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The Digital Revolution

Over the last 30 years, digital media, computers and the internet have become embedded in almost every branch of social life, as well as in educational institutions. If you walk into any classroom today ‘you’ll find a mix of smart phones, tablet computers and smart boards’ (Livingstone, 2014, p. 1) or other digital media (Paulsen and Tække, 2019b). Like other media researchers, we agree that this digitalisation has transformed the basic communicative infrastructure of teaching and society (Dede, 2016; Jenkins et al., 2013; Paulsen and Tække, 2020) and has thus sparked a media revolution comparable to those triggered by the inventions of speech, writing, printing and electronic media (Eisenstein 1983, Finneman 1997). Such media revolutions alter and expand the (im)possibility space of human activities: they afford us new options (i.e., enabling us to do things differently) (Wegerif 2013), but they also bring about challenges and problems and make concepts, norms and solutions developed in former media ecologies obsolete (McLuhan 1967, Tække and Paulsen 2016).

In this chapter, we analyse how the old classroom with its four walls becomes communicatively contaminated when teachers, students and others are equipped with computers, tablets, smartphones and a wireless network and how both new obstacles and possibilities arise in connection with this openness. Thus, the aim of the chapter is to bring forward an account of how digital transformation alters the premises of teaching, in both good and bad ways. Yet, what we provide in this chapter is only a structural analysis of the transition to digital age. In Chapter 3 we examine more extensively how actors with different educational understandings are likely to respond to and modify the new situation differently. What we intend to do in this chapter is to sketch out what the media environment initially brings forth about new educational obstacles and possibilities. Our exposure is based on the theoretical framework outlined in Chapter 1. The core of this is, that teaching is a historical and social invention, that opens up for contingent interactions between teachers and students, but also, that teaching only becomes possible through media, such as speech, writing, print, electronic

media and now also digital media. With each new media revolution, the total media environment – and thus also the communicative infrastructure of teaching and society – is altered and the capacity of teaching has changed. In this chapter we flesh out this first phase of the digital media revolution with regard to education. Yet, as we also argued in Chapter 1, the contingent character of mediated teaching – especially the radical openness of contemporary media environments – can be responded to and modified differently by societies, schools, teachers and students, depending on their understandings of what it ought to mean to educate through mediated teaching. In Chapter 3 we analyse such responses and the different value-based educational stances toward the general obstacles and possibilities of digital media, that we account for here in Chapter 2.

The chapter is divided into three main parts. In the first part we sketch out our historical understanding of the educational situation *before* and *after* the arrival of digital media. This part provides us with a general framework to understand the transition to digital age.¹ Parts two and three discuss whether the digital situation gives rise to new obstacles and/or possibilities by reviewing the research. Part two examines ‘media panics’ and obstacles that new digital media gives rise to with regard to teaching and education, while Part three discloses to what extent new teaching practices – with new educational possibilities – can be developed through embedding digital media. We close the chapter by summarising what is educationally new when it comes to the digital situation compared with that ‘before digital media.’

The School in a Historical Medium Perspective

First, the spoken language defines humans as human beings and creates the basis for society since knowledge can now not only be stored in genes, but also in the spoken language (Tække 2011). With scripture, knowledge can be communicated

¹ The distinction between ‘before’ and ‘after’ Internet and digital media is, to some extent, analytical. There is no single day that separates ‘before’ and ‘after’. Yet, in, e.g., the 1990s, no schools in Denmark made use of the Internet, but, by 2020, it is now the law that every school must use IT in school (Elf and Paulsen 2020). Thus, we use the distinction ‘before’ and ‘after’ to analyse the *structural change* that has taken place as if from a distance, not noticing all the small alterations and deviations and not caring about when exactly the change happened, which is not much different to distinctions between premodern and modern times. This implies that ‘before’ and ‘after’ can be different in different countries/contexts; some in which classroom teaching might still take place today as what we structurally call ‘before’. In other words: ‘before’ and ‘after’ denote two structurally different media ecologies: one without the internet and digital media and one with.

over longer periods of time and longer geographical distances than is the case of spoken language, which enabled great empires such as those of Egypt and Rome (Innis 1991; 1986). With writing we also see the first schools and the prototypical forms of *Bildung* as described in Chapter 1, but not before printing education began to gain the forms and structures we know today (Luhmann 2006). Printing enabled a multiplication and dissemination of the same text (via copies), which meant that, eventually, the majority of the civilised world learned to read and write. The Czech pedagogue and theologian Iohannes Amos Comenius (1592–1679) was perhaps the first to use both text and pictures in his educational book *Orbis Sensualium Pictus* (Frau-Meigs et al., 2017: 93). The advent of printing technology allowed society to revolutionise itself. In Europe the new media was used to propel phenomena such as the reformation, enlightenment and modern science (Eisenstein 1983) and eventually the public sphere and democracy (Habermas 1976). As discussed in Chapter 1, the visions of *Bildung* were a part of the enlightenment project and schools for ordinary people were founded from the eighteenth century onwards (e.g. in Denmark from the beginning of the nineteenth century (in 1814) all Danish children had to go to school) (Drejer 2014: 60). Typically, like in the US, this was a one-room rural schoolhouse, later replaced with the industrial-era schools we have today (Dede 2016: 105).

Since this foundation of the educational system the interactions between students and teachers has taken place within a closed classroom fenced by four walls. This is a specific type of architecture including both social and physical technology. The school is one of the societal institutions built on what Foucault (2002) calls the ‘power of discipline’. We have a closed room with a teacher sitting in front of a class of students, monitoring them, asking them questions, noting marks in a protocol, etc. During the teaching time there are no interruptions from the outside: ‘The interaction takes place in a closed room that is not public, so that distraction from the outside world can be minimized’ (Luhmann 2006: 131). The teacher has an authoritative power over the interpretations of the printed textbook and great power over the educational interaction. The closed classroom ensures that ‘the education system can control its own thematic and decide for itself when to begin, alternating or quit themes’ (Luhmann 2006: 132). This closed classroom system was structured around the principle of one teacher, one book, one subject, one curriculum, one class (based on students around the same age) – and all the communication within the school-class made up a self-referential structure from lesson to lesson, allowing only students and their teacher to participate (as inside members of the

communication). The students could think about their relationships outside the classroom but had no interactional access to them (while in school). In this way the teacher became not only the one held all the power as the educational leader but was also the person who decided the truth within the classroom setting.

The Main Structure of Teaching Before Internet and Digital Media

Thus, first of all, the teaching situation before the arrival of the Internet was characterised by a clear-cut distinction between classroom teaching and the outside world.² Interaction between teachers and students was restricted to the classroom: between teacher and students (and among the students). Here they could communicate about the outside world through representation media such as textbooks, blackboards and the assumed all-knowing teacher (functioning as the absolute Other). There were exceptions – like field trips – but these were exceptions. Before the advent of the Internet, the main structure of teaching was therefore *a two-chamber system*: on the one hand, the homes of students and what happened there were more or less different for everyone. Some got help with schoolwork, while others didn't. On the other hand, the school – that is, the classroom teaching – was mainly the same for everyone (if one was placed in the same class, with the same teacher, attending the same lesson). The consequences of this structure were chance inequalities, exclusion mechanisms and the reproduction of social classes. By this, we do not mean that these were objective results like gravity effects – rather, they were problems that different teachers (and other actors) dealt with in different ways, thus shaping the two-chamber system differently. Outside school, the students were left to their own personal networks, with created inequality because some came from highly literate and cultivated homes where the parents were educated, read books and were used to the doxa of the school system; while others came from homes with little or no education and a doxa that matched very poorly with the culture of the school. Also, it seems that teachers tended to better accept students with a more prominent social position who, through their receptions, attitudes, language codes, elegance and personality were given more weight than students who communicated in other codes (Bourdieu 1977).

² In Paulsen and Tække (2013, 2017, 2019b) the teaching situation before the advent of the Internet is analysed in detail. The following is based on Paulsen (2020).

Shapes of the Closed Classroom

Yet, societies, schools and teachers with different educational understandings shaped the closed classroom very differently.³ To simplify matters, we suggest that the mainstream shaping developed in the old rural and later industrial era was identical with what we, in the introduction to this book, called a ‘technical and causal understanding of teaching’. Before the arrival of the Internet, societies, schools and teachers with this mainstream understanding framed the closed classroom in such a way that it could be used to produce an input-output machine – or what could be called *an echo-chamber* (Paulsen and Tække 2016). The idea was to stimulate students to learn as much as possible of the same X (curriculum). A typical way of doing this would take this form: First, the students should read X in the textbook, then talk about X in the class, then write X on the blackboard and then write X down in personal notes, perhaps also making exercises or other activities about X. Finally, the students took a test where it was seen to what degree they could reproduce X. Many variations and deviations from this standard were worked out. The point here is only that, before the advent of the Internet, mainstream schools and teachers developed ways of framing teaching in the closed classroom to control the production of outputs. The implication was that the closed classroom was understood, used and modified into a control and steering technique. Interaction in this old rural and later industrial-era schools’ classroom then took the form of sequences of echoes. Thus, we propose that the echo room has been the main institutional form of educational interaction called classroom teaching for the last two or three centuries. The foundational infrastructure of this has been the four walls, the blackboard, the teachers’ authority, the printed book and later also copies from books, newspapers and e.g. tape recordings of native language speakers. This educational and social technology inside the classroom was developed and refined over centuries and fitted the industrial mass production where society needed many people with exactly the same qualifications and not so much autonomous thinking.

Yet, there have also been other understandings of teaching than just the technical-bureaucratic mainstream understanding (Roy 2003, Paulsen 2020). According to Drejer (2014) the mainstream ‘positivistic’ understanding had been challenged, especially in the twentieth century (in Denmark and similar

³ The analysis of different educational responses and thus different restructurations of the basic teaching situation before and especially after the arrival of digital media and internet, is elaborated further in Chapter 3.

countries), by more 'deliberative' and democratic understandings of education but, from the beginning of the twenty-first century, the positivistic understanding of education had regained the upper hand. What we want to do here, however, is to sketch out how the closed classroom was also shaped differently than into an echo chamber – and was thus 'made sense of' by alternative understandings of education (see Chapter 1). Let us call these alternatives: (a) a facilitating and voluntaristic understanding; (b) a critical and challenging understanding; and (c) an experimental and creative understanding of education. Our aim is to show that these alternative understandings relied on the same main structure (i.e. the closed classroom, but shaped it differently). We will examine here and in Chapter 3, that because all educational actors – despite operating on the basis of different educational understandings – relied on the same main structure, they all reacted – more or less – with the same initial perplexity to the arrival of digital media and the Internet, which undermined this structure, but later began to develop different variants of the new open classroom of the digital age.

One alternative shaping of the closed classroom was carried out by societies, schools and teachers who affirmed a more facilitating and voluntaristic understanding. As an alternative they used the closed classroom to *protect* the students from the outside world and to facilitate students' *own* self-development in a safe environment. Here, teaching activities were based on students' own interests and experiences but supported by the teachers, who encouraged them to undertake projects and explore the world within their reach. The students produced posters, their own books, experiments, projects, plays, artworks, gardens, constructions, music performances, roleplays and so on. They used their bodies, instruments, pen and paper and other analogue media. The classroom/school was constructed as a secure space for all this, without interference from outside society.

Another alternative to the mainstream echo chamber was teaching developed by societies, schools and teachers who wanted to critically challenge and encourage students to become transformative citizens. Before the arrival of the Internet, these shaped the closed classroom into a place where they selectively confronted students with the strangeness of the world (e.g., using books, films, tapes, pictures of ancient artwork, clips from newspapers, or from experimental settings). The students worked in the classroom with epochal key problems such as environmental issues (Klafki, 2005), analysing the problems and discussing possible solutions critically.

Finally, there were also schools and teachers who developed even more experimental and creative forms of teaching in which students, together with

their teachers, were supported to create and develop new expressions, thoughts, constructions, potentially creating new ways of perceiving, acting and being in the world.

All these variants of using the closed classroom for different educational purposes are important to take account of and remember, when it comes to discussing the consequences of the shift to digital age, to which we now turn.

The Main Structure of Teaching After Internet and Digital Media

With digital media and wireless networks, the classroom is communicatively opened. This produces both a new space and a new time. Students can access educational communication from almost everywhere and at any time. Teachers can contact and interact with their students while they are at home or elsewhere. Other people 'from the whole world' can contact students and teachers sitting in a classroom. The upshot is that communication⁴ in and out of the schoolroom has increased massively, while the communication inside the classroom between the students has increased by using written interaction. Thus, with the arrival of the Internet, digital media and wireless networks (in Denmark mainly at the beginning of the twenty-first century⁵), teachers and especially students began to use digital media (in school time) to interact and communicate not only with one another but also with outsiders from the surrounding world, through interaction media like Messenger. This opened up the classroom: The clear-cut distinction between inside and outside of teaching was *deconstructed*. In the pre-Internet classroom it was impossible or very unlikely that students (and teachers) communicated with outsiders – friends, parents, politicians, sellers and so on – and also it was almost impossible to participate in other communities. However, with this new media, students can now be sitting in the classroom playing online games, participating in online communities, being politically active, sending and receiving private messages, collecting information quickly and being in touch with people from across the globe. However, they are also vulnerable to exposure to those whose commercial interests have other aims than education. All this means that the fixed boundary of classroom teaching has been destabilised:

⁴ Communication in the most broadly sense: interaction, film watching, gambling, gaming etc.

⁵ In the Danish upper secondary schools, school reform from 2005 stated that IT should be used in all subjects and daily teaching practice. Around that time, upper secondary schools began to buy wireless networks but also computers, digital blackboards etc. At the same time, it became normal for students to bring laptops to school, using them to carry out non-educational activities, like sending private messages. See Paulsen and Elf (2020) and Paulsen and Tække (2013).

Teaching can, in principle, take place anywhere and anytime, with students and teachers being in different places and the teaching situation is nowhere safe from outside influences. This implies a more complex, contingent and open teaching situation than before with new obstacles and possibilities and a lack of adequate social norms and teaching methods.

Educational Understandings of the Open Classroom

We described above how the closed classroom of the pre-Internet era was shaped and modified differently by societies, schools and teachers with different educational outlooks. We think the same is – and will be the case – when it comes to the open classroom of the digital age. Yet, based on our analysis of the development of teaching in Denmark the last 15 years (see Paulsen and Tække 2013, 2016, 2019) it seems to us that most schools and teachers, with only few exceptions, have responded with the same level of perplexity to digital media and the new radical openness. When digital media appeared – and changed everything, as described above – the first response of teachers in mainstream schools can be seen as a reaction to what the new digital media situation did to their closed classroom: it made it open and (to begin with) uncontrollable. At first, this new open room implied distraction, loss of control and loss of authority and teachers responded with frustration. They wanted to prohibit the new disturbing world: ‘Shut down the Internet’ they cried. While students’ attention was drawn away from teaching to other things, the functioning of the mainstream teaching machine declined. Media platforms like Facebook were more likely to catch students’ attention than mainstream teaching machines (Paulsen and Tække, 2016).

Even schools and teachers who based teaching on more facilitating, progressive and voluntaristic outlook were concerned. For them, opening up the classroom meant that their safety and protection was lost. Other people now had direct access to students’ mental processes, 24 hours a day. Thus, actors with non-educational goals could interrupt and influence the students using glamorous content, commercials, games and so on – undermining educationally framed self-development. The first response to all this from the progressive teachers was ambivalence. On the one hand, they wanted to protect the students by trying to shut down the Internet or prohibiting the use of smartphones and/or other new media during teaching hours. On the other hand, they also wanted to respect their students’ ability to make their own choices. Thus, these schools and teachers oscillated between protecting students (by trying to prohibit the use of new media during school hours) and ignoring the new situation (being too kind to

prohibit media use). The result was ambivalence, confusion and conflict (Tække and Paulsen 2013).

Schools and teachers who were even more critical in their outlook and who usually used the closed classroom to challenge the students, saw, that, in the new digital environment their students were focused on other things that were more appealing but with less educational value, making it harder to challenge them. In the eyes of the students, the old analogue material looked outdated and community and dialogue within the classroom was undermined. The first response to the new media for these teachers was resignation and despair. To really challenge students and encourage them to think deeply seemed to be mission impossible in the digital age. The art of Ancient Greece, novels, classical music, difficult mathematical problems, philosophy and 'heavy' books like *Das Kapital* appeared to be impossible to bring within reach of most students' attention and interest. The frustrating thing was that more than ever before, challenges to prevailing thought and practice were required, but these were not likely to become meaningful to most students.

However, teachers in experimental and creative schools where less perplexed, after all, the shift to the digital age appeared to them like one great experiment. Yet, it also took some time for these schools and teachers to really make valuable educational use of the new media.

Thus, it can be shown that all teachers reacted with concern to the arrival of the Internet, wireless networks and digital media, because they all relied on the same basic infrastructure of teaching – the double-chamber system. Therefore, first responses to the digital age were not quite different: All were confused: Should we ignore new media, or should we prohibit them?. On the other hand, as we elaborate in Chapter 3, when societies, schools and teachers – with different educational outlooks – began to develop more advanced responses, they also begin to distinguish themselves more and more from one another. Nevertheless, there are some common features in all their different responses/strategies. They all react with frustration. This was their shared first response. Then, after a while, they began to incorporate and imbed digital media in the classroom teaching. This was their shared second response. Finally, they all begin to use digital media to make educational use of the new openness outside of the classroom, by using the Internet and digital interaction media. This was their shared third response. These similarities point to a common way of responding to the new, despite their differences. It shows a general cultural pattern in which, sooner or later, digital media was integrated educationally. That being said, it might be that we are only describing the initial phases of a

digital revolution; it cannot be excluded that the future will bring different and also more rejective responses (see Chapter 5).

The Media Environment of the Digital Age

We now move on to review and discuss research literature both in relation to obstacles and possibilities and in the next chapters look from the perspective of our own research at the responses to digitalisation in the educational system. We begin by looking at the debate, then go on to assess students' competencies, then focus on the obstacles of distraction and multi-tasking before – in the third and last main section of the chapter – examining research that indicates new possibilities when digital media are embedded and integrated into everyday teaching practices.

The Debate

The present debate regarding digital media and education including children and young people's use of media is polarised; on the one side we find *IT-boosters* (e.g., politicians, tech companies and big organisations like OECD (2001, 2009) and the European Commission (2014)) but also researchers who, for instance, have suggested and promoted concepts like *digital natives* (Tække 2021). From this point of view, digital media and technology is predominantly a good thing and also necessary to implement if one wants to be in the driver's seat of the modern way of life, the global economy and the knowledge society of the future (see Elf and Paulsen 2020 about the it-boosting discourse). However, we find *IT-sceptics* (e.g., self-professed experts, parents, school leaders and teachers (Tække 2021). Yet, this debate and dichotomy is based on the common view that digital media has a unilateral impact on education; the only disagreement is whether it is positive or negative. In the research literature about media and education that relies on a deterministic view on education (speaking of impact) one can both find deterministic researchers who are mainly positive (i.e., media is changing education for the best) and deterministic researchers who are mainly negative (i.e., media is changing education for the worse) (Paulsen and Tække 2013). However, from a non-deterministic point of view this debate is almost senseless, because media does not have certain effects on education (see the introduction to this title). More non-deterministic media and education researchers therefore also tend to offer a more complex, but also more critical (in the Kantian sense – indicating both possibilities and limitations) view of media and education thus, for instance, warning against

uncritical embedding of digital technology that are linked to commercial interests and/or new forms of surveillance, nudging, increased control, capitalism, but also techno-idealism (Livingstone 2012, Cuban 2003, Selwyn 2014, Han 2016, Sims 2017, Williamson 2017, Frischmann and Selinger 2018, Zuboff 2019). On the other hand, some IT-sceptics forward arguments about the *unconditional* harmful effects of the digital media on the biological systems level (brain damage, lack of sleep and exercise and addiction), the psychic systems level (loneliness, narcissism, low self-esteem and self-harm) and the social level of systems formation (bullying, asocial behaviour, normlessness or countercultural norms, unwanted photo sharing, echo chambers and the sharing of fake news) (Tække 2021).⁶

Our own position is in accordance with the critical and non-deterministic position outlined above, to go beyond the debate between IT-boosters and IT-sceptics. Thus, we would argue that the questions of new media and technology are important but call for nuanced answers that take account of the pros and cons of the new media, but also take account of the 'dynamic' situation; meaning that positive and negative effects are never 'unconditional' but depend on the specific societal and cultural ways media are selected, innovated, understood and used within a given society (Finnemann 2008). This implies that the advantages and disadvantages of new media cannot be determined in any simple way, neither speculatively nor empirically. Thus, we reject all simple answers like (a) new digital media has only negative effects; (b) only positive effects; or (c) completely definite effects (negative and/or positive). Instead, we propose that societies, schools, teachers and students transform themselves in unpredictable ways, when they begin to act in new media environments that include digital media, responding to and modifying the new media situation, together or in conflict with other actors (e.g., companies and politicians). If we go back in media history, the inventors of the alphabet, for instance, could not in any way foreshadow the many different real consequences of the new transformative capacity that the alphabet afforded together with other media (Luhmann 1995, Paulsen and Tække 2009). This implies that we must be careful and avoid general and deterministic statements and acknowledge that effects and consequences depend on how different actors use, respond to and continuously modifies the whole media environment (e.g. in democratically or totalitarian directions and also are being transformed at the same time) by these activities. In other words: media and society/school are tightly intertwined, almost as a seamless web and

⁶ We return to the IT and generally media-sceptic research and provide the research in children's sleep later in this section as an example.

can only analytically be separated. Thus, it would be more adequate to describe and understand society and media/school as ‘media using people’ who transform themselves and the media – and their capacities – in unpredictable ways into ‘new media using people’, configured differently.

Also if we, as critical media scholars, observe the debate one thing that stands out is that it is an old debate re-actualised every time a new medium comes into use (Frau-Meigs et al., 2017: 93–98). Drotner (1999) defines the debate as media panic or even as moral media panic (see the classical works on ‘moral media panic’ by McLuhan 1967 and Cohen 2002) and, according to her, every time a new mass medium has entered the social, it has spurred public debates and: ‘In some cases, debate of a new medium brings about [...] heated, emotional reactions: in that case we have to do with what may be defined as a media panic. It may be considered a specification of the wider concept of moral panic and it has some basic characteristics: the media is both instigator and purveyor of the discussion; the discussion is highly emotionally charged and morally polarised (the medium is either “good” or “bad”) with the negative pole being the most visible in most cases; the discussion is an adult discussion that primarily focuses on children and young people’ (Drotner: 996). Drotner’s oldest example is from 1795 where a group of evangelical philanthropists in Britain launched a zealous campaign against women reading short stories: ‘the poison continually flowing thro’ the channel of vulgar and licentious publications’ (Drotner: 599). According to Luhmann (2000b: 139 n 23; 142 n 12) the concept of the authentic first came with the print and mass media. Not before printed books, the distinction between those who experienced the world at first hand and those who experienced it second hand through reading books came into language. In relation to digital media Drotner (1999: 595) writes that cases from the USA were reported in Denmark as early as 1998 by the Danish newspaper *Berlingske Tidende* (17 March 1998) under the headline: ‘The Internet is addictive like narcotics.’ This sounds like the headings in today’s debate about smartphones and social media. An example of a media moral panic, which seems to come back with every new medium, is one in relation to sleep. When we look into the topic like Matricciani et al. (2012), who made a systematic review of 32 sets of medical recommendations for sleep from 1897 to 2009 the problem seems to be a permanent public conflict: ‘Recommended sleep duration consistently exceeded actual sleep duration by about 37 minutes . . . as if children always needed extra sleep, no matter how much they were actually getting. The rationale for sleep recommendations was also strikingly consistent for more than 100 years: children were overtaxed by the stimulation of modern living, although that stimulation was embodied in whatever the technological avatar of the time was.’ The stimulations

included schoolbooks, radio, television and the Internet. The review also highlighted the ‘consistency with which authors acknowledged the lack of empirical foundation for their recommendations, despite extremely detailed and quantified guidelines. It is remarkable that after more than 100 years, sleep recommendations are still being issued in the acknowledged absence of meaningful evidence’ (Matricciani et al., 2012: 553).⁷ The situation today is that the mass media listens more to researchers if they can come up with a conflict angle like: ‘It’s “digital heroin”: How screens turn kids into psychotic junkies.’⁸

The New Media Situation

Instead of deterministic statements and beliefs, we suggest that one should analyse the concrete new media situation (i.e. the whole media environment, including both digital and non-digital media and also analyse how different actors understand, respond to and modify this situation and what effects and consequences such understandings, actions and modifications seems to have). As suggested above, our own analysis indicates that the most important feature of the new media environment is the radical openness that is afforded by digital media. We have noticed that some initial and visible implications with regard to teaching in schools in the Danish upper secondary school context are:⁹

1. The classroom has become more *uncertain* than ever before, because the possibilities of communication both inside the class and with outsiders increases with digital media.
2. Students seem to have problems with being attentive to the teaching and being present in the classroom *and* also ‘answer back’ and being attentive to outsiders and online fora.
3. Some students describe themselves – or are being attributed – as *digitally addicted*, meaning that they cannot control themselves and do what they really want in the new alluring and appealing media landscape with online games and other temptations.

⁷ Here quoted in in line with the latest OECD report Burns and Gottschalk (2019).

⁸ *New York Post*, 27 August 2016.

⁹ It should be noted that this is not a list of general consequences, but only consequences that we found in the Danish upper secondary school context. Not all schools in other contexts have the same equipment, not all students and teachers can be supposed to use the media they have access to in the same way and not all schools will have the same laws and political and educational infrastructure as Denmark, for better or for worse. Nonetheless, we think that the six consequences that we outlined in the Danish context tells a story about how it is likely that schools and teachers might respond initially, given similar contextual constraints.

4. Some students think the right strategy in the new media environment is to *multi-task*, that is simultaneously being attentive to the teaching and other things, made accessible through digital media. As we elaborate, such a strategy is not advisable.
5. The awareness of students is also interpellated and caught by social media, advertisements, commercial companies and others who, through digital media, can capture their attention even when they are in school. The initial result is a 'war over students' attention', declining attention in school and a weakening of the power of the mainstream teaching machine.
6. Teachers initially – as described earlier in this chapter – tend to respond either with ignorance of these problems or try to prohibit non-educational relevant media use, without great success.

See Paulsen and Tække 2013

Yet, our point is not that these and similar problems of the new open classroom and teaching in digital age are totally unavoidable facts. Rather they are concrete and *exemplary* problematic aspects of the *initial* phase of the new situation. Also, as we argue later in this chapter, but even more in Chapters 3 and 4, these six obstacles can all be responded to in different ways and modified, to some extent, even into being educationally valuable. For instance: social media use can draw students' attention away from teaching *but* if teachers begin to use social media to mediate teaching, the same media can also be used to draw their attention back again. Also, the six problems, we have indicated, are related primarily to an initial situation, in which digital media and the internet has become available, both in school and outside school, but in which normal teaching does not yet make use of the media to any great extent, when it comes to fulfilling educational aims. Likewise, the problems are tied to a situation in which most student's understanding of and experience and success with acting and developing a good school life in the new media environment is very limited (in opposition to the belief that they are digital natives and therefore have great digital skills).

Students' Competencies – The Present Situation

Peruvian scientist Eliana Gallardo Echenique, in a review article based on reading 355 publications, has sought to find out what we should put into concepts such as digital natives, net generation and millennials (Echenique 2014).¹⁰ It

¹⁰ This section is based on Paulsen and Tække (2018).

turns out that those who praise digital natives base their view on anecdotes and not on scientifically valid methodology (see also Helsper and Eynon 2009). They induce a picture of young digital natives (vs. immigrants) who are team-orientated, collaborative and capable of multi-tasking between many different media (Helsper and Eynon 2009: 169). Critical empirical research rejects this view. There is no significant difference to immigrants and so-called digital natives usually have a superficial understanding of the new technologies and have only limited capabilities for very specific purposes and only superficial knowledge of, for example, search and analysis. Only a few can manage more advanced new technologies. Their abilities are less advanced than the teachers think, and they do not form a homogeneous group in terms of their technological ability. Therefore, one should not assume that they can manage much, on the contrary, they must learn it through a teaching that takes this upon itself. Only a small group knows anything special about technology. The conclusion is that the concept of digital natives (and similar concepts) is merely anecdotal (Helsper and Eynon 2009: 169–72).

Researchers Cinque and Brown (2015) take up the story by pointing out that young people, here under the label ‘generation next’, are not necessarily good at managing new media. The empirical basis put forward by Cinque and Brown is from Australia, where several hundred students who had just started at the university answered a questionnaire. What is being studied is what screens the students are looking at for how long and for what purposes. The researchers conclude that young people are not very skilled in their IT use and almost always try to ‘google’ themselves out of problems ‘over the development of research skills via electronic databases and scholarly journals’. To this end, they spend little time using IT in pursuit of their studies (Cinque and Brown: 2015).

The researchers Gretter and Yadav (2016) find a big gap between those who can deal with technical subjects and those who cannot; here, the researchers believe that the schools must close the gap. This by combining science (programming) and the humanities (critical thinking). They refer to Jenkins (2008, 2006) who thinks we should become participants and learn to work in networks. The point is that through the scientific programming skills we can practice our media literacy (Gretter and Yadav 2016). However, Iversen et al. (2018) do not believe that everyone should learn how to program and that for those who nevertheless do it, that education in programming cannot stand alone because a basic knowledge of algorithms and pattern recognition does not entail a critical and reflexive attitude towards the digital society. For this, programming alone does not give students the prerequisites to make informed choices

regarding technology and participation in technology development. Instead, Iversen et al. (2018) propose 'computational empowerment' that shifts the focus from programming as an end in itself, to imparting the necessary characteristics and resources to students to participate in technological development. This is done through participatory design where students are supported to develop skills, competencies and critical understanding (*Bildung*) and are also encouraged to engage in creating improvements for the digitalised society. Of course, we agree that programming itself does not develop critical thinking. It would probably be too difficult for non-mathematically orientated classes to have to learn it (to a greater extent). In this context we find it important to consider Iversen et al.'s (2018) methods to help students who do not directly learn to program, to be able to reflect critically on, for example, Facebook's functional infrastructure regulated by algorithms. The important thing is that no student should go through high school without being challenged to reflect critically on technology and to learn to express themselves, to participate in the digital society on an enlightened level.

This indicates that there is a need to rethink the scientific, technical and mathematical education fields, but perhaps also the interdisciplinary connection between educational areas. One may well consider whether a new subject such as *Informatics* would be a solution or the IT competencies should be addressed in single subjects, including interdisciplinary courses where students work together across subjects, such as literature, mathematics and social studies.

Fu (2013) speaks about three sets of problems that constrain the digital education of students. The first set is that many teachers do not have the necessary ICT skills and experience, have technology prejudices and lack the time and support to acquire skills in the new media. To this end, many teachers are under pressure from national tests, exams and the like. Second, many teachers use new technology as an extension of existing ways of teaching that they do not change. The third set of barriers is organisational and administrative. School leaders focus more on quantity and student test results than on how ICT is used. For this, schools do not always provide adequate support, hardware, software, continuing education, etc. To this end, a review of Norwegian conditions points to an overall problem regarding rules and guidelines (Engen et al., 2015).

All in all, students' capabilities are overestimated and teachers lack the skill, experience and an adequate understanding of the new situation, that are not developed because of prejudice, lack of time, tests, management and regulation.

The Obstacles and Possibilities for Attention

Research on multi-tasking clearly seems to reject its use in learning situations.¹¹ If students do multi-task, the research shows that the tasks in question will be performed more poorly and take longer, with students learning and remembering less about what they have done than when tasks are performed one at a time (Pashler, 1994; König, 2005; O'Brien, 2011; Rekart, 2012; Lee et al., 2012). One mitigating factor is that young students, to some extent, learn to cope with media activities occurring at the same time as teaching (Bardhi et al., 2010). After all, multi-tasking is not a pathology (Aagard, 2018).

For more than 100 years, psychologists have been interested in the (in)ability to perform two or more activities at the same time (Pashler, 1994). In general, research shows that our attention is disturbed if we try to do several things at the same time (Pashler, 1994). However, 'attention' is a term that covers several sub-areas of consciousness, perception, memory functions, etc., implying metaphysical/philosophical discussions and ambiguities (Pashler, 1994). However, others (e.g. König, 2005) do not define multi-tasking as performing different activities simultaneously, but as the ability to achieve multiple action goals within the same time period, by switching between individual activities to achieve certain goals. In this definition, multi-tasking is perceived as the ability to switch rapidly between different activities – rather than being able to perform these activities strictly simultaneously.

It can be concluded that students may not be able to multi-task effectively in the strict definition of the word, but that they can learn to switch more effectively between different activities. In a study of 132 undergraduate students, König (2005) shows that it is not possible to multi-task effectively, in the sense of simultaneously performing several tasks at the same time, but that we do have the ability to switch between different activities, depending on how good our short-term memory or working memory is. However, this individual ability is not just something that can be learned – it can also be unlearned. For instance, older people are typically less able to switch between different activities that require decisions, actions and reflection than young people. But no matter how good your working memory is, it seems to be weakened by multi-tasking (in the strict sense of performing different tasks simultaneously) (O'Brien, 2011). One test of 130 students shows that we absorb less information when we do more than one thing at a time (e.g., watching a video and reading, then answering

¹¹ This section is based on Paulsen and Tække (2019b).

questions) (Lee et al., 2012). Also, Kuznekoff et al. (2015) show how damaging multi-tasking is for learning in teaching situations in a research set up where they distract students during teaching. Yet, such laboratory experiments are both reductionistic and damaging for the debate about digital media in relation to education (Paulsen and Tække 2019b). According to Aagard (2018) such experiments (like those by Lee et al., 2012, König 2005 and Kuznekoff et al., 2015) only cover situations in which students attend classes and are simultaneously asked to perform tasks which have nothing to do with the teaching. Such studies only deal with cases where digital media was used exclusively and explicitly to distract the students and the result is hardly surprising: students cannot concentrate fully when they are distracted.

Single-Tasking, Multi-Tasking and Multiplexing

Following Paulsen and Tække (2019b) the counter concept to multi-tasking is single-tasking. Single-tasking does not imply that people are thinking of only one thing for a certain period of time. Logically, if a person reflects on a topic, the topic involves (most often if not always) several objects, concepts and causalities. As a result, creative thinking implies a kind of multi-perspectivism but is still a kind of thinking in which topics and concepts from completely irrelevant fields do not intervene. Using a Husserlian term, the intentional object is given in a horizon that enlightens it as a meaningful context (Pietersma, 2000). One borderline case could be what Pierce calls abduction, defined as a situation in which a concept from another domain enlightens our thinking like a metaphor (Jørgensen, 1993). In our definition of single-tasking, abduction involves single-tasking if this technique of reasoning is used to inform and understand only one single intentional learning object. Another borderline case is group work, in which a polyphony of different meanings meet each other in discussions. Again, we draw a distinction by saying that if a class or group only discusses one single object (e.g. how to understand X, we refer to this as single-tasking). If some people in the group begin to discuss other objects (Y, Z etc.) in an unrelated way, we refer to this as multi-tasking.

Now the question is if single-tasking in this definition is possible and perhaps more useful and better suited to the present environment. This is a very old discussion because as mentioned in Chapter 1, Plato made it clear that writing harms our memory. What Plato could not know is that history has shown that, because of writing, arguments have grown longer and more consistent and our vocabulary has grown much bigger (Ong, 1982). The start of printing means that

this process continued and new developments took off like the invention of the index and the possibility of comparing arguments (Eisenstein, 1983). Even so, Plato is still right in one sense because our ability to remember things by heart has declined as we have learned to write things down, look things up in an encyclopaedia etc. On the other hand, this also means that humans began to use more than one medium when performing activities like studying, thinking, communicating, reflecting, learning etc. This combined use of several media with different and supplementing intellectual affordances has produced a new version of homo sapiens with much larger cognitive capacities. Inspired by Fahey and Meaney (2011), we call this phenomenon *multiplexing*. We define multiplexing as focusing our attention on the same intentional object using more than one medium.¹² Even in the pre-internet school system, many different multiplex strategies had been developed. For instance, teachers said things aloud as they wrote them on the blackboard; while students listened, looked at the blackboard and wrote things down in their notebooks.

The new media situation for our attention calls for both critical and creative (Bildung) perspectives on education and media; meaning that schools and teachers should support, encourage and challenge students to both *reflect* on their attention, the ‘war of attention’, their effect on others’ attention, but also *experimenting* with developing new ways of being attentive in the new media environment. This new educational aim is required in the digital age.

New Teaching Practices

Now we turn to new possibilities for improved teaching practices and/or practices that are necessary in the new medium environment.¹³ We are talking enhanced professionalism, media literacy and Bildung that teachers from around the world, have invented and which have been documented by researchers. By new teaching practices, we mean new teaching-orientated understandings and uses of media in digitalised society that are relevant in different ways in relation

¹² The concept literally means multi (many) plex (fold), like manifold. Fahey and Meaney (2011) only mention the concept *en passant*: ‘It’s not “multi-tasking” to take notes or have a conversation with your colleagues during a presentation—as long as you’re talking about the topic at hand. Some call this “multiplexing” where overlapping tasks are closely related to each other and even complementary. Attention is not lost in multiplexing—in fact, it is multiplied.’ The concept is also used in cross fields between neuroscience and computational mathematics in a comparable way with ours (Feng et al. 2014).

¹³ The section about teaching practices is based on Paulsen and Tække (2018).

to the school's knowledge areas and, of course, to society and for the single human being in the digitalised society. We distinguish between four such new practices:

1. New participation practices (interaction).
2. New community practices (organisation).
3. New expression practices (production).
4. New impression practices (interpretation).

All four practices can, in principle, be actualised in one and the same teaching, meaning that, in such a teaching, there are both developed new ways of *participation* (in a class) and new ways of maintaining the *community* among students and staff through embedding digital media, but also new educational ways of working with impressions (e.g., finding and reading text) and expressions (e.g., making presentations). In the following, we review research literature that are relevant in relation to each of the four fields of practices. The aim is to discuss whether societies, schools and teachers, equipped with digital media, would be able – at least in principle – to develop new and different teaching practices that, on a general level, seem educationally relevant. For instance: if it is possible with digital media to expand educationally relevant ways of participating in teaching, almost everyone would agree that this might make it better, at least for those who otherwise would have weaker participation possibilities. Yet, we are aware that the same 'general possibilities' can be used for different purposes (both good and bad). We follow up this issue in Chapters 3 and 4. At present, our concern is only to discuss at a general level whether digital media opens up new teaching practices.

1. New Participation Practices (Interaction)

New participation practices build on an understanding and application of new possibilities for interaction and participation in the new media environment. We especially observe this in the form of written interaction especially through so-called 'social media'¹⁴ that can be set up with private settings which either allow interaction or exclude it. Interaction media expands teaching possibilities as

¹⁴ We define social media in line with Linaa-Jensen and Tække (2018: 42) as: 'a special type of Internet service where users can communicate (including, for example, sharing information, pictures and music). They operate through a digital infrastructure that enables, delimits and influences communication. Social media content is user-generated (produced, remixed, or at least copied). In principle, they allow for interaction (two-way communication). Last, they can almost always be accessed through different kinds of interfaces and different terminals.'

they change the environment in which we experience, think and communicate by adding a parallel virtual space for interaction to the visual and auditive face-to-face space (Tække 2002). Temporally, many can be actively participating in the interaction simultaneously, while spatially, participants may be physically separated, e.g. they participate from home or from abroad (Tække and Paulsen 2013; Crook 2008: 5).

International research into the use of digital media to promote interaction and participation has – so far – mostly been conducted at American universities. It shows positive results from both qualitative and quantitative experiments and studies with social media in education (Ebner et al., 2008, McNely 2009, Moody 2010, Junco et al., 2010, Atkinson 2010, Lowe and Laffey 2011, Shannon 2011, Elavsky et al., 2011, Elavsky 2012, Hosterman 2012, Yaros 2012), as well as in online courses where the use of social media is also proven to give students an improved social community with each other (Holotescu and Grosseck 2008, Dunlap and Lowenthal 2009). There are also studies that show that the media, if used properly, has a positive impact on the study environment (Ellison et al., 2007, Wright 2010, Elavsky et al., 2011, Reid 2011, Webb 2012). Here, we concentrate on the interactive aspect in regard to education and focus on the written interaction used in the SME project (see Chapter 3), primarily the use of Twitter for particular educational purposes.

The choice of Twitter in the SME class was particularly inspired by an American project in which researchers could report good results (Junco et al., 2010). The researchers describe a semester-long experimental study that investigated the use of Twitter in teaching. There were 70 participants in the study, with a control group of 55 first-year university students. The trial showed both significantly better engagement and grades in the Twitter group than in the control group. It also showed that both students and teachers became engaged in learning processes that transcended traditional classroom activities. The study shows that contact between teacher staff and students improved (2010: 10). The use of Twitter was also found to encourage students' cooperation both academically and socially. Twitter homework provided more educational activity and provided better feedback opportunities not only in homework, but in all sorts of other things. For example, there was a group that had problems accessing an online video that was on the syllabus; by using Twitter they immediately obtained help. The researchers, in comparison to the control group that used only Ning (a system similar to Lectio and Black Board), concluded that those using Twitter had more and better communication with their teachers. Similar results have been obtained by Menkhoff et al., (2015) and Kinsky and Bruce (2015) and good results have

also been documented with Twitter in language teaching (Montero-Fleta et al., 2015). According to Menkhoff et al. (2015), Twitter is a good medium for creating academic engagement, where more people have the opportunity to express themselves and where the teacher is better positioned to observe whether students have understood the academic content. The use of Twitter is described as a new form of classroom teaching. Hattem and Lomicka (2016) discuss 18 studies where Twitter has been used in language teaching. Again, the results are predominantly positive and the only criticism, besides a number of tips for successful use, is that Twitter can seem overwhelming and can cause information overload.

Overall, in the new media environment, with Twitter and other social media, the possibilities to create educational interaction are expanded, thus creating more participation opportunities and forms that can not only be adapted to the different disciplines and educational areas in the school but can also redefine them. The latter, however, especially where third parties are invited into the interaction (what we define in Chapter 3 as ‘third-wave teaching’), thus enable students to encounter a range of otherness that works conducive for *Bildung*, in living and engaging ways with content and form, which exceeds what a teacher in combination with a textbook can offer alone. Students connect to groups, other school classes, individuals (e.g., experts and databases, using the new medium environment as part of their education (Paulsen and Tække 2016). They take part in the convergence culture (Jenkins 2008) carrying out produsage (Bruns 2008), learning to navigate and take part in the new society and its forms of production, network, communication and culture. Where the teacher and textbook have previously been the primary ‘otherness’ through which students were to become good educated citizens, in school, this can now be expanded by meetings with other people and using content over the Internet; the teacher takes responsibility for these meetings as being academically and educationally relevant (Paulsen and Tække 2016c). Especially in the linguistic, cultural and humanistic educational spheres, there is research that indicates there is potential to strengthen the interaction and participation dimension of school subjects (Montero-Fleta et al., 2015; Hattem and Lomicka 2016).

According to Krutka (2015), this overall view appears to give a different picture to that of Postman’s more pessimistic view. Admittedly, there is much about the Internet that fits with Postman’s criticism in terms of technopolis: increased information overload, increased focus on speed and efficiency, individualisation and the like.

According to Postman (1993), education in Technopolis is quantified (e.g. grade systems and multiple-choice tests) and made into an economic relationship

(e.g. taximeter systems and the like). In contrast, Postman argues that it is important to have meaning and coherence in education (an argument shared by Biesta 2006 and Klafki 2005). However, according to Postman (1993:186), modern education is characterised by the absence of meaning and coherence, since in a modern curriculum there is no central pervasive idea; on the other hand, modern education is simply a combination of subjects (see Klafki 2005 for similar criticism). Similarly, there is no vision of a person with *Bildung* other than a person with skills (i.e. a machine-human, only a technical ideal (thus the first of the two vulgar variants of *Bildung* that we criticised in Chapter 1)). Likewise, there is research that describes how new digital technologies are used for monitoring, behavioural control and testing (Livingstone 2014) that reinforce the features of the modern that Postman criticises. For example, Twitter has also been criticised for creating information overload, narcissism and having a mind-boggling format. Nevertheless, Krutka (2015) points to the potential these media have that point in a different direction. According to Krutka, media platforms like Twitter enable what he calls *affinity rooms* for professional exchange and development and emotional support from energetic colleagues.¹⁵ The use of hashtags enables people to come together on topics to create dialogue and purposeful action (see also Poshka 2014 and the concept of public pedagogy). For example, educators (teachers, principals, educational researchers and others) have created these hashtags where substantial communication occurs. This allows teachers and others to connect with colleagues with similar interests and engage in social dialogue that was not possible when using individual personal computers. Krutka also mentions hour-long moderated chats on topics that address professional education challenges.

We conclude, in line with Krutka (2015), that the new media environment gives rise to both obstacles and possibilities and that it is, therefore, crucial to cultivate a critical and creative media usage that can go up against Technopolis and create a more humanistic, meaningful and context-based culture, through the new possibilities for participation.

2. New Community Practices (Organisation)

Community practices also relate to participation but at the organisational level. The new forms of participation require the development of norms and ethics

¹⁵ See Mueller et al. (2014) for the similarity of online teacher collaboration based on Lave and Wenger's concept of practice communities.

that enable participation, as well as the acquisition of norms when connecting to communities, groups and networks outside the classroom. For example, many may be actively participating in the interaction at the same time. Spatially, for example, it must be organised so students can participate from home or from excursions and the class can connect with resource persons who are located elsewhere. All these opportunities require the development of community practices if they are to be actualised. There are a number of specialised media such as Wiki and YouTube that, in collaboration with interaction media like Twitter and Facebook and the digital board in the classroom, can provide fruitful media chains¹⁶ (Paulsen and Tække 2013; 2015), as well as online supervision and feedback (Buus 2013). However, there are also a number of softer values where social media is important for a good teaching community and school environment (Ellison et al., 2007; Holotescu and Grosseck. 2008; Dunlap and Lowenthal 2009; Wright 2010; Elavsky et al., 2011; Reid 2011; Webb 2012; Avram 2014). With soft values we mean the potential to establish a better community. If the new media is used by students and teachers, there will be more opportunities to get to know each other, build trust, create things together, become friends, bond and maintain relationships, get to know each other's friends and form sub-communities, 'backchannel', network and plan parties and do homework together. In addition, general principled guidelines for the appropriate use of media such as Facebook may need to be decided for the entire school/institution (Wang et al., 2014; Menzies et al., 2017).

According to Ellison et al. (2007), a media platform like Facebook can help students accumulate, maintain and transfer social capital, help convert latent ties into weak ties by making visible information about one's-self and mutual friends, or friends of friends. Intensive use of social media provides a form of social capital that can be transferred so that one can exchange ideas and perspectives. However, Zeng et.al (2012) state that it is important that all institutions create a social media strategy. There are risks of defamation, bullying, copyright violation and, for example, false advertising. On the other hand, in the worst-case scenario, rules can violate freedom of expression and obstruct communication and participation. Thus, there are good reasons to establish guidelines for the use of a medium like Facebook (Wang et al., 2014; Menzies et al., 2017). There is no doubt that there are many positive experiences with the use of Facebook (e.g. in

¹⁶ By media chain we understand the interaction between several media, for example the class is looking for relevant websites and tweet them to a common hashtag, where the pages are subjected to source criticism, again via Twitter, after which there are oral discussions about communication strategy in spite of rehearsal and finally the knowledge gained is entered into a wiki or a Google page – ready for retrieval in relation to the coming examination period.

first language teaching (Marciano 2015)). In addition, Leaver and Kent (2014) and Avram (2014) point out that the Facebook group function is good for teaching, as you can organise academic activities and content where you do not need to be friends with the students (one of the possible legal, personal or moral problems). You can ask students to contribute resources, annotate material online, make criticisms, review or just comment during the lessons. Facebook can provide an expanded space for interaction with other students and teachers, which can offset a lack of informal face-to-face discussions. At the same time, both Leaver and Kent (2014) and Zuboff (2019) point out that the teacher asks students to join a company that commercialises user data. In our opinion, this seems unacceptable in a democratic context, but in today's Denmark, Facebook is currently the number one social mainstream medium culturally, socially, commercially and politically.

In conclusion, social media can be a good platform through which to organise teaching, but it is not without its problems. On the one hand, there are poor and time-consuming systems such as Blackboard (the same conclusion reached by Mueller et al., 2014) and, on the other hand, there is Facebook's commercial monitoring of users.

3. New Expression Practices (Production)

Expression practice relates to the area of articulating oneself in the digitised community. It requires knowledge to write text for microblogging and blogging, as well as graphically setting up a blog, editing a video movie, recording a podcast, etc. One must be able to set who can watch and advertise the media product. You have to be able to handle different genres and aesthetics, as well as handle the programs that control the setup and execution of different media products. For this, there are soft skills such as being able to see social codes in the circles that one wants publish in. For example, might someone be offended? In addition, the discussion on whether students should learn to code, which can be both relevant in terms of expressing themselves through animations, games, etc., and in generating better reflexivity regarding the digital infrastructure regulated by algorithms and surveillance capitalism. It is important that instrumental skills are embedded in and never separated from humanistic, emancipatory and democratic educational aims (see Klafki 2005 and the critical *Bildung* tradition described in Chapter 1).

To take an example, we can look at weblogs: following the literature, blogs can be used for many things (e.g. language teaching) (Al-Qallaf et al., 2016, Karlsen 2015) and for professional immersion (Liburd et al., 2011, p. 23). According to

Karlsen 2015), a blog can function as both material and link collection and as supplement and variation in relation to written submissions. A study by Al-Qallaf et al. (2016) was teaching English as a foreign language. The results of the study showed that students came to write longer sentences with fewer errors in grammar and spelling. The students were more motivated and more positive about the subject than before. The teachers were also excited but were concerned about their own digital literacy skills. It was a closed class blog where one of the researchers acted as moderator and students and teachers could leave comments. The topics were based on curriculum, letters to friends, travel experiences and analyses of both educational films and other films (2016: 531). In the first two weeks of the 12-week project, the moderator (i.e. the researcher!) introduced some technical challenges; to create an account, post text, post photos, etc. In week four, a certificate was promised to those who showed more than a basic interest in blogging. In week five, the blog posts doubled. From week five, the moderator uploaded a video once a week to write about. All students were happy for feedback – preferably instant. Corrected errors were observed to have a positive impact on later blog texts (2016: 534). Thus, the experiment clearly shows that the students felt that they were motivated by writing blog posts and they learned the technical while working more with the English academic content than otherwise.

Another example is online shared documents such as Google.docs documented by Elavsky (2012) and Dall (2015), Mathisen (2015) and Løvschall (2015) from the BIT-project (that we followed as researchers). According to Dall (2015), shared documents can be used to strengthen writing in history and other subjects. However, the teacher must design the documents to suit specific academic needs and ideas. Initially, the teacher must work with the students so that they have a common understanding of the structure of the multi-modal texts, tables and pictures as they will all have different levels of media literacy.

The upshot is that many new educational relevant possibilities of expression – especially new and better possibilities of co-producing expressions in a class and/or together with others, as well as remixing former expressions and contributing to further remixing and curation – come with the new media. New genres as fan culture, for instance, has also emerged and exploded in the last decades.

4. New Impression Practices (Interpretation)

There are myriads of specialised media that can be used in teaching. The textbook has been the primary reading medium in education since the acquisition of the

print medium. Other media such as photocopies, the blackboard, films, overhead projectors and various authentic materials (e.g., newspaper articles) have been added as supplements over the years. With the advent of digital media, the old reading media have been both re-mediated and re-functionalised (Finnemann 2005). In addition, information search and source criticism are now among the most important areas of impression practice. It is a common school practice (at least in Denmark) to search the Internet for facts and solutions to problems in all subjects. However, it is not an inherent feature to be able to find through the search engine's algorithmic structure and operation forms, as well as the use of the Boolean operators, how URLs are structured and how searches can be specified, etc. (Paulsen and Tække 2019). In addition, there is the whole field of source criticism, where students must, for example, orient themselves to various websites' own source references and/or the commentary track on Wikipedia. In an age of alternative news, mis- and disinformation, outdated school books and maps and access to large scientific databases, it is an educational problem in all academic fields, as well as an expression of critical Bildung, to be able to search information and to be able to relate critically to it, including being able to remix it in accordance with copyright and professional academic standards for originality and source references.

As we have already mentioned, notions of the great abilities of the digital native do not hold true (Echenique 2014; Cinque and Brown 2015), to which students look more for relevance than for credibility when searching (Kiili 2012) and can only poorly understand underlying business motives (Kiili et al., 2018). The use of Google and Wikipedia often takes place behind the back of teachers, which must also be seen as evidence for not (enough) teaching in information search and source criticism (Schreiber 2017: 221). If students are to be properly supported for the digitalised society, they must be encouraged to search for information and challenged to source criticism in school (Gretter and Yadav 2016).

Just as in relation to expression practices, there seem to be new, educationally valuable, ways of generating impressions in connection with the new media environment. Many new impressions can be established in teaching through the Internet and new ways of searching information and making interpretations can be created. At the same time, the enormous amounts of available information of dubious quality mean that it is important to encourage and support students to become better able to relate to sources critically.

Literacy and Digital Media Practices

Following Hutchison et al. (2016) who surveyed 1,262 students aged 9–12, the following applies: ‘There is a need to support schools and teachers in understanding how to integrate digital technology into literacy instruction in a way that supports the development of the full range of literacy skills that students need, are able to do and prepares students to be literate in a digital world’ (2016: 436). According to Hutchison et al. (2016), literacy today cannot simply consist of reading and writing printed texts; one must also learn to read and write digital texts. This dualistic idea means that the reader must not only be able to decode alphabetical texts but must be able to make sense of information based on images, sounds, videos, colours and combinations. To do this, one must be capable of locating information that is relevant in evaluating the validity and reliability of the information. Students must be able to navigate a digital device and understand a plurality of contexts, vocabularies and norms that are not normally associated with printed texts (e.g., understanding the use of URLs). To do this, they must also be able to communicate effectively digitally. Socio-culturally, literacy is about applying knowledge for specific purposes in specific use contexts. As the web is interchangeably, large and varied, it requires many forms of background knowledge and skills to make sense of it. The goal is not only to be consumers, but also to contribute to collective knowledge (2016: 436).

Digital Teaching Practices – Aims and Means

Marner and Örtengren (2013) and Marner (2013) discuss how the introduction of the new media in some subjects (where the media is part of the substance), transforms the subjects, which is consistent with the media-ecological perspective (see medium theory in Chapter 1). Marner (2013) reports on the use of IT in art education in upper school in Sweden and is based on observation and interview. The students find that the use of the computers is involved in everything in relation to the pictures. They make remix (e.g., the last supper with junk food). The students are inspired by each other and the older ones help the younger ones. This produces a multi-vocal teaching environment where everyone helps, inspires and instructs each other (Marner 2013: 365). A student expresses that it is not art teaching, but teaching in creativity, since they learn to use what they already have in their heads. Students are aware of the distinction between mastering and appropriation: ‘This indicates that pupils are aware of the

difference between what Wertsch (1998) calls mastery (learning to master the medium on the medium's terms) and appropriation (mastering the medium on one's own terms)' (Marner 2013: 366). The mastery became so good that students did not get good grades for the performance of the technical aspects (to paint a nice horse), but for the realisation of ideas (Marner 2013: 367). The teacher also supervises from home and in breaks. Some put their products online receive external comments from outside, others do not (2013: 368). This example shows that not only means but also goals have already been altered in some subjects.

The Struggle Between the New and the Old

Thus, in the new media environment, school subjects change – in the example above it is now not necessarily about drawing, but about remixing. Historically, according to Marner and Örtengren (2013) and Marner (2013), there is a variability in what is perceived as belonging to the subject and what does not. The new aspects of the subject will be seen as anomalies and will be neglected and placed at the periphery (Marner and Örtengren 2013: 677). Marner and Örtengren conducted 150 interviews at nine different schools to depict the discursive struggle with four different ways in which schools/subjects/teachers can relate to digitisation. The development of the subject (the transformation of what the subject is as result of the new media) is described using the concepts of the sacral and the profane, where the sacral is the spirit of the subject which cannot be avoided and the profane can be avoided, but which can later be incorporated in the sacral (but which can be seen as something imposed from the outside) (Marner and Örtengren 2013: 676). The results of the study show:

- **Resistance:** Especially observable in schools where the digital is perceived as irrelevant, which is why you stay with the paint brushes.
- **Adding:** (where activities are introduced only to do something digital) In schools where this occurs, it is concluded that adding digital is not enough if the digital is really to be integrated.
- **Embedding:** In schools where the digital is really embedded in the teaching, not just as an addition but as an integral part, the relationships between the sacral and the profane change by providing the communicative aspect at the expense of the aesthetic practical. It should be noted that right equipment is needed here for everyone.

- **Digital media as dominant.** Where this occurs, it implies unilateral instrumentalism that is not recommended.

Following these results, the point is that if subject matter teaching and Bildung in upper secondary school are to be changed qualitatively through the inclusion of digitisation (i.e., not just strengthened in terms of efficiency), then it requires that the digital be embedded as an integral part of the overall subject matter teaching. But not in a way where the digital media becomes dominant, nor in a way in which it is simply added, while most of the teaching and subject matter teaching remain unchanged (see also Cuban 2001).

Digital Teaching Practices and Bildung

From our perspective, teaching practices must always be applied in a Bildung context reflecting about knowledge, attitude and existence (see Chapter 1). Of course, much knowledge is at stake in both impression and expression practices, but in the unfolding of these practices, reflexivity can support their use in the service of the common good. Likewise, with community practice, where the skills of organising joint activities in social media call for reflexivity over attitude and existence. Participation practice in its innermost identity is always already reflexive, but the question is whether reflection is used in the public interest. The school must encourage and challenge students to develop existentially, to take care of each other and the community and to strive for the necessary knowledge to do so. Each small course within each particular subject must lift its small part of the overall Bildung of the students (see Figure 2.1, but also Chapter 4, in which we discuss this further).

In the research literature, the new digital community is characterised by the dissemination of knowledge, by participatory culture, convergence culture, appropriation, remix and produsage (Bruns 2008, Jenkins et al., 2013, Jenkins 2008, 2006).¹⁷ Knowledge production now takes place through networking, where production involves a large degree of re-production, where already created media texts (text, film or, for example, programming code) are pieced together and remixed. In such a production context, one, as also pointed out by Hutchison et al. (2016), it is not enough to simply being able to consume media texts; a digital society – guided by critical Bildung – also requires that you actively participate critically in the production. Therefore, students must be

¹⁷ We define *appropriation* as: ‘The ability to meaningfully sample and remix media content’ (Jenkins, 2006, p. xiv).

Figure 2.1 Teaching practices and critical Bildung.

challenged to enter into produsage contexts, become experimenting network participants and perform remix and appropriation. In this context, the teacher's role is to teach the students how to refer, applicate, paraphrase and remix in a legitimate and academically sound way.

Conclusion

In this chapter we have analysed obstacles and possibilities in relation to the understanding and use of digital media in the education system. We began with observations of the school in a historical medium perspective to provide a framework for our interpretations. Our basic argument was that teaching has been made possible and developed through successively actualisations of non-digital media, like oral language, writing and the print medium. All this resulted in closed classroom teaching which was the main structure of teaching before the advent of the Internet and digital media. Yet, with digital media (almost) everything changed; because the closed classroom became communicatively open and more contingent than ever. With the new radical openness both new obstacles and possibilities emerged, forming the initial digital situation, that now

confront contemporary teachers and students. Also, we argued that present debate tends to focus on either obstacles or possibilities, but without sufficiently acknowledging the complexity of the new media environment. Instead, we called for critical, but nuanced stances towards digital media, acknowledging that impacts depend on how different actors understand, struggle and modify the media environment. Further, we observed students' competencies in the present situation and found not only that these have been overestimated, but teachers also lack skills and experience, that have not been developed because of prejudice, lack of time, tests, management and regulation. Also, we observed what the new medium environment means to attention span and concluded that we cannot multi-task, but also that this does not mean that we cannot use digital media in education – quite the contrary, we argued that digital media opens many new possibilities for teaching including new expanded forms of multiplexing. Finally, we followed up on this by arguing that schools and teachers equipped with digital media would be able to create new and better or at least expanded teaching practices; or more specifically: (1) new and expanded ways of participating in teaching, (2) new ways of maintaining and developing school communities, (3) new and expanded ways of finding, selecting and interpreting educational relevant impressions; and (4) many new exiting ways of creating, remixing and co-producing expressions in teaching. Thus, what is educationally new when it comes to the digital situation compared with 'before digital media' is, first of all, the radical openness, followed by both new obstacles and possibilities. Yet, this radical openness does not change education and teaching overall. The main educational problems and understandings might stay the same. It is 'only' the premises of teaching that have changed (even though some or all teaching subjects will change in content because of societal changes in the digital media environment). Also, classroom teaching has not disappeared. What really matters is, therefore, how societies, schools and teachers with different understandings begin to re-create classroom teaching, taking advantage of the new possibilities, but also working to overcome the obstacles.