the students were disturbed by having their infrastructure for learning sabotaged by this somewhat arbitrary enforcement of rules. Some students stated that it sometimes seemed as if their peers thought of it as a personal right to have the mobile phone available during classes. When mobile phones were regarded as private property confiscation was perceived as extra problematic.

Exc:9

Luke: [...] you can't ban them, that's how it is. A mobile is someone's property and there could be several reasons for why someone brings it to class. And if it's banned then it will always be those who refuse to obey to the regulation. So, it

will be just another issue with the mobiles. You could have more strictly regulation, if you misuse it, it will be taken from you, but otherwise, I don't support a complete ban of it. (#2)

The appreciation of the regulation was expressed differently in the different focus groups. Generally, the students supported some kind of regulation. As it is indicated from Luke's statement in the excerpt above, it is difficult to see how such regulation would be designed to meet both the conditions of the right for the students to have their privacy and be in control of their belongings, and the possibility for the teachers to ban the use of the mobile phones. From the students' narratives, there seem to be no universal solutions. Overall the students believed that using the mobile phone was a personal matter. The students pointed to the individual student's own responsibility for his or her own educational achievements. The students were not in unison agreeing on how to responsibly use the mobile phones in class. They all expressed that it was not acceptable to use the mobile phone in a manner that disturbed anyone. However, what was perceived as disturbing varied, and the students' sensitivity to disturbances varied. One student described that the screen light of classmates' mobile phones could be disturbing (Sam #4). Another student stated that it was more so the classmates' whispering to each other while looking at the mobile phone that was distracting (Efraim #1).

In addition to disturbances in the classroom the interaction with the outside world was potentially distractive. In the survey, and even more so in the focus group discussions about potential distractions, social media was the most recurring topic. Social media was often the reason why the mobile phone was used for leisure activities rather than school work during class. As the main distractions students mentioned Facebook, Instagram and Snapchat, of which the latter involved making faces which also attracted the attention of their co-located peers, for instance during student presentations.

Exc:10

John: If you see someone that sits and raises their eyebrows and open their mouth to activate the Snapchat filter, then it is, it bothers you, then I lose my focus (#4).

A particularly difficult struggle for the students to handle were the temptations provided by notifications from social media and applications. All the students knew that they could turn the notifications off. But at the same time, if they did not respond to an event they felt that they might miss out on something important within their social network of friends. The students wanted to stay updated, and be included socially. Hence, it was difficult for the students to postpone their responses to their friends.

To summarize, based on the students' narratives, the influx of content which was not related to school work through social media was difficult to handle for the students during school hours. The students were aware that the use of mobile phones in the class could be destructive, but at the same time they did, with some exceptions, believe that their education had mostly benefitted from the use of mobile phones. The students voiced a discrepancy between their own and the adults' conceptualization of mobile

phones. The students did not believe that adults understood that mobile phones in the hands of the students could be useful for school work. They generally regarded the use of mobile phones to be a personal matter, where each and every one had an own responsibility to not let their usage disturb the rest of the class. They did not support banning of the mobile phone, but appreciated some guidelines for their handling of the devices during class. School work and leisure activities often relied on the same infrastructure. For example, social media was generally associated with leisure, but the students also used social media groups to communicate with peers about school work and to organize study groups based on the class or course. Listening to music was not only a leisure activity, in school it could also be a means to seal out distractions and help the students to concentrate.

5 Concluding remarks

Using the notion of infrastructure opens up the dynamics and complexity of the social and technological arrangements that enable social practice (Bowker and Star 1999; Guribye 2015). Infrastructures are not static, they grow (Star and Bowker 2006). Development and maintenance of infrastructure, are social processes in which the infrastructure's components through the use of them are negotiated and established (Bygholm and Nyvang 2009). Based on the findings from the survey and the focus group interviews with upper secondary students we argue that, BYOD is no longer a choice to make for pioneering schools. Students have in fact *already brought* their own devices to school. In contrast to other technologies which are established and accepted resources of school's infrastructure for learning, mobile phones are not distributed and supported by schools. However, the students describe that they and their teachers engage in daily negotiations on the use of the devices for school work.

When students are merging their universal service infrastructure and the infrastructure for learning of school, they are to some extent adapting their regular use of mobile phones to the norms of school practice. At the same time the use of the mobile phone in school opens a boundary space between school work and leisure activities. When the mobile phone becomes more intertwined in students' everyday life and school work it is a call for new solutions to handle the mobile phone in a responsible way. The integration of technology to an infrastructure can be facilitated by careful planning, and an awareness of that the new technology inevitably will impact the practices enabled by current infrastructure for learning (Guribye 2005). Therefore, there is a need to have an informed discussion of how to handle the mobile phone in school in order to get school work done. The mere understanding of an implicit policy does not seem to be enough to guide the management of the use of mobile phones in the classroom. At present, the teachers keep on confiscating mobile phones and the students keep on using them for all sorts of actions, school related and not school related. This circular play-out of actions holds the potential to lead to a continuing situation of unstructured use and unstructured enforcement of individual policy, from which no one involved benefits. Since the mobile phone is present in classrooms, Berry and Westfall (2015) suggest that the main figure of the discussion should be integration rather than prohibition of the technology. We argue that such a discussion should also include parents. Since parents are important for students to succeed in school (Statens medieråd 2016), they need to understand the

conditions under which their children work. The students did express a concern for the younger generation's use of the mobile phone, and they suggested that there might be a need for some kind of training in order to be able to use the mobile phones in a way that supports learning. Kolb (2008) suggests a social contract between educators and students on how to use the mobile phone. Drawing on the student perspective we argue that this sort of contract could be a social resource in the infrastructuring of mobile phones in upper secondary school. Both students and teachers have to be formally supported in crossing the boundary between school work and leisure activities, that would eventually facilitate the work of infrastructuring (Star and Bowker 2006; Pipek and Wulf 2009) the mobile phone in school practice. As we have shown, the presence of mobile phones in school challenges the school's infrastructure for learning, at the same time the mobile phone has become a resource in the student's infrastructure for learning.

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References

- Alexandersson, K., & Davidsson, P. (2016). *Eleverna och internet 2016*, (The students and Internet 2016). https://www.iis.se/?pdf-wrapper=1&pdf-file=eleverna_och_internet_2016.pdf. Accessed 27 Mar 2017.
- Baker, W., Lusk, E., & Neuhauser, K. (2012). On the use of cell phones and other electronic devices in the classroom: evidence from a survey of faculty and students. *Journal of Education for Business*, 87(5), 275–289.
- Beland, & Murphy (2015). *Ill Communication: technology, distraction & student performance*. Centre for Economic Performance (CEP) (No. 1350). Discussion Paper.
- Berry, M., & Westfall, A. (2015). Dial D for distraction: the making and breaking of cell phone policies in the college classroom. *College Teaching*, 63(2), 62–71.
- Bowker, G. C., & Star, S. L. (1999). *Sorting things out: Classification and its consequences*. Cambridge: MIT press.
- Bygholm, A., & Nyvang, T. (2009). An infrastructural perspective on implementing new educational technology: the case of Human Centred informatics. In L. Dirckinck-Holmfeld, C. Jones, & B. Lindström (Eds.), *Analysing networked learning practices in higher education and continuing professional development* (pp. 35–50). Rotterdam: Sense Publishers.
- Campbell, S. (2006). Perceptions of mobile phones in college classrooms: Ringing, cheating, and classroom policies. *Communication Education*, 55(3), 280–294.
- Cohen, L., Manion, L., & Morrison, K. (2013). *Research methods in education* (7.th ed.). London: Routledge.
- Gao, Q., Yan, Z., Zhao, C., Pan, Y., & Mo, L. (2014). To ban or not to ban: differences in mobile phone policies at elementary, middle, and high schools. *Computers in Human Behavior*, 38, 25–32.
- García, A. (2012). Trust and mobile media use in schools. *The Educational Forum*, 76(4), 430–433.
- Guribye, F. (2005). *Infrastructures for learning. Ethnographic inquiries into the social and technical conditions of education and training*. Norway: The University of Bergen.
- Guribye, F. (2015). From artifacts to infrastructures in studies of learning practices. *Mind, Culture, and Activity*, 22(2), 184–198.
- Guribye, F., & Lindström, B. (2009). Infrastructures for learning and networked tools. The introduction of a new tool in an inter-organisational network. Sense, Rotterdam. In L. Dirckinck-Holmfeld, C. Jones, & B. Lindström (Eds.), *Analysing networked learning practices in higher education and continuing professional development* (pp. 110–122). Rotterdam: Sense Publishers.
- Haglund, T. (2013). *Rapport om utvärdering av Sanda gymnasiets Chromebookprojekt ht-2013*. (Report from the evaluation of Sanda upper secondary school's Chromebook project fall of 2013). Provisional edition. Jönköpings municipality. <http://www.ed.jonkoping.se/download/18.5b87f5c1449c80141cf7/1394266625345/Rapport+om+utv%C3%A4rderingen+av+>

- Sandagymnasiets+Chromebook+projekt+ht+2013+Prelimin%C3%A4r+utg%C3%A5va+1+22.43.pdf. Accessed 17 Feb 2017.
- Halkier, B., & Torhell, S. (2010). *Fokusgrupper (focus groups)*. Malmö: Liber.
- Hanseth, O., & Lundberg, N. (2001). Designing work oriented infrastructures. *Computer Supported Cooperative Work (CSCW)*, 10(3), 347–372.
- Hassoun, D. (2015). “All over the place”: a case study of classroom multitasking and attentional performance. *New Media & Society*, 17(10), 1680–1695.
- Humble-Thaden, M. (2012). *Tools for school: student fluency and perception of cell phones used for learning*. ProQuest Dissertations and Theses: The University of North Dakota.
- Katz, R. L., Felix, M., & Gubernick, M. (2014). Technology and adolescents: perspectives on the things to come. *Education and Information Technologies*, 19(4), 863–886.
- Keengwe, J., Schnellert, G., & Jonas, D. (2014). Mobile phones in education: Challenges and opportunities for learning. *Education and Information Technologies*, 19(2), 441–450.
- Kolb, L. (2008). *Toys to tools: connecting student cell phones to education*. Eugene: International Society for Technology in Education.
- Kukulka-Hulme, A., Sharples, M., Milrad, M., Arnedillo-Sánchez, I., & Vavoula, G. (2009). Innovation in mobile learning: a European perspective. *International Journal of Mobile and Blended Learning (IJMBL)*, 1(1), 13–35.
- Kukulka-Hulme, A., Sharples, M., Milrad, M., Arnedillo-Sánchez, I., & Vavoula, G. (2011). The genesis and development of mobile learning in Europe. In D. Parsons (Ed.), *Combining e-learning and m-learning: new applications of blended educational resources* (pp. 151–177). Hershey: Information Science Reference.
- Lindberg, J. O., Olofsson, A. D., & Fransson, G. (2016). Contrastings views: student and teacher perceptions on ICT in education. In *ICICTE 2016, International Conference on Information and Communication Technologies in Education, Rhodes, Greece, 7-9 July, 2016* (pp. 1–10).
- Ling, R. S. (2004). *The mobile connection: the cell phone's impact on society*. San Francisco: Morgan Kaufmann Pub.
- Morgan, D. (1997). *Focus groups as qualitative research* (2nd ed., Qualitative Research Methods). Los Angeles: SAGE Publications.
- O'Bannon, B. W., & Thomas, K. M. (2015). Mobile phones in the classroom: preservice teachers answer the call. *Computers & Education*, 85, 110–122.
- Olin-Scheller, C., & Tanner, M. (2015). Street smart i klassrummet?: Högstadielävers användning av smarta telefoner i undervisningens mellanrum (street smart in the classroom?: Secondary students' use of mobile phones inbetween education). *KAPET, Karlstads universitets Pedagogiska Tidskrift*, 11(1), 23–44.
- Ott, T. (2014). A historical materialist analysis of the debate in Swedish print media on mobile phones in school settings. *International Journal of Mobile and Blended Learning*, 6(2), 1–14.
- Pachler, N., Bachmair, B., & Cook, J. (2009). *Mobile learning: structures, agency, practices*. New York: Springer Science & Business Media.
- Pachler, N., Bachmair, B., & Cook, J. (2013). A sociocultural ecological frame for mobile learning. In L. Muilenburg & Z. Berge (Eds.), *Handbook of mobile learning* (pp. 35–46). New York: Routledge pp.
- Parsons, D. (2017). Stakeholder, corporate, and policy perspectives. In J. Traxler (Ed.), *Capacity Building in a Changing ICT Environment 2017*. Geneva Switzerland: International Telecommunication Union.
- Perselli, A-K. (2014). *Från datasal till en-till-en: En studie av lärares erfarenheter av digitala resurser i undervisningen* (from computer hall to one-to-one: a study of teachers' experiences of digital resources in the teaching). (doctoral dissertation, Dept. of Education Mid Sweden University, Härnösand, nr 196).
- Philip, T. M., & Garcia, A. (2015). Schooling mobile phones: assumptions about proximal benefits, the challenges of shifting meanings, and the politics of teaching. *Educational Policy*, 29(4), 676–707.
- Pipek, V., & Wulf, V. (2009). Infrastructuring: toward an integrated perspective on the design and use of information technology. *Journal of the Association for Information Systems*, 10(5), 447.
- Ragan, E. D., Jennings, S. R., Massey, J. D., & Doolittle, P. E. (2014). Unregulated use of laptops over time in large lecture classes. *Computers & Education*, 78, 78–86.
- Roberson, J. H., & Hagevik, R. A. (2008). Cell phones for education. *Meridian Middle School Computer Technologies Journal*, 11(12). Retrieved from <https://www.ncsu.edu/meridian/sum2008/roberson/03.htm>. Accessed 16 June 2016.
- Samaha, M., & Hawi, N. S. (2016). Relationships among smartphone addiction, stress, academic performance, and satisfaction with life. *Computers in Human Behavior*, 57, 321–325.
- Schulman, A. (2015). 2015–11-05. In *Hur svårt kan det vara att förbjuda mobiltelefonerna (how hard can it be to ban the mobile phones)*. Column: Aftonbladet <http://www.aftonbladet.se/nyheter/kolumnister/alexschulman/article21684659.ab>. Accessed 24 Feb 2016.

- SFS. (2010:800). *Skollag* (School law). Stockholm: Utbildningsdepartementet. http://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/skollag-2010800_sfs-2010-800. Accessed 16 Feb 2017.
- Sharples, M. (2002). Disruptive devices: mobile technology for conversational learning. *International Journal of Continuing Engineering Education and Life Long Learning*, 12(5/6), 504–520.
- Skolinspektionen. (2016). *Anmälan angående ordningsregler vid Bergetskolan i Orsa kommun* (Report concerning local policy at Bergetskolan in Orsa municipality). *Skolinspektionen. Dnr, 41-2016*, 2758 http://www.orsa.se/wk_custom/documents/%7B89d15889-4f67-4402-bd80-f68142544e93%7D_skolinspektionen_mobilforbud.pdf. Accessed 16 Feb 2017.
- Skolverket. (2011). *Läroplan, examensmål och gymnasiegemensamma ämnen för gymnasieskola 2011 (curriculum for the upper secondary school)*. Stockholm: Skolverket.
- Skolverket. (2014). *Nästan alla grundskoleelever fortsätter till gymnasieskolan (Almost all elementary school students continue to upper secondary school)*. <https://www.skolverket.se/statistik-och-utvardering/nyhetsarkiv/nyheter-2014/nastan-alla-grundskoleelever-fortsatter-till-gymnasieskolan-1.223182>. Accessed 4 Apr 2017.
- Skolverket (2016a). *IT-användning och IT-kompetens i skolan (IT use and IT competence in the school)*. Skolverkets IT-uppföljning 2015. Rapport Skolverket: Dnr: 2015:00067. http://www.skolverket.se/om-skolverket/publikationer/visa-enskild-publication?_xurl_=http%3A%2F%2Fwww5.skolverket.se%2Fwtpub%2Fws%2Fskolbok%2Fwpubext%2Ftrycksak%2FBlob%2Fpdf3005.pdf%3Fk%3D3005. Accessed 16 Feb 2017.
- Skolverket. (2016b). *Redovisning av uppdraget om att föreslå nationella it-strategier för skolväsendet – förändringar i läroplaner, kursplaner, ämnesplaner och examensmål* (Report regarding the suggested national IT strategies for school – changes in the curriculum). (Dnr: 6.1.1–2015:1608). http://www.skolverket.se/om-skolverket/publikationer/visa-enskild-publication?_xurl_=http%3A%2F%2Fwww5.skolverket.se%2Fwtpub%2Fws%2Fskolbok%2Fwpubext%2Ftrycksak%2FBlob%2Fpdf3732.pdf%3Fk%3D3732. Accessed 16 Feb 2017.
- Star, S. L., & Bowker, G. C. (2006). How to infrastructure. In L. Lievrouw & S. Livingstone (Eds.), *Handbook of new media: social shaping and social consequences of ICTs* (pp. 230–245).
- Star, S. L., & Ruhleder, K. (1996). Steps toward an ecology of infrastructure: design and access for large information spaces. *Information Systems Research*, 7(1), 111–134.
- Statens medieråd. (2016). *Medierelaterade konflikter i familjelivet* (Media related conflicts in the family). <http://statensmedierad.se/download/18.6d5173b7153ab02cc3da00dd/1459758794924/Medierelaterade-konflikter-i-familjelivet.pdf>. Accessed 7 Jan 2017.
- Sung, Y. T., Chang, K. E., & Liu, T. C. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: a meta-analysis and research synthesis. *Computers & Education*, 94, 252–275.
- Tallvid, M., Lundin, J., & Lindström, B. (2012). Using TPACK for analysing teachers' task design: Understanding change in a 1: 1-Laptop setting. In C. D. Maddux & D. Gibson SITE (Ed.), *Research Highlights in Technology and Teacher Education 2012* (pp. 23–30).
- Tessier, J. (2013). Student impressions of academic cell phone use in the classroom. *Journal of College Science Teaching*, 43(1), 25–29.
- Thomas, K., & Muñoz, M. A. (2016). Hold the phone! High school students' perceptions of mobile phone integration in the classroom. *American Secondary Education*, 44(3), 19–37.
- Thomas, K., & O'Bannon, B. (2014). *BYOD-as long as your device is not a cell phone! Perspectives from the classroom on cell phones integration*. Jacksonville Florida: Paper presented at the Society for Information Technology and Teacher Education.
- Tindell, D. R., & Bohlander, R. W. (2012). The use and abuse of cell phones and text messaging in the classroom: a survey of college students. *College Teaching*, 60(1), 1–9.
- Vetenskapsrådet. (2011). *God forskningssed* (codex for research). *Vetenskapsrådets rapportserie*, 1, 2011.
- Veyrat, N., Blanco, E., & Trompette, P. (2008). Social embodiment of technical devices: eyeglasses over the centuries and according to their uses. *Mind, Culture, and Activity*, 15(3), 185–207. doi:10.1080/10749030802186595.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge: Harvard university press.
- Wibeck, V. (2001). *Fokusgrupper: om fokuserade gruppintervjuer som undersökningsmetod (focus groups: about focused group interviews as a research method)*. Studentlitteratur: Lund.
- Wilkinson, S. (2011). Analysing focus group data. In D. Silverman (Ed.). *Qualitative research*, 3rd edition. Sage. pp. 168–184.
- Wu, W.-H., Jim Wu, Y.-C., Chen, C.-Y., Kao, H.-Y., Lin, C.-H., & Huang, S.-H. (2012). Review of trends from mobile learning studies: a meta-analysis. *Computers & Education*, 59(2), 817–827.