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Curating the use of digital media in higher education: a case study

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ABSTRACT

Digital technology constitutes a substantial presence in higher education and notions like ‘digital natives’ and ‘21st century digital skills’ dominate educational discourse. However, within the last decade, scholars have started questioning the prevailing techno-optimism and practitioners have started debating whether and how to regulate the use of digital devices. Based on a systematic qualitative analysis of 100 written evaluations and mapping sessions with five students, this study explores students’ experiences in an undergraduate course in which the teacher **restricted the use of digital devices in discussion classes**. We found that **students expressed mostly positive attitudes towards resulting class engagement and mostly negative attitudes towards taking, sharing, and searching their notes**. Finally, we discuss our findings based on the notion of media affordances.

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Introduction

Since the turn of the decade, we have witnessed a veritable explosion in the prevalence of information and communication technology (ICT) in campuses across the world. Today, practically every developed country has a detailed strategy that encourages and supports the use of digital technologies as a means for improving and modernising its educational systems. As a result, educational technology constitutes a multi-trillion dollar market (Selwyn 2014). In the context of this rapid growth, the aim of the present study is, paradoxically, to investigate students’ attitudes towards *restrictions* on the use of technology in the classroom. This focus is important for two reasons. First, because digital devices constitute a ubiquitous part of educational practice, restricting the presence of ICT may cause interruptions that illuminate tacit and ‘commonsensical’ practices and conventions (Schutz, Walsh, and Lehnert 1972; Trowler 2008). In other words, studying *restrictions* may reveal taken-for-granted aspects of everyday ICT use in teaching-learning practices. Second, while digital technology is omnipresent in today’s lecture halls and classrooms, scholars and practitioners have started debating whether and how educators should limit and regulate the use of ICT (e.g. Zhu et al. 2011). Due to these developments, there have recently been calls for more research into educational policies that can reduce digital distraction (Flanigan and Babchuk 2020). Thus, while we readily acknowledge that the notion of restricting students’ access to technologies flies in the face of conventional wisdom, we find it both interesting and important to investigate this phenomenon.

Digital natives and 21st century skills

Much of educational technology's current popularity is connected to two distinct but complementary educational discourses. First, there is a prominent concept of 'digital natives' (Prensky 2001), which refers to young people who have grown up using digital technologies as part of their everyday lives. Technology is said to have changed the way these young people think: Digital natives prefer immediacy, crave speed, and possess an uncanny ability to multitask (Prensky 2001). This discourse further stipulates that digital natives will be bored without the rapid changes that technology-based multimedia experiences can provide, which means that we must embed technology into the educational system to the greatest possible extent (Prensky 2001). Change is not just an option, it is an imperative (Jones 2011). Many scholars have critiqued the notion of digital natives (e.g. Kirschner and De Bruyckere 2017); yet, it continues to influence societal and educational discourse. Over and against (young) digital natives, we find (older) digital immigrants in the form of teachers who have grown up in a pre-Internet era will never learn to speak the technological language 'fluently', and struggle to adapt to the contemporary, digitised classroom. In accordance with this way of thinking, McLeod (2012) speculates that educational professionals often restrict technology use due to a lack of competence: 'Because they lack a thorough understanding of why and how these technologies are powerful, it becomes all too easy to simply dismiss their pedagogical usefulness' (p. 11).

Second, we have an equally powerful societal discourse on 21st century skills, which stipulates that, in order to thrive in today's globalised knowledge economy, students must be equipped with a core set of digital skills that include technical skills (i.e. the ability to use ICT to accomplish practical tasks), information management skills (i.e. the ability to use ICT to find, select, and organise information), and collaboration skills (i.e. the ability to use ICT to develop a social network and work in a team) (Van Laar et al. 2017). Such 'pro-technology' discourses may prompt harsh reactions to educators who attempt to restrict access to laptops. Not only can this action be construed as a reactionary move made by digital immigrants who fail to understand the importance of digital technologies, it also seems borderline irresponsible to hinder students' acquisition of 21st century skills.

A critical approach to educational technology

The field of educational technology has its dissenters, however. One of those is Neil Selwyn, who has long argued for a more critical approach to the study of educational technology. According to Selwyn (2014), an optimistic consensus has emerged around the use of educational technology. Indeed, the field of educational technology is replete with accounts that celebrate the potentials of these technologies, but it is rarely acknowledged that they may also have unintended consequences (Bigum, Bulfin, and Johnson 2015). Selwyn (2016) argues that the problem with such glossy rhetoric is not that it intends to cover up the truth or lie per se, but that it often disregards how things really are: 'Certainly, the possibility of technology not leading to learning and/or other educational gains is rarely a matter for consideration' (p. 438f). In other words, the problem with this one-sided narrative of technological progress is not (only) that it is factually incorrect, but that it actively neglects and obscures any and all problematic aspects of educational technology use. As an antidote, Selwyn (2014) urges researchers to move from 'state-of-the-art' research that addresses what *could* and *should* happen in an indeterminate near future to 'state-of-the-actual' research that explicates what is *actually* going on in the messy realities of our current educational system.

Empirical explorations of technological ambivalence

In the past few years, such critical research has increasingly acknowledged, described, and analysed the ambivalent nature of educational technology. For example, numerous studies have raised concerns about the negative effects of multitasking or, more aptly, distraction (Aagaard 2019).

Such distraction consists of students using laptops for a variety of off-task purposes including instant messaging, meme-browsing, news-reading, and video-watching. It has been demonstrated that engaging in such distraction is associated with lower grade point averages, reduced test scores, and impaired concentration (see, e.g. Bellur, Nowak, and Hull 2015; Sana, Weston, and Cepeda 2013). Importantly, however, distraction does not always spring from conscious choices. In a qualitative study from 2015, Danish high school students described experiencing 'habitual distraction' in the form of a strong attraction towards frequently visited, but educationally irrelevant websites like Facebook (Aagaard 2015). Laptops were experienced as being endowed with an attractive allure that 'pulled them in'. Versions of this experience seem to recur across age groups, geographical locations, and educational levels. In a mixed-methods study from 2014, researchers examined Canadian university students' attitudes to laptop use in the classroom and found that perceived benefits included active note-taking, the ability to search for academic resources, use of subject-specific software, communicating and sharing information with peers, and engaging with online interactive tools. Perceived challenges, however, included distraction (Kay and Lauricella 2014). Similarly, a qualitative study from 2015 examined Korean college students' attitudes to laptop use in the classroom and found comparable results with perceived benefits including fast and accurate note-taking, the ability to search for related information, easy management of learning materials, and effective time management. Perceived challenges included distraction and a nagging scepticism regarding the practice of note-transcription (Jeong, Shin, and Park 2015). Finally, a qualitative study from 2019 focused on off-task use of technology and found that Canadian university students acknowledged the distractive potential of laptops, but expressed a desire to be in charge of their own learning and felt that it was their own personal choice to use devices for off-task activities (Neiterman and Zaza 2019).

Aim of the present study

As should be evident, these empirical studies neither seek to deny nor invalidate the positive aspects of educational technology, but they do demonstrate the problem with a one-sided techno-optimism and create an analytical room to discuss the downsides and drawbacks of educational technologies. Furthermore, although these studies examine students' attitudes towards (relatively) unrestricted laptop-use, they provide important clues as to what might happen when laptop-use is restricted. Based on these findings, we should remain open to the possibility that students may be relieved by the absence of digital temptations. Returning to Selwyn's emphasis on the state-of-the-actual, however, we emphasise that students' reaction to such restrictions is ultimately an *empirical* question that has not yet been studied. The present study, therefore, asks the following question: "What are undergraduate students' attitudes towards restrictions on their use of digital devices in discussion classes?"

The study not only adds to the research community's current knowledge about the impact of educational technology on classroom interaction. It also adds knowledge to a growing number of higher education practitioners' who are considering restrictive measures (see, e.g. Zhu et al. 2011).

Methods

Research design

The study was motivated by a research interest in an ongoing course in which laptop access was restricted. Yin (2012, 4) defines the methodology of a case study as 'an empirical inquiry about a contemporary phenomenon (e.g. a case), set within its real-world context'. The case study is well suited for exploring the phenomenon of students' attitudes towards restrictions on educational technology, because such attitudes are contingent on context.

Case context

The context of the study was the course Organisational Analysis, a first-year course encompassing subject such as organisational structure, collaboration, job motivation, and social network. A total of 160 undergraduate students (mean age 22, 70% female) were enlisted. The course was part of the bachelor programme at a major and research-intensive higher education institution in Denmark. The semester-long course was designed in accordance with blended learning principles, which means that students were supposed to watch an online video lecture each week after which they were to physically attend face-to-face discussion classes. Participation in these discussion classes was voluntary and the typical teaching-learning activities were student presentations, plenum, and small-group discussion. The course was planned and taught by a senior teacher and researcher. As is common in Danish higher education, students were assessed by their performance on a final exam, which was a written, three-day, take-home exam. It should be kept in mind that student autonomy and independence are core values in the Danish educational system and that higher education students have substantial freedom with regard to how they approach their studies. This also applies to the use of digital devices, and it is common for students to bring laptops and smartphones to class. However, in this particular course, the teacher informed students that they were *not* allowed to bring mobile devices. The teacher justified this by Danish standards unusual rule by explaining that he expected its implementation to result in better notes, more active participation, and less distraction.

Data collection

The present case study was designed as the course was ending, which means that data were collected *post hoc*. We were granted access to parts of the end-of-semester course evaluation, which consisted of students' answers to two open-ended questions: 'What do you find *negative* about not using digital devices in discussion classes in [course name]?' and 'What do you find *positive* about not using digital devices in discussion classes in [course name]?'. One-hundred students responded to these questions, resulting in 6,815 words of data.

As a second data source, we recruited five students for a 1.5 hour concept mapping exercise (Kara 2015; Newman 2013). Concept mapping is a way to support and enhance the collection of verbal data by letting participants in groups draw, discuss, and thus trace links between ideas, understandings, and concepts (Kara 2015:90). The purpose of these sessions was to explore student's attitudes towards their studies at the university, yielding what Ulriksen refers to as the 'implied student' (Ulriksen 2009). Except for a sandwich, students did not receive any compensation for participating in the exercise. The sessions were recorded and transcribed; they will be used to contrast and complicate the findings from the evaluations. While analysis of the evaluations was approached inductively, the transcribed sessions were analysed with the intent to add background to the evaluation findings.

Qualitative analyses

Given the study's exploratory nature, we approached the analysis inductively and in accordance with grounded theory principles (Charmaz 2006). First, course evaluations were read in full and initial themes were identified and noted in memos. Then, the material was coded, comment by comment, using students' *in vivo* expressions. These codes were subjected to axis coding in which they were compared, altered, and merged into new codes. The final 17 codes were compiled into three themes: taking and using notes, classroom engagement, and learning outcomes and processes. Finally, based on the coding scheme (see Table 1), the full material was subjected to focused coding.

As recommended by Miles, Huberman, and Saldana (2014), we used displays to analyse the data. Hence, we constructed a descriptive display in which the final codes were distributed within a table

Table 1. Excerpt from coding scheme.

Theme	Codes	Description (<i>in vivo</i>)
Taking and using notes	More troublesome to take notes by hand (§ = 30) (etc.)	Comments about the process being more difficult due to lack of laptop (<i>slower, double work ...</i>) ...
Classroom engagement	More present and less distracted (§ = 73) (etc.)	Comments about being more present and concentrated (<i>present, focused, [not] distracted ...</i>) ...
Learning outcomes and processes	Obtains deeper understanding (§ = 13) (etc.)	Comments about learning more, qualitatively and quantitatively (<i>understanding, learned more ...</i>) ...

§ denotes the number of references in the data (i.e. the number of comments about a particular issue).

consisting of three rows representing the three major themes and two columns representing negative and positive attitudes (see Table 2). Next, we did the following to support the validity of our findings: To ensure the display’s authenticity, transparency, and inclusivity, respectively (Dahler-Larsen 2012), we (i) included codes that were constructed from the data and with the use of *in vivo* expressions, (ii) designed the display by using the three major themes as well as the two-course evaluation questions, and (iii) deliberately included data that conflicted with the main trends. For example, although the vast majority of comments under the theme ‘classroom interaction’ were positive, we also included comments expressing negative attitudes.

Results

Based on our display (see Table 2), we now describe our findings, theme by theme. The description incorporates *in vivo* expressions, which are highlighted in *italics*.

Table 2. Descriptive display showing students’ attitudes towards the restriction on the use of digital devices in discussion classes.

Theme	Negative attitudes	Positive attitudes
Taking and using notes	More troublesome to take notes by hand (§ = 30) More difficult to organise notes and exploit search features (§ = 31) Fewer and/or worse notes (§ = 29) Not possible to look up notes in classes (§ = 22)	Better to take notes by hand (§ = 9) Selective notes (§ = 7)
Classroom engagement	Not free to do something else if not relevant (§ = 1) Less inclined to join discussion (§ = 2)	More present and less distracted (§ = 73) Listens to what is actually being said (§ = 7) Forced to pay attention (§ = 8) People are more attentive (§ = 16) More inclined to join discussion (§ = 12)
Learning outcomes and processes	Fewer points (§ = 7) Less ready for the exam (§ = 3)	Obtain deeper understanding (§ = 13) Approaches the subject matter in a different way (§ = 14)

Each sentence corresponds with an analytical code (see Table 1); § = number of references in the data; N = 100.

Taking and using notes

Comments regarding taking and using notes constitute a major theme in students’ experience of the ICT-free course, and Table 2 shows that students were primarily concerned with negative aspects of not being allowed to use laptops. Because students were unaccustomed to taking notes by hand, they found it *troublesome* to do so, mainly because the process was *much slower* and involved *double work* since they would eventually transfer their hand-written notes to the laptop. These comments demonstrate some major concerns about the restriction of devices in class. First, it makes it more difficult to *store one’s notes in the same place* (e.g. online or in a note-taking programme). Some

students found it harder to *manoeuvre* and *navigate* in their notes, and students lamented the inability to apply the *search functionality*, which allows them to look up words easily. Some students also complained that they were no longer able to *share notes online*. Furthermore, the sheer amount of notes may decrease when taken by hand. Comments show that students considered it harder to *get it all down in writing*, that students took *fewer notes* and that some students *give up taking notes*. Some students found their notes *messy* and *unmanageable*. The following quote is illustrative:

I almost grew up with it [a computer] and therefore it is a problem to write by hand. I feel more insecure and slow. I don't get the same good notes and my mind easily wanders off. I don't have the same system for my notes as I have on the computer.

While comments about taking notes by hand are primarily negative, it is also possible to find positive comments. Some students argued that it was somehow *better* to take notes by hand, an experience they described with expressions such as *learning better by getting it through the pen*. More specifically, some students described themselves as being more *selective* and only writing down the *most important things* instead of *just quoting the teacher verbatim*:

You are 'forced' to continually consider what is important because you cannot capture it all in your notes. Sometimes, in other courses, I catch myself writing down word-for-word what is being said.

Many students expressed both negative and positive experiences regarding note-taking in the ICT-free course. This shows that students were perfectly capable of assuming a balanced and reflective perspective on note-taking, and that it would be wrong to interpret the data as individual students having *either* positive *or* negative experiences of taking notes by hand. For example, some students lamented that it was harder for them to take comprehensive notes, while simultaneously appreciating the opportunity to take more selective notes:

It takes a lot of time and it has been a slightly problematic whereas on the laptop I would be able to quickly search my notes [...] You listen in another way. Now I contradict what I just wrote [in the negative text box] but often you remember better when you write by hand.

Classroom engagement

Students' comments about classroom engagement were another major theme in the data. However, in opposition to students' comments about note-taking, students' comments about classroom engagement were predominantly positive.

A large proportion of students experienced being *more present* and *less distracted* when attending device-free classes. Comments on this theme contain expressions like being *less tempted* to do *irrelevant things* and being *less distracted* and *disrupted* by the off-task behaviour including that of their peers. Instead, students described themselves as being more *focused*, *present*, *attentive*, *concentrated*, and *conscious about what is going on*.

You are one hundred percent present without being able to quickly check Facebook etc. which otherwise 'just happens' sometimes

A number of students said they had been *listening* more closely to *what is actually being said* which suggests that students were not only more attentive, but that some of them shifted attention from facts and information to the meaning of what was being said:

I have been listening more 'directly' to what [the teacher] has been saying because I sometimes stop taking notes and listen instead.

Interestingly, a number of comments use the expression *being forced to* with highly positive connotations. Students described their ICT-free classroom experience in terms of being *forced to be attentive* and *forced to think* and that *it is nice not to have the opportunity to do irrelevant things*. These expressions can be linked to the concept of being *more inclined to participate*; for example,

one student wrote that *you are forced to pay attention and in that way, you automatically participate more*.

It is interesting to note that many of the comments about attentiveness and participation in discussions uncover a communal dimension of students' ICT-free classroom experiences. While comments about note-taking predominantly concerned students' own activities, many of the comments about attentiveness and participation contained words like *we, people, peers, in general, and all students*. For example, some students said that *people are more attentive, that attention, in general, has been directed towards the teaching, and that people have been present when working in small groups*.

The few negative comments about classroom interaction should not be neglected, however. For example, two students expressed that they felt less inclined to join class discussion.

Because you cannot always remember the notes you have written [at home] you are less inclined to say something in class because you feel insecure.

This comment is interesting, because it provides a bridge between note-taking and classroom engagement. It is also worth mentioning that a number of students expressed a sense that they already managed to cultivate responsible habits regarding the use of laptops and that the ICT-restrictions, which they did not necessarily oppose, made no difference to them.

Learning outcomes and processes

Some of the comments reflect students' beliefs about the extent to which the ICT-free course affects their learning outcomes and learning processes. On the negative side, students worry that their notes contain fewer insights, which would place them at a disadvantage at the final exam. On the positive side, a number of comments reflect the fact that this change compelled students to approach learning differently and that this strategy affected their learning outcomes positively. Without their laptops, some students were *challenged to remember [their] notes, forced to use their own words rather than transcribing, aware of what [they] know and what [they] need to revise, forced to think* and described the experience as having *opened [their] eyes about what [they] can actually remember*. As a result, some students *learned more, reached a deeper understanding, and gained full advantage from classes*.

In the same way that certain students expressed ambivalence regarding note-taking, it is also the case that a given student can voice both negative and positive assessments of how an ICT-free course affects his or her learning outcomes. In particular, there seems to be a tension between, on one hand, *getting more insights* to be used at *the exam* and, on the other, *reaching a deeper understanding*. The following quote illustrates this:

It is hard to get most of the key points noted because it takes longer by hand [...] However, the key points you get by hand stick better.

Discussion

As a way to discuss our findings, we employ James J. Gibson's (1979) concept of 'affordances'. Gibson originally coined the term in an attempt to move psychology's focus from the 'inner' workings of the mind to the richly textured 'outer' environment. Affordances are the action possibilities that environmental items offer to specific agents. Water, to use one of Gibson's examples, affords wading if it is shallow, floating if the agent is not too heavy, and skittering if the agent is an insect. In the past few years, Gibson's concept of affordances has become a popular tool to approach the analysis of educational technology. For example, based on the options made available by digital technologies, Bower (2008) has developed an extensive classification system containing affordance categories like media affordances (e.g. write-ability), spatial affordances (move-ability), temporal affordances

(playback-ability), navigation affordances (search-ability), synthesis affordances (combine-ability), access-control affordances (share-ability), technical affordances (speed), and reliability (robustness). We now move on to discuss how the presence and absence of these affordances may influence student perceptions of the restricted use of digital devices in discussion classes. Moreover, to add complexity to the evaluation findings, we include points and perspectives from students participating in the mapping exercises in the discussion.

Laptops as transcription devices

An overarching theme in the course evaluation was the identification of the laptop as a device that enables students to take notes in a fast, efficient, and organised manner. In contrast to this finding, it has been demonstrated that using a pencil to take lecture-notes yields better results than using a laptop, because laptop users tend to perform ‘mindless transcription’ in which their notes overlap verbatim with the presented material (Mueller and Oppenheimer 2014). One possible explanation for this finding is that while a laptop may objectively *offer* the same action possibilities as a pencil (i.e. the possibility of carefully condensing and rephrasing the material), its compositional speed tends to *afford* verbatim transcription (Aagaard 2018a). Importantly, this affordance is not lodged in the technical apparatus itself, but only exists because most students can type significantly faster than they can write. In other words, it is *because* today’s students have grown up using technology as part of their everyday lives that laptops afford transcribe-ability. This may explain students’ negative attitudes towards handwritten notes, which persist despite their awareness of the affordances of condensing, rephrasing, and thereby better understanding the material.

Drawing on findings from the mapping exercise, however, students’ preference for digital note-taking was also linked to something else. Students’ various and meticulous ways of writing, sorting, and sharing notes online were, at least for students in the mapping exercise, strongly linked to meeting the requirements for the final exam. Given the brevity of the courses they follow (10 weeks, on average, with one lecture per week, followed by an exam) and their status as first-year students, respondents found it difficult to decipher the exact expectations and they lacked knowledge of how to achieve their best performance on the exam. As such, they relied heavily on their notes and their ability to share, search, and compare notes across the student group. In this sense, technical, media-, navigation- and reliability-related affordances enabled by the laptop were not just linked to the habit of using the laptop for notes, but also linked to a lack of feedback or knowledge about assessment criteria and a need to have their ‘back covered’ by extensive note-taking. This points towards a need to provide students with increased information and feedback, as well as aligning expectations, especially when restricting students’ habitual modes of preparing for exams, such as taking extensive notes.

Laptops as portals

While past generations lived in an analogue world where location and presence constituted were inseparable, the digital has ‘cleaved’ these two notions (Floridi 2017). While it is easy enough to pinpoint the factual position of students’ bodies (location), it has become much harder to determine their experiential terminus (presence). Today’s students may be wholly focused on the discussion occurring here-and-now in the classroom, but they may also be searching for additional arguments on Wikipedia or simply browsing off-task videos on YouTube. As a result, it is instructive to understand media technologies like laptops as ‘portals’ that afford experiential transportation (Aagaard 2018b). The metaphor of the portal is helpful, because it inclines us to discuss media engagement in terms of absence and presence in particular places (e.g. in the classroom, on Wikipedia, or on YouTube). In this regard, it is noteworthy that students in the present study seemed to appreciate having this metaphorical portal closed; indeed, an overwhelming majority of students commented that they felt more present, less distracted, and more attentive to what was said during classroom

interactions when laptops were absent. Paradoxically, students appreciated *being forced* to focus on the activities of the classroom. Closing of the portal freed them from the seductive pull of distraction.

Our findings also point to the importance of carefully choosing when and how to restrict the use of digital devices, however. While students in the mapping exercise agreed wholeheartedly that they felt more present and engaged in the ICT-free class, they also argued that the experience would have been different if the teacher had chosen to restrict the use of digital devices in lecture hall sessions. In the evaluations and mapping exercises, students claimed that having access to laptops in lecture hall sessions made them *actively* engage in discussions, because they were accustomed to taking notes this way and had found ways to stay off social media and away from other digital distractions. They also argued that having access to laptops afforded them access to previous notes and search tools online, which ensured them that the questions and comments they posed were, in fact, valid (mirroring findings from Kay and Lauricella 2014).

Laptops as common-sense thinking

According to students in the mapping exercise, the taken-for-granted way of attending a class at this university was with a MacBook in front of them, a smartphone beside the MacBook, which displays Microsoft's OneNote application open on the screen. Although other practices were accepted, they were less common. This mode of attending class mirrored their previous experiences in upper secondary school, and was further confirmed by their introductory experiences to the university (e.g. from visits before applying, by tutors and older students during introduction weeks). In other words, using digital devices in class was a very integrated part of their *natural attitude*.

The sociologist Alfred Schutz defines 'natural attitude' as the routine frame of mind in the 'taken-for granted world of everyday life' where we bracket out the critical attitude and more existential doubts about reality (Schutz, Walsh, and Lehnert 1972). Our natural attitude is the organising principle that dictates how we function, as it allows us to carry out our daily activities without having to reflect on every action and response we exhibit throughout a day. However, when something unexpected happens, our natural attitude is temporarily suspended, until we manage to make sense of it, and, eventually, take it for granted, thereby allowing a return to the natural attitude. Depending on how we come to make sense of the unexpected occurrence, this may lead to more minor learning experiences as well as life-altering decisions.

Our findings suggest that, for some students, the restricted use of digital devices did, at least momentarily, suspend their natural attitude towards the ways of attending class at university level. They had to find other ways to write notes, which left them feeling a bit insecure when joining the discussions, as they had no way to support their claims, and, to some degree, felt trapped in their inability to determine the appropriate focus for their attention. These experiences were not common-sense to the students, which accounts for their comments of being *forced to think, participate*, etc. Based on this experience, only a few students expressed any intention to make a radical change to the ways they took notes or participated in class. However, the restricted use of digital devices did act to confirm their views on the affordances of using technology (e.g. sorting, searching, and sharing notes), and also emphasised the affordances of being present, with the portals closed (e.g. deeper understanding, ability to concentrate). The outcome of this suspension may, therefore, be seen as a stronger awareness of and reflection on when and when not to use the laptop.

The students were in their first year of university and their ways of attending class were, therefore, less common-sense than at later stages in their university programme. Furthermore, it was a discussion class, where, from the beginning, the teacher 'warned' them of the restriction, and also emphasised notetaking's secondary status to discussion in this class. These mitigating circumstances may account for the many positive reactions to the restricted use of digital devices. Had the teachers decided to restrict the use of digital devices at all levels and in all classes (or *turned stone-age* on them, as one student described it), it may have resulted in a much stronger

suspension of the students' natural attitudes, and thus produced a more radical outcome. This points towards the need to carefully consider when and how to compel 'digital natives' to turn off the digital devices.

Limitations

Students' attitudes towards restrictions are moderated by the social and educational practices in which they are embedded. Thus, when assessing the generalisability and applicability of this study, the context must be carefully regarded. First, restrictions were imposed in a first-year class, in which students may have been more open to unfamiliar educational practices. The teacher informed the researchers that the same restriction had caused conflicts between the teacher and older students. Second, Danish educational culture favours both teacher and student autonomy, especially in higher education. Hence, on the one hand, Danish students may be more sceptical of restrictions on their freedom to use devices. On the other hand, students may be more willing to recognise teacher directions regarding devices. Finally, students' attitudes on restrictions are likely to be moderated by rapport with the teacher, generally, and the teacher's communication, in particular. For example, the teacher was well liked and clearly explained the rationale for restricting devices, which renders it likelier to elicit more favourable student attitudes.

Implications

While our results support previous findings with regard to the ambivalent nature of educational technology, they also point to certain novel developments in the field of educational technology: First, while existing research has challenged the concept of digital natives from the vantage point of technological literacy (e.g. Kirschner and De Bruyckere 2017), our critique of the concept is first and foremost psychological and emerges from students' own descriptions of an ICT-free classroom. Today's students are not superb multitaskers, they seem acutely aware of their own cognitive limitations, and they actually appreciate 'being forced to' concentrate on what is going on during class. This critique has the added effect of deflating the supposedly antagonistic relationship between digital natives and digital immigrants. Teachers are not anxious Luddites, and educational device-restrictions cannot automatically be ascribed to a 'lack of thorough understanding' (cf. McLeod 2012). In fact, such restrictions may sometimes emerge from a deep understanding of the everyday workings of ICT in the classroom.

Importantly, however, restrictions come in many different shapes and sizes and we do not advocate a blanket ban of laptops either. First, studies have shown that banning laptops is more likely to hinder student performance in the class than help (Elliott-Dorans 2018). Secondly, banning laptops may lead to students feeling trapped, hindered, and deprived of fundamental rights to choose their own ways of attending class (see Neiterman and Zaza 2019). Finally, since study life is cross-contextual, simply banning laptops from the classroom is unhelpful and may lead to 'double work' for students, as we have shown. Instead, we propose to add the important meta-skill of critical reflexivity (i.e. knowing when *not* to use ICT) to the framework of 21st century skills. Such critical reflexivity involves knowing when to close the metaphorical portal. As Vlieghe (2017) argues, the digital natives that populate today's classrooms shouldn't solely learn what they can do with ICT, but also come and see the limitations and dangers ICT involves (p. 402).

Conclusion and perspectives

On the basis of course evaluations and mapping sessions, this study explored students' attitudes towards restrictions on the use of digital devices in discussion classes in a first-year undergraduate course. We found that students in this study displayed predominantly favourable attitudes concerning their ability to engage in class, which resulted from a limitation of their spatial affordances. We

also found that students displayed predominantly negative attitudes towards taking notes by hand, which was a consequence of the reduced technical, navigation-, and media-related affordances.

This study contributes to the growing empirical literature exploring the use of digital devices in higher education by examining what happens when the use of digital devices is restricted. Respondents were asked to describe the positive and negative aspects of an ICT-free course. Results show that students are critically aware of both benefits and challenges associated with laptop use. These balanced and reflective views demonstrate that technology acceptance is not a black-and-white matter. As Peter-Paul Verbeek (2013) reminds us, dealing with technologies is neither a question of uncritical acceptance nor blind resistance. Between 'yes' and 'no', he argues, we are looking for a 'how' (p. 80).

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