A mixed-methods exploration of off-task use of educational technology in class: An affordance-based analysis of two quantitative studies and one qualitative study

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Summary

The purpose of this PhD thesis within the field of Educational Technology (ET) is to explore students’ unsanctioned off-task use of ET in secondary schools in Norway, Sweden and Finland. This is an article-based thesis consisting of three articles and an extended abstract.

While several studies have addressed various student outcomes of ET use in general and off-task use in particular, few studies have investigated the dynamics involved in students’ off-task use of ET in class. Therefore, it is pertinent to investigate when students perform off-tasking, who go off-task for what purposes, and how is it experienced by students. Moreover, there are even fewer studies that have used multiple methods design based on both quantitative and qualitative studies as a methodological approach to understanding students’ off-task use of ET in class.

To address this gap in research, the main research question in this thesis is: What factors can account for students’ off-task use of ET in class? Two sets of sub-questions are necessary for answering the overarching research question: (1) questions related to pertinent interactions in the classroom involved in the actualisation of students’ off-task use of ET (e.g., who did what, when, why, against what opposition, what compromises and concessions were involved?) and (2) questions related to the structural context of these interactions, that is, the structural context conditioning the pertinent interactions (e.g., the source of motives and positions, what was wanted and not wanted, strategies adopted, institutional norms and commitments).

I base both my theoretical framework and methodological approach on critical realist tenets regarding the relationship between ontology and epistemology. Theoretically, I use a critical realist-based affordance theory to analyse the involvement of ET, students, and the classroom-context in students’ off-task use of ET in class. Methodologically, critical realism substantiates the compatibility of methods thesis and thus legitimates my mixed methods methodological approach and multiple method design comprising two quantitative studies and one qualitative study.

Article 1 reports on a quantitative study that empirically investigates pertinent antecedents of secondary school students’ regulatory strength in technology-rich classrooms. I used a questionnaire to collect survey data from 3,400 students in Norway, Sweden and Finland, and Structural Equation Modelling (SEM) to analyse the data. I found that (a) the stronger the students’ sense of a motivational school-net-conflict, the less are they able to exercise self-regulation in technology-rich classrooms, (b) the more time students spend online in class, the stronger their sense of motivational conflict, (c) the more students appreciate schooling, the better are they able to exercise self-regulation in technology-rich classrooms, and (d) improvements in teachers’ explanations, expecting more of students and enforcing classroom management, do not improve students’ self-regulatory ability directly, but are dependent on school appreciation for contributing overall to self-regulatory strength. Overall, the SEM indicates that the cumulative positive effects of teachers’ explanatory skills, their efforts to regulate students’ classroom behaviour and their expecting the very best of the students are undermined by students’ sense of being trapped between two worlds—one with digital distractions and one with real world demands; one dominated by instant gratification and one requiring its delay. At the very least, the results imply that providing good teaching with self-regulation effects in instructional environments with open net-access is challenging and hinges on students’ appreciation of schooling.

Article 2 reports on a quantitative study that empirically explores pertinent antecedents of young people’s beliefs about agency in informal online learning (‘digital agency’). I used a questionnaire to collect survey data from 3,400 students in Norway, Sweden and Finland, and Structural Equation Modelling (SEM) to analyse the data. The main findings indicate that (a) the more students’ prefer ‘online culture’, the stronger their sense of
agency in informal online learning, (b) the more time students spend online in class, the stronger sense of digital agency and the more students prefer ‘online culture’, (c) that the more students appreciate schooling and have positive school associations, the stronger their sense of digital agency, and (d) the more students’ prefer online culture or spending time online in class, the less they appreciate institutionalised schooling.

Overall, the SEM indicates that both online culture and school culture contribute substantially to students’ agency in informal online learning. Still, their internal relationship is strongly antagonistic, indicating the existence of a wide gap between the two. It is also noteworthy that the factor of time spent online seems to be closer to online culture than school culture, despite taking place within the institutional frames of school. This finding indicates that while provision of Internet access can be a central and constructive element within the classroom’s infrastructure for learning, it can also represent a competing set of discourses about learning. If this is the case, schools’ efforts to capitalise on young people’s digital proficiencies and thus vitalise formal schooling through open access in class might have the opposite effect.

Article 3 reports on a qualitative study that investigates how a purposive sample of 11 Norwegian upper secondary school students from the same school explains the reasons for their off-task use of ET in class. I conducted five focus groups, and the data material consisted of interview transcripts. The main findings were that (a) the students provided nuanced and rich descriptions of the processes involved in the transition from on-task work to off-task use of ET in class involving enabling contextual frames (e.g., the ubiquitous availability of online devices) and sudden trigger events (e.g., receiving a text message), (b) the enabling contextual frames included individual tendencies, availability of digital distractions, de facto norms in class, teacher and school subject characteristics, and institutional grade-centred incentive regimes operationalised through tests, (c) the triggers included an instant need to check what was going on in social media, receiving a text, watching a nearby peer go off-task, sudden loss of perceived task-value (too boring, too easy or too difficult) and perceived break entitlement, (d) the students mobilised primarily sovereign conceptions of agency as responsible for the agency-failure involved in their problematic off-task use of ET, that is, the dominant frame mobilised by all 11 students revolved around the issue of an individual, innate, trait-level lack of self-control, (e) an exception to the main pattern was students’ reference to the institutionalised grade-centred, test-based incentive regime as a primary reason for off-task use of ET, that is, off-task practices as an ecological agency-failure, suggesting that effort investment in class was a waste of time since the final grade was based on a handful of tests, (f) the second exception was students’ reference to how the online activities themselves were a prime reason for off-task practices, that is, off-task practices as a new material agency failure, suggesting that the available activities online seemed to exert an independent ‘pull’ causing pre-reflective, habitual off-task use of ET among students in class.

Based on the findings in the three articles, the main contribution of this thesis is increased knowledge about how certain patterns of interactions combined with conditioning contextual factors are involved in students’ off-task use of ET in class. The thesis shows how students’ out-of-school use of connected technologies is involved in in-school use of ET, and in the actualisation of unsanctioned off-task use of ET. Moreover, the thesis indicates how the technology itself, as well as social and institutional factors, play important roles in students’ off-tasking. Furthermore, the empirical findings suggest that students’ appreciation of school plays a key mediating role between teachers’ efforts to help and the outcome of their efforts. Overall, the thesis advocates an interpretation of off-tasking as an outcome of an imbalance of how students perceive the potency of the combined mitigating factors relative to the combined risk factors, turning certain events into triggers of procrastination. This implies that systemic, multilevel approaches are required to address students’ off-task use of ET in class.
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Part II: The articles

Article I

Article II

Article III
1. Introduction

Digital media play an increasingly important part in the lives of young people. In their out-of-school experiences, digital devices convey images and visions, enable self-expression, play and the forging of social relationships and provide news, information and opportunities for activities to stimulate learning. Ito et al. (2010) emphasise how young people engage with digital media not merely as technologies, but as cultural forms that enable ‘hanging out, messing around, and geeking out’. This is also an expression of how new media gradually take over functions that used to be based on face-to-face, direct human interaction without the mediating presence of technology. However, the mediating technologies are not just a neutral means that carry human intentions unscathed from one point to the next. Technologies actively nudge, interfere and translate the human intentions they mediate, or as Bruno Latour claims, ‘[I]f you want to keep your intentions straight, your plans inflexible, your programmes of action rigid, then do not pass through any form of technological life. The detour will translate, will betray your most imperious desires’ (p. 252, cited in Aagaard, 2017, p. 1130). For students who want to do well in increasingly digitised schools and classrooms, Latour’s words may serve as a warning.

Internet-connected digital devices have become ubiquitous elements in contemporary classrooms. Within these institutional frames, ‘educational technology’ (ET) is integrated on the assumption that their use will stimulate student interest, generate intrinsic motivation and promote knowledge building, as well as develop students’ digital literacy. In practice, this means that students in class are supposed to use the same technologies for educational purposes that mediate play, socialisation and informal information seeking. By implication, if students use social media, popular webpages and online games in a way that displaces and interrupts educationally relevant practices, ET becomes a source of distraction rather than a means for learning. Numerous studies on multitasking, procrastination and off-task media use show that ET can have disruptive effects on educational practice and debilitate educational performance (Arnesen, 2010; Arnesen, Elstad & Salomon, et al., 2016; Arnesen, Elstad & Christophersen, 2017; Arnesen, Elstad & Christophersen, 2017; Ophir et al., 2009; Sana et al., 2013; Gaudreau et al., 2014; le Roux & Parry, 2019). With rapid technological changes in- and out-of-school, it becomes crucial to understand how students’ self-regulation and attitudes to formal schooling are involved in the use of ET and how ET-use interacts with the social, pedagogical and institutional frames of the classroom. Connected technologies mediate both vernacular and educational experiences, and ET provides students with access to both. The adversarial relation between the two is epitomised by off-task use of ET in class. While most extant research focuses on how off-task use of ET affects measures of student outcomes, some notable exceptions explore the dynamics of students’ off-task use. In Chapter 2 on research framing, I present the work of three scholars that represent three different strands of research that focus on these processes (Blikstad-Balas, 2012; Aagaard, 2015, 2016, 2017; Dinsmore, 2019).

In this thesis, I build on research on the interplay of students’ in- and out-of-school experiences combined with studies specifically on off-task use of ET in class to dig deeper into students’ use of ET for unsanctioned off-task purposes in class. The topic casts in sharp relief the inherent tension between student adjustment to formal schooling, or adjustment of formal schooling to students in the digital age. Moreover, the topic combines a focus on the student-technology dyad with a dedication to the study of state-of-the-actual regarding the use of ET by students in classroom contexts. Specifically, I explore the issue of off-task use of ET in secondary school, drawing on quantitative data from 3,400 students aged 16 to 18 in Norway, Sweden and Finland and qualitative data from a purposive sample of eleven Norwegian students who experience a
conflict between their school ambitions and their net-activities and habits, that is, a ‘school-net-conflict’ (SNC).

Pertinent relationships are addressed in two quantitative studies using Structural Equation Modelling (SEM) on survey data reported in Articles 1 and 2, and in one qualitative study using HyperRESEARCH on interview data reported in Article 3. Article 3 is based on pertinent findings from Articles 1 and 2. Based on empirical findings reported in the three published articles, I intend to piece together an encompassing research-based contribution to the debate regarding the use of online, digitised resources in classroom contexts. In this extended abstract I seek to provide overall analytical coherence by employing a critical realist-based affordance theory as it has recently been developed in the field of information Systems (IS) (see Volkoff & Strong, 2018). Similarly, I seek to provide overall methodological coherence by using critical realist (CR) ontological and epistemological assumptions in my Mixed Methods Research (MMR). Overall, I maintain that the thesis contributes substantially, theoretically and methodologically to the field of educational technology by providing new empirical insights, by adopting and adapting productive theoretical perspectives and by utilising a mixed methodology, multiple methods design. In the rest of this introduction, I present in more detail the research context (1.1) as a precursor for explicating the research field (1.2) and thereby specifying the research topic (1.3). Then I present the research questions (1.4) and the disposition of this extended abstract (1.5).

1.1 The research context

This thesis is part of the research project Learning in the 21st Century (L21) funded by the Norwegian Research Council (NRC) as part of the practice-oriented PRAKUT-programme. The programme call emphasised that youth cultures emanating from pervasive engagement in digitally induced and enabled activities are sources of cultural relevance for the learning processes taking place in school. Thus, to gain a deeper understanding of how young people develop and acquire knowledge, there is a need go beyond the learning processes within each arena to explore pertinent interplay between arenas. Based on the programme call, the L21-project explored different aspects of the relationship between young people’s formal schooling (‘school-culture’) and their connected, digitised life-worlds (‘online culture’). The main aim was to identify ways of ‘bridging’ that harnessed educational benefits, but at the same time identified and filtered out educational risks (see Arnesen et al., 2016). My thesis is part of a work package dedicated to descriptions and analyses of students’ perceptions of the relationship between school culture and online culture with a particular emphasis on students’ perceptions of off-task use of ET. The PRAKUT-programme and the L21-project form the background for the current thesis. I now turn to the substantial research context to which my thesis relates.

Studies show that young people in Norway, Sweden and Finland are amongst the most digitised demographic group in the world and they perceive themselves as having advanced digital skills (Fraillon et al., 2014, 2020). They spend increasing portions of their lives online, making digital media constantly present (Edwards & Larson, 2020). In incorporating connected technology into their lives, they have changed the ways that they interact with each other. It is common to see them as increasingly networked as individuals, rather than belonging to tightly knit social groups (see e.g., Barry Wellman et al., 2020). Arguably, the way Nordic youth organise their social relationships in the age of pervasive connectivity epitomises this ‘networked individualism’.

These networked individuals reside in three different countries with close historical, cultural and political ties as part of the Nordic region. They are highly developed welfare societies that emphasise strong public institutions as well as self-determination and rights for young people. In terms of their educational systems, the three countries still champion the ideals of the Nordic model of education; social cohesion, equal opportunity and egalitarian values (Blossing et al., 2014). These ideals are incorporated in the idea of the ‘fellesskolen’, that is,
a public, unitary school for young people of all backgrounds. Consequently, there is a relatively low proportion of private schools. Despite increasing differences due to varying influence of liberal ideas of schooling, the structural features of the school systems are still quite similar with, for example, nine or ten years of compulsory schooling. However, there are also notable differences between schooling in Norway, Sweden and Finland. International comparative tests such as PISA and TIMMS revealed that students’ achievements varied between top performing Finnish (female) students and the mediocre Swedish and Norwegian ones (OECD, 2021). However, the Finnish results have steadily declined, thus reducing the gap in performance (Saarinen, 2020). Another important difference is the degree to which computers are used in secondary schools (age 16–18): Finnish learners use computers less frequently and spend less time online than Swedish or Norwegian learners (Fraillon, 2014; Arnesen et al., 2017a, 2017b). Further, this gap has narrowed as Finnish authorities have increased spending in and promoted the use of digital technologies through their program called ‘Comprehensive school of the digital era’ (Fraillon, 2020; OECD, 2018; Saarinen, 2020).

The degree to which young people in these three countries are in fact organising their social lives around networked individualism’s loose, fragmented networks may differentially impact their perception of institutionalised, formal schooling. Some scholars identify how the dominance of school for young people’s learning identity is being challenged by a particular kind of ‘digital’ learning identity more in line with the individualistic characteristics of networked individualism (Loveless & Williamson, 2013). Indications of a shift from ‘schooled’ to ‘digital’ learning identities may manifest themselves among the highly digitised young people in Norway, Sweden and Finland. Thus, we need to look beyond the technological devices, tools and applications as such, and focus on the practices and discourses that surround them, the meaning people ascribe to them and the social relationships and structures that these technologies are attached to in order to engage with the issue of off-task use of ET in class.

1.2 The research field
The research presented in this thesis is located within the broad domain of educational research. The research is practice-oriented and empirical, rather than prescriptive and theoretical, and does not intend to instigate processes of change and development as in action-oriented or educational design research. However, the findings have implications for how students relate to ET in and out-of class, how teachers integrate ET in instruction, how teacher educators can make students critical yet constructive regarding ET and how pertinent ET directives and policies confront off-task use in a way that acknowledges that the challenges involve both the technology and the individual student, but also the social, pedagogical and institutional contexts through which off-task use is actualised in practice (see Chapter 7 for implications). As mentioned above, the prime focus here is on off-task use of ET in class as a key expression of the conflict between in- and out-of-school practices in the Digital Age. At the heart of the study is the exact moment that a student leaves school work behind to engage in unsanctioned off-task use of ET in class. From this analytical starting point, I explore the immediate circumstances of particular instantiations as well as students’ discursive repertoire used in their reasoning (Article 3). In Articles 1 and 2, I test two theoretical models statistically (SEM) to engage with 1) the issue of pedagogical and motivational influences on off-task use, and 2) the issue of students’ learning preferences as school oriented (school culture) or net-oriented (online culture) as indications of off-task use of ET in class. An analytical focus on educational technology (ET) runs through all three studies, and situates this thesis within the field of educational technology research (ETR).

The field of ETR has grown substantially in importance in the last couple of decades as rapid technological developments expand the range of opportunities and create new constraints. The shifting research emphases reflect these emerging trends and constitute the state-of-the-art in the form of articles published in the most prestigious ETR journals such as The British Journal of Educational Technology (BJET). Content analyses of
articles published in BJET 2010–2018 reveal an expanded emphasis on and sensitivity towards the learning processes of students through the use of ET (Bond et al., 2019). As a reflection of this trend, the analyses show that the terms ‘learning’ and ‘students’ appear much more often than in the preceding decade. In fact, the analyses show a practice-oriented emphasis that discuss student experiences of using technology within school contexts, and how various tools affect teaching and learning. Research has continued to address the integration of a wide variety of technologies and informal digital practices into school contexts (e.g., the use of mobile phones and social media), with an increased focus on concerns about the psychological challenges that mobile learning can pose for students (Bond et al., 2019). In line with the current trends in ETR, this thesis addresses students’ experiences with technologies-in-use in formal schooling, thus confronting both the complex issue of ET integration and the issue of unintended and problematic side-effects. Hence, the thesis provides a timely substantial contribution to the field.

Currently, there are calls for more critical and theoretical approaches to ETR (Jameson, 2019). Reviews of articles published in high-impact journals indicated a conspicuous lack of theoretical, conceptual or methodological frameworks (see, e.g., Hew et al., 2020). BJET’s special issue ‘Developing Critical and Theoretical Approaches to Educational Technology Research and Practice’ (Jameson, 2019) is a response to the ongoing trend of self-critical examination of the contribution that ETR can make to the field, thus reflecting the need to move away from ‘victory narratives’ of technologies’ positive effects while providing limited empirical evidence for added value. A large body of extant research has analysed the extent of criticality and educational or disciplinary theory within ETR and found it inadequate (see, e.g., Crook, 2019; Hassler et al., 2016; Selwin, 2016, 2015, 2011). In a recent in-depth review of the 503 most recent empirical studies in high impact journals—with the telling title: ‘Where is “theory” within the field of educational technology research?’—it was discovered that in the majority of articles explicit engagement with theory was absent, indicating that the field of ETR is methodologically weak and under-theorised (Hew et al., 2020). Hence, the authors recommended that researchers should develop more ‘middle range’ theories and be more explicit about the theories that underpin their studies. In BJET’s special issue, editor Jameson is explicit: ‘Challenges include, e.g., whether macro-level research findings (e.g., OECD, 2015) about the negative aspects of computer usage are really being considered and taken up in research, policy and practice’ and asks whether ‘Selwyn and others (…) are justified in asserting that much research in the field has engaged in “previous decades of technological boosterism, hyperbole and outright evangelism” rather than genuine searching inquiry’ (Selwyn, 2015 quoted in Jameson, 2019). She thus challenges the ETR community to consider the extent to which ‘the evidence emerging from research findings in educational technology is really engaging in an informed, deeper way with important global issues (Selwyn, 2015) and educational studies (Crook, 2019) to effect a beneficial influence on education policy, theory and practice, including, particularly, outcomes for learners’ (Jameson, 2019). These critical remarks and recommendations concern both a disturbing tendency to provide ‘victory narratives’ and overlook research findings about negative aspects of ET, but also a lack of substantial and methodological theoretical explication and development, without which systematic and principled inquiry in ETR is hampered.

In line with this criticism, I explicitly address a problematic and negative side effect of the use of ET. I intend to provide a nuanced but critical narrative that opens up further inquiries and discussion, rather than providing either ‘victory’ or ‘defeat’ narratives that tend to close down and restrict open exchange of ideas and perspectives. Based on the criticism pertaining to lack of theoretical depth and transparency, I have chosen to employ critical realism as a meta-theory in this thesis. This means that the ontological and epistemological tenets of critical realism form the foundation for both the substantial affordance theory I use as an analytical framework (see Chapter 3) and the type of mixed-methods methodology (see Chapter 4) I employ in this
thesis. This choice is based on a need to provide an overarching and principled frame for the three separate studies of which this thesis consists, but also on an effort to contribute theoretically and methodologically to the field of ETR (see Chapter 6).

1.3 The research topic

As stated above, the research topic in this thesis is students’ unsanctioned off-task use of ET in class. The topic is a central instantiation of the meeting between formal schooling (‘school-culture’) and the connected world of young people (‘online culture’), and highlights the need to go beyond the complex learning processes within each arena and acknowledge their interplay. Thus, I focus on how to understand the interplay between ‘school culture’ and ‘online culture’ among young people by means of an exploration of off-task use of ET in class. In Chapter 2 on research framing, I present three main approaches to the interplay between ‘school culture’ and ‘online culture’, namely a subject didactical approach, a learning ecological approach and a normative approach. I use these three main approaches to link the key topic of off-task use of ET to the larger fields of educational research and new media research, thus making crucial connections to perspectives and insights that can enable productive discussions regarding the use of connected technologies (see Chapter 6 on research contributions and Chapter 7 on implications). After the explication of the three approaches, I present extant research that specifically addresses the key issue of off-task use of ET in class.

As mentioned above, there is a large body of extant research that shows that ET can have disruptive effects on educational practice and debilitate educational performance. While I do not explicitly address learning outcomes with regard to ET, it is still a pertinent backdrop for this thesis. A study by Beland and Murphy (2016) can serve as an illustrative example of a strand of research that indicates that especially low-achieving students struggle in technology-rich classrooms. Their quantitative study shows that student performance on high stakes tests increased significantly after schools banned the use of mobile phones. Interestingly, they found that the increases in performance were driven by the lowest-achieving students, and therefore concluded that restricting mobile phone use could be a low-cost policy to reduce educational inequalities. Their interpretation of the processes behind the positive change in performance was limited to the conjecture that a highly multipurpose technology, such as mobile phones, can have a negative influence on productivity through distraction, but could also be a useful learning tool if the use is properly ‘structured’.

Their research indicates that practices related to mobile phones distract low-achieving students more than high achieving students, that is, low-achievers are less able to exercise self-control in the presence of distractions. While their study is interesting since it manages to establish a compelling connection between a restriction of mobile phones and increased test results, there are many gaps that need to be addressed. This kind of descriptive causality, that is, establishing that there exists a statistical relationship by means of quantitative methods, does not take us far by way of suggesting why the relationship exists. What are the steps through which the absence of mobile phones explains increased test results? This kind of explanatory causality is required if one is interested in how the so-called ‘unstructured’ use of mobile phones could possibly become ‘structured’ and thus possibly turn the mobile phone into a useful learning tool.

Gaps that previous studies leave behind include the nature of off-task use of the phone in class and the classroom conditions that enabled or constricted this debilitating use, that is, the social, pedagogical and institutional frames for the off-task use of ET in class. They suggested that low-achieving students failed to keep focus, but also that the way mobile phone use was ‘structured’ in class was somehow involved in their failure. However, their study raises a series of new questions that inform the research questions I pose in the next section (1.4). What are the characteristics of the setting in which off-task practices are actualised by students using mobile phones? Why do the students switch from doing schoolwork to engaging in off-task
practices? What triggers that transition? What are the enabling conditions? For example, what did the teacher and the peers do at the moment a student went off-task? What were the official rules and *de facto* classroom norms regarding mobile phone use? Are the multiple functionalities of the mobile phone particularly potent as distractors? How do the students’ off-task practices vary according to the type of subject, the type of teacher and the way the teaching is organised, the quality of the classroom management and the students’ general attitude towards formal schooling? I would also question the assumption made by Beland and Murphy (2016) that low-achieving students are less able to focus, thereby scoring lower on high stakes tests. Perhaps high-achieving students are equally distracted, but it does not affect their grades on high-stakes tests to the same extent? In general, there is less research addressing the *dynamics* involved in students’ off-task use of ET in class, than research addressing various student *outcomes* of ET use in general and off-task use in particular. Selwin and Aagaard (2021) comment that it is ‘less pertinent to investigate whether the use of digital devices for off-task purposes impairs students’ academic performance than when this phenomenon happens, how it is experienced and why it occurs so frequently’ (my italics). The extant studies on off-task use of ET presented in Chapter 2 are notable exceptions to this trend by focusing on the dynamics involved.

1.4 The research questions

The overarching aim in this extended abstract is to provide a research contribution to the topic of students’ off-task use of ET in class. The main research question is thus: *What factors can account for students’ off-task use of ET in class?* I consider two sets of sub-questions necessary for answering the overarching research question: (1) questions related to pertinent interactions in the classroom involved in the actualisation of students’ off-task use of ET (e.g., who did what, when, why, against what opposition, what compromises and concessions were involved?) and (2) questions related to the structural context of these interactions, that is, the structural context conditioning the pertinent interactions (e.g., the source of motives and positions, what was wanted and not wanted, strategies adopted, institutional norms and commitments). I approach these issues by zooming in on a limited number of factors that I deem pertinent for the questions raised: the social, pedagogical and institutional setting; the student-device relationship in and out-of-school; the experienced ‘fit’ between school and online culture (school-net-conflict); potent configurations of triggers and enabling conditions; and the discourses students mobilise to make sense of problematic off-task use of ET in class. I situate the key topic of off-task use of ET within the broader context of the relationship between in- and out-of-school learning (see Chapter 2.1).

The research questions and subtopics are used to link the separate studies reported in the three published articles of which this thesis consists. This entails that each of the three separate studies has a more limited research focus with independent research findings (see Table 1 below). In this extended abstract, I intend to increase the pertinence of these independent findings by introducing a common research framing (see Chapter 2 on in- and out-of-school learning and off-task use of ET in class) and a common analytical framework (see Chapter 3 on affordance theory). In turn, this requires that I explicate the principle I use to integrate my two quantitative and single qualitative study (see Chapter 4 on my critical realist foundation and mixed methods methodology). The empirical, theoretical and methodological contributions discussed in Chapter 6 are thus based on these theoretical and methodological foundations. Table 1 summarises the research focus, methods and main findings of the three separate studies. The aim is, early on, to provide the readers with a general overview of the studies of which this thesis consists.
<table>
<thead>
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<th>Table 1: Overview of research focus, methods and findings from Articles 1, 2 and 3</th>
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<td><strong>Main perspective: self-regulation</strong></td>
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<tr>
<td><strong>Article 1. Antecedents of Students’ Self-Regulatory Strength in Technology-rich School Environments</strong></td>
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<tr>
<td><strong>Research focus</strong></td>
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<tr>
<td>To explore how time spent online at school is associated with a sense of school-net-conflict and students’ regulatory strength, seen in combination with their school appreciation and quality aspects of teaching (classroom management, high expectations, explanatory skills)</td>
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<td><strong>Article 2. Learner Antecedents of Youth’s Beliefs about Agency and Online Learning</strong></td>
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<td>To explore how time spent online at school is associated with agency for informal online learning (digital agency). To explore how student preferences for schooling (school culture) and net-based learning (online culture) are associated with each other and with digital agency, seen in combination with students’ school associations and positive attitudes</td>
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<td><strong>Article 3. Exploring Students’ Explanations for Off-task Practices in an Innovative Learning Environment (ILE) using a Typology of Agency as Theoretical Framework</strong></td>
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<tr>
<td>To explore students’ explanations for off-task practices in an Innovative Learning Environment (ILE) using a typology of agency as theoretical tool</td>
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</table>
1.5 Disposition

The structure of the rest of this extended abstract is as follows. In Chapter 2 (research framing), I explicate pertinent research that this thesis draws and expands upon. The chapter starts with a presentation of research on the relationship between in- and out-of-school learning before I elucidate research on the situated classroom processes involved in off-task use of ET in class. A central aim is to identify research gaps that I address in this thesis. In Chapter 3 (theoretical framing), I expound the theoretical framework that I use to interpret the empirical findings presented in my three articles. I assert that a mid-range, critical realist-based version of affordance theory is a compelling analytical tool for analysing the dynamics between ET, students and the actualisation of off-task practices in the classroom. Chapter 4 (methodological framing) is dedicated to an elucidation of the methodological framework in this thesis. I find a critical realist-based mixed methods methodology and multiple methods design appropriate for a thesis that consists of two quantitative studies and one qualitative study. By drawing on critical realist ontological and epistemological assumptions as foundation for both the substantial theory framework and methodological framework, I aim to increase the internal coherence and external transparency of this extended abstract. In Chapter 5 (presentation of findings), I present pertinent findings from the three published articles. I dedicate Chapter 6 (discussion of findings) to an explication of how this PhD project contributes empirically, theoretically and methodologically to the topic of off-task use of ET in the field of educational technology research (ETR). In Chapter 7 (implications from findings), I indicate how my contributions have implications for students and teachers with regard to off-task use of ET in class, and thereby how my contributions are relevant for other important stakeholders such as school owners, policy makers and bureaucrats. I also indicate pertinent research gaps I leave behind and promising future research agendas.
2. Research framing

This chapter elucidates previous research that I build upon and expand on in my work on off-task use of ET. Hence, it is not a comprehensive research review, but rather a research framing. The chapter consists of two main parts. In the first part (2.1), I explicate three main approaches to the interplay between ‘school culture’ and ‘online culture’. As mentioned in the Introduction (see 1.3), I include these three approaches to link the key topic of off-task use of ET in class to the wider issue of the interplay between in- and out-of school learning, thus making connections to perspectives and insights from the larger fields of educational research and new media research.ii In the second part (Chapter 2.2), I present extant research that specifically addresses the issue of off-task use of ET in class. In the last section (Chapter 2.3), I highlight pertinent research gaps and discuss how my thesis can be a timely research contribution to ETR.

2.1 Research framing in- and out-of-school learning

In order to situate the issue of off-task use of ET in a wider context, I present three different ways that research has approached the relationship between in- and out-of-school learning. There will be a brief explication of (a) the subject-didactical approach, (b) the learning ecology approach and (c) the normative approach. I end this section by indicating how each approach has a bearing on the issue of off-task use of ET, thus foreshadowing the discussion of my findings in Chapter 6.

2.1.1 The subject-didactical approach

In a subject-didactical approach to the relationship between learning in- and out-of-school, the emphasis is on differences related to the structure of the content to be acquired and the nature of the relationships and processes involved in the acquisition. In the seminal article ‘Learning In School and Out’ (1987, 13), Lauren Resnickiv identifies four broad contrasts that indicate that school is a particular place and time for people, in some ways disconnected from daily life and work: (1) the dominant form of learning and performance is individual in school and socially shared outside school (individual versus shared cognition); (2) the greatest value is placed on pure mentation in school and cognitive activity shaped by and dependent on tool manipulation outside school; (3) reasoning in school is mostly symbol-based, while reasoning outside school is often intimately connected to the contextual circumstances; and (4) at school the focus is general, widely useable skills and theoretical principles, while situation-specific learning dominates outside school (Resnick, 1987, 14–15).

Resnick suggests that both the structure of the knowledge used and the social conditions through which it is used might be fundamentally mismatched, thus very little from school is likely to be readily applicable for out-of-school use (Resnick, 1987, 15). Her description resonates with numerous school subject-specific efforts to use informal learning elements to improve subject didactical theory and practice.v Similarly, Lee Shulman refers in his classic article ‘Those who understand: Knowledge Growth in Teaching’ (1986, 5) to a ‘missing paradigm’ and asks rhetorically ‘where did the subject matter go?’, ‘where do teacher explanations come from?’, ‘how do teachers decide how to represent content?’ and ‘how to deal with problems of misunderstandings?’vi Consequently, the structure of knowledge differentiates subject matter in school and the way different subject matter is taught, thus setting it apart from and playing another role than the content found in informal practices.

Similarly, Basil Bernstein’s (2000) sociology of knowledge distinguishes between vertical and horizontal discourses to theoretically account for different knowledge structures. He claims that the formal knowledge structures instantiated in the different disciplines (and recontextualised in school subjects) are systematised in a principled manner by conceptual and theoretical frameworks that enable systematic thinking. He maintains that this kind of discourse is ‘vertical’ in its orientation. In constrast, informal knowledge structures are
inherently use-oriented and local, and lack a principled and abstract theoretical framework. According to Bernstein, this kind of discourse is ‘horizontal’ in its orientation. Both Resnick and Bernstein assert that this kind of local, situation-specific learning is very limiting by itself, since it lacks generality and power of transfer. Based on Bernstein’s thinking, Michael Young (2008) conceptualised ‘Bringing knowledge back in’ as a response to a tendency in the sociology of education to reduce knowledge to the perception and experience of the knower.\textsuperscript{vii}

Overall, the subject-didactical approach emphasises that the structure of knowledge in most school subjects is different in terms of its mainly principled, symbolic and abstract form, yet more powerful than the content found in informal practices. Therefore, the formal content as instantiated in the school subjects is rarely tampered with to get closer to and link up with Resnick’s identification of positive potentials in informal learning practices. Hence, while the content of the curriculum is beyond the pale, numerous pedagogic ways induced by and informed by informal learning processes (e.g., Green, 2008) are there to help learners access, acquire and participate in curricular content practices. Within this approach, meaningful connections between learning in- and out-of-school can therefore be achieved by more subject-oriented shared cognition, contextualised reasoning and tool manipulation as suggested by Resnick (1987), as well as skillful pedagogical use of the dominant interests of students as a way to connect with the vertical discourses of curricular content.

2.1.2 The learning ecology approach

In the learning ecology approach, the emphasis is on differences between formal and informal learning with regard to the extent young people see the relevance of, and identify with, the learning content. Consequently, scholars highlight the importance of interest development and the perceived quality of the social relationships involved in the learning processes. This approach figures prominently in new media research on the relationship between young people’s informal online learning and formal learning at school. A point-of-departure typical for this corpus of literature is expressed in the foreword to Ito et al. (2010):

Young people immersed in new digital tools and networks are engaged in an unprecedented exploration of language, games, social interaction, problem solving, and self-directed activity that leads to diverse forms of learning. These diverse forms of learning are reflected in expressions of identity, how individuals express independence and creativity, and in their ability to learn, exercise judgment, and think systematically (Ito et al., 2010, foreword).

This description of the young generation is somewhat unique in how strongly generational identity is equated with technological identity (see also Tapscott, 1998; Prensky, 2001 on ‘digital natives’). Ito et al. (2010) link the technology practices of young people to David Buckingham’s (2007, 96) description of a digital divide between in-school and out-of-school use, which he considers ‘symptomatic of a much broader phenomenon—a widening gap between children’s everyday ‘life worlds’ outside of school and the emphases of many educational systems’.

The article ‘Interest and self-sustained learning as catalysts of development: A learning ecology approach’ (2006) by Brigid Barron is a prime example of a learning ecological understanding of the nature of interplay between in- and out-of-school learning. Here, interest development and self-initiated learning processes are considered central aspects of all learning:

Interviewer: How do you learn about computers?

Learner: At the beginning I was reading magazines, surfing the net, I talked to my cousin Ian, my step dad, Uncle Jack, I took a course after school at Kingston Computers called Teen Tech. They taught
you how to build computers and they taught you about small networks. That was another helper to my knowledge.

This boy reflects on the basis for his interest in computers and his strategies for gaining expertise, and drawing on the story, Barron maintains that ‘learning about an area of interest can be distributed across resources including personal contacts, text-based resources, Internet exploration, and more structured learning opportunities’ (Barron, 2006, p. 194). She adds that by the time of the interview, his out-of-school-generated knowledge was complemented by completing a number of high school courses in computer science. On the basis of this and similar stories, Barron argues that if we want to understand the development of interest and competence, one must look both within and across settings. Since the topic of her exploration is the development of technological fluency, Barron (2006) emphasises how new technologies can dissolve boundaries and open up to novel types of agency in learning.

Thus, in addition to expertise development, out-of-school activities such as gaming with peers support aspects of identity development such as being part of a community, experiencing competence and fostering interest. Barron (2006) notes that the important notion of agency in accounts of identity formation is relevant here. She claims that in order to better understand self-initiated learning, attention needs to be paid to the role played by agency in sustaining the interest that drives learning. According to Barron, both conceptual knowledge and broader aspects of becoming a person are developed through out-of-school learning. This raises questions about how interest emerges, in particular, how identity, material, social or ideational resources enable or constrain it, and how students evaluate the ‘fit’ between formal education and their sense of self.

Barron (2006) identifies three under-researched enclaves. First, how learning to use technology is distributed among multiple settings and resources. Second, how, when and why young people choose to learn. Third, synergies between participation in technologically mediated informal learning activities and formal education and the conditions that enable or constrain boundary-crossing activities.

As mentioned, Ito et al. (2010) is a prime example of how the learning ecology approach addresses the relationship between informal learning and learning in school. Their focus is on how young people live and learn with new media in their everyday lives, hence the title of the book Hanging out, messing around, and geeking out: Kids living and learning with new media. Based on a media ecology approach, they explore new media practices located in young people’s social and recreational activities rather than in contexts of explicit instruction, thus addressing how new media figures in terms of friendship, intimacy, family, gaming, creative production and work. They state as a fact that their approach reflects an emerging consensus that the most engaged types of learning with connected media take place in youth-driven circumstances that are geared towards recreation and social communication. The gap between informal online practices and formal learning is thus described in terms of three types of differences, that is, in the level of engagement, in the power relationship in the learning settings and in the nature of the content and processes of learning.

Ito et al. (2010) also address the issues of identity and agency as central factors for understanding learning and the gap between learning contexts. According to Ito et al., new media provide opportunities for young people to exhibit agency and expert knowledge that frequently exceeds that of their elders. In turn, this creates an intergenerational struggle over authority and control regarding literacy and learning. Ito et al. claim. They find that young people engage in both interest-driven and friendship-driven genres of participation that both rely on peer-based learning dynamics. These dynamics have according to Ito et al. (2010) a different structure from formal instruction, in the sense that the peers that young people learn from are not determined on the basis of their institutional position, but on the basis of common interests and chosen affiliations. Ito et al. (2010) conclude that young people actively create their own social worlds and unique genres of youth cultures.
The last example from a learning ecology perspective of the gap between informal and formal learning is Kristiina Kumpulainen et al. (2009): ‘Learning bridges—Toward participatory learning environments’. They complement the previous two examples by using the concept ‘funds of knowledge’ to denote the networked cultural know-how of different communities, that is, important cognitive and cultural capital that facilitates and guide participation and learning by providing frames of reference. Their central argument is that traditional formal education does not fully acknowledge, appreciate nor utilise the cultural worlds of the learner, thus not paying sufficient attention to the funds of knowledge learners take with them to school from other settings. ‘This cultural capital, containing knowledge, skills, values, and attitudes, is far too seldom used as the basis for teaching and education’ (Kumpulainen et al., 2009). In line with this strand of thinking, they regard the classroom community as a node in a network of information that comprises diverse funds of knowledge. The ‘gap’ is further elaborated by the claim that in-school knowledge is fragmented and separated from its actual context of use. Hence, school is in danger of becoming too separated from the rest of the world, and the knowledge, skills and attitudes learned at school disconnected from the learner’s life. Kumpulainen et al. (2009) also stress the importance of learner identities and agency in relation to learning. As with Barron (2006) and Ito et al. (2010), they claim that school is too concerned with the separate school subjects and their factual knowledge, while neglecting the lifelong and lifewide holistic development of students’ identities. Formal schooling is thus failing to teach students to acknowledge and appreciate the wider importance of learning in their everyday lives.

Overall, the learning ecology approach considers that in contrast to formal education, informal learning draws on higher levels of interest and engagement among the young, and involves higher degrees of self-determination both in terms of learning content and the social relationships involved in learning. In addition, by considering learning as primarily a cultural rather than a cognitive activity, young people do not transfer skills and knowledge, but rather identify with and participate in different social and cultural practices (youth cultures) through which they can exhibit agency and expertise. A key bridging strategy among these researchers is thus to stimulate agency in learning both individually and in communities of practice, as well as taking full advantage of young people’s funds of knowledge and understanding that learning is not just about subject matter but about making learning existentially meaningful for young people. From a learning ecology approach, it is important that students have access to connected technologies in class to stimulate learning, encourage participation in communities of practice and to let students exhibit agency and expert knowledge and draw on their diverse ‘funds of knowledge’. However, I assert that these exponents of the learning ecology approach under-emphasise both the gravity of the unintended side-effects such as off-task use of ET, as well as the normative differences between formal education and informal learning.

2.1.3 The normative approach
Drawing on the work of Gert Biesta, the third approach to the interplay between in- and out-of-school learning focuses on normative differences between learning cultures and educational cultures. Biesta (2011) identifies a shift in educational research from a focus on education to a focus on learning, which opens up to exploring how young people learn both in relation to formal education but also beyond and outside of particular educational arrangements in a wide range of informal and non-formal settings. In contrast to formal education, however, these learning cultures are not framed and defined by norms in the same way. Consequently, the tendency to use these learning cultures as rolemodels for formal education is misplaced, that is, what takes place in informal learning cultures is not directly applicable to what takes place in school (Biesta, 2011, 201–202):

‘In educational settings the intention is not that those involved in such settings (…) learn. The very point of educational settings is that those involved learn something and that they learn this for a
particular reason (...). Unlike “learning” (...), education always entails content, purpose and relationships’ (Biesta, 2011, p. 207).

Accordingly, Biest concludes that it is important to distinguish between learning cultures and educational cultures, and understand educational cultures as learning cultures framed by purposes. He distinguishes between three domains of educational purposes: qualification, socialisation and subjectification, that is, gaining knowledge, becoming part of a community and becoming a person. A key point for Biesta is that ‘good’ education entails finding the right balance between these three domains in all educational encounters, making improvisation an indispensable attribute of teachers’ competence. By extension, these domains are the frames of reference within which decisions regarding the use of ET in class ought to be made, that is, considering how technologies-in-use are involved in students’ qualification, their socialisation and their subjectification.

In the same vein, Biesta (2013) identifies a difference in orientation between ‘learning from’ and ‘being taught by’, thus challenging the learning ecological idea that the classroom community is just like any other node in the ecology of contexts contributing to learners’ funds of knowledge. The idea of ‘being taught by’ involves interruption and challenge, introducing students to something new from the outside, thus stimulating reflection and processes of maturation. In this respect, Biesta (2013) considers teaching as educationally indispensable, that is, comparing being ‘taught by’ with receiving a gift. It follows that the teachers are not just a disposable and dispensable ‘resource’ that students can learn from or not.

Finally, based on his existential philosophical orientation, Biesta maintains that the educational (rather than the didactic) task or responsibility of the school is to ‘make a mature existence in the world possible’, and mature should be distinguished from infantile where the latter is an existence purely driven by one’s desires, while mature existence engages with the question of whether one’s desires can actually be seen as desirable, both for the individual him/herself and for the collective. Biesta considered this perspective as relevant for the discussion about online informal and formal learning, as it raises the question of how online practices operate in relation to desires, that is, whether they interrupt desires so that a transformation from infantile to mature becomes possible, or whether they actually multiply desires and keep young people ‘caught’ in their desires. The question is particularly relevant in light of how addictive technology can be, thus pointing to the issue of distraction and off-task use of ET in class. All in all, Biesta presents three possible normative gaps: learning cultures versus educational cultures, ‘learning from’ versus ‘taught by’ and whether online practices interrupt or multiply desires.

Overall, Biesta’s philosophical way of describing the gap between in- and out-of-school learning focuses on the normative differences between learning cultures and educational cultures. The question of bridging therefore must be seen in relation to the educational consequences, that is, in terms of the specific educational content the students should learn, the reason why they learn the content and the nature of the educational relationships involved in learning. In particular, the issue at stake is whether the in-situ, in-class judgements about the trade-offs between Biesta’s (2011) three main domains of educational purposes—qualification, socialisation and subjectification—are suitable for the body of students in question. In keeping with Biesta (2013), a key issue regarding the use of ET would be whether it would help young people escape their immediate desires or whether it would rather multiply desires and keep young people trapped in their desires, since only via an escape a transformation from an infantile to a mature existence becomes possible. The overarching norm Biesta presents is thus not efficient education or ‘what works’ in education, but what education works for, that is, what is ‘good’ education.
2.2 Research framing off-task use of Educational Technology
In this chapter, I will restrict myself to relevant Educational Technology Research (ETR) that informs the current study of students' off-task use of ET in class. A large body of previous research indicates that digital devices can be sources of distraction, particularly for low-achieving students (see, e.g., Beland & Murphy, 2016). However, the field lacks research that adequately addresses how and why educational technologies afford off-tasking in class, for whom and under what circumstances. The previous research presented in this chapter serves to frame and situate my study in the field of ETR by answering some pertinent questions, while leaving others unanswered. It is my aim to continue where they left off and thus provide a research contribution to the field of ETR. The disposition of this chapter is as follows: first, I present extant research conducted by Aagaard (2015b, 2017) regarding how students' embodied habits are involved in their distractive uses of educational technologies in class (Chapter 2.2.1). Then I turn to the work done by Dinsmore (2019) on student and teacher negotiations over the use of educational technology in the classroom (Chapter 2.2.2), before I end by presenting Blikstad-Balas' (2012) research on what students use their laptops for during teacher instruction (Chapter 2.2.3). In Chapter 2.3, I relate the findings to the overarching research question and identify the under-researched areas that I attend to in this thesis.

2.2.1 The ambivalent nature of technologies in the classroom
Aagaard’s (2015, 2017) point of departure is the striking discrepancy between two mutually exclusive discourses on educational technology. He suggests that the field is characterised by ‘an uneasy armistice between technological determinism and instrumentalism’ (Aagaard, 2017, p. 1128). Technological determinism is the notion that technology determines the structure of society and culture, that is, technology is presented as an independent force of development. Aagaard shows how so-called determinists make grandiose claims concerning the connectivity of educational technology: ‘the microcosm of the traditional face-to-face classroom has been eclipsed by the contemporary global classroom. This new technology-enhanced learning environment provides opportunities for educators to design learning that empowers students to reach beyond local resources and people and to engage in learning with and from others from anywhere and anytime in the world’ (Lock, 2015, p. 140 cited in Aagaard, 2017, p. 1128). According to Aagaard, determinists believe that educational technology ‘enhances’ learning by erasing the barriers that separate the classroom from the outside world: contemporary classrooms are ‘open’ not ‘closed’, ‘global’ not ‘local’, ‘connected’ not ‘isolated’. For determinists the source of this positive change is placed in the benign force of technology, and students and teachers are portrayed as passive beneficiaries. Determinists thus tend to claim that resistance is futile (Aagaard, 2017, p. 1128). At the same time, educational technology is present in the classroom and elevated claims are questioned when faced with the state-of-the-actual.

Technological instrumentalism is the view that people are in total control of their actions, and technologies are just means to voluntarily chosen ends. All technologies are therefore neutral and under human control. The intentions of the person using the technology could be good or bad. Agency is thus conceptualised in sovereign terms as residing entirely within human beings, while technologies are conceived as neutral intermediaries. It follows that misuse of technology is the sole responsibility of the user. This means that unintended consequences of educational technology such as distraction in class are ‘ascribed to internal psychological shortcomings such as deficient self-regulation, low abstract reasoning, or lack of academic engagement on behalf of the students’ (Aagaard, 2017, p. 1129). Distraction is thus conceptualised as a psychological phenomenon, and educational technologies are seen as the mechanisms that alleviate this pre-existing psychological tension.

Aagaard demonstrates how the two contradicting discourses—technological determinism and technological instrumentalism—exist side by side, and claims that it leads to the paradox of educational technology: ‘When
something good happens, we praise technology; but when something bad happens, we blame the students (occasionally, this blame also extends to their teachers)’ (Aagaard, 2017, p. 1129). Aagaard finds both discourses problematic as it is just as wrong to ‘technologise’ the benefits as it is to ‘psychologise’ the problems with the use of educational technologies. Instead, he advocates a critical stance on the study of educational technology that moves away from so-called state-of-the-art research that emphasises what could or should happen in the future, and towards state-of-the-actual research that focuses on what is ‘actually going on here-and-now in the messy realities of our educational system’ (Aagaard, 2017, p. 1130). Studies of unintended or problematic uses of educational technology such as the exploration of students’ off-task practices belong within such a critical research frame (see Chapter 1.2).

His research interests include how connected technology enables both invigorating educational practices by bringing relevant material into the classroom and educationally debilitating practices by providing an accessible router for students to escape the immediate educational circumstances. He uses the term ‘spatial relations’ to describe how educational technologies ‘open a gateway to the world that can be used both to bring relevant information into the space of the classroom (‘outside-in’) and to escape educational activities in favor of off-task activity (‘inside-out’)’ (Aagaard, 2017, p. 1130). By investigating these complementary ‘movements’ in class, he uncovers the ‘uneasy position of educational technology between burden and blessing’ (ibid). ‘Outside-in’ refers to connected educational technologies’ ability to bring the world into the communal space of the classroom, for example, educational technology enabled the class community to experience Marilyn Monroe as powerfully present in class via the smartboard and speakers (Aagaard, 2017, p. 1134). Similarly, students can use connected devices to ‘invite presence’ to enrich their learning processes. He comments that ‘[t]his outside-in movement of information, whether factual or pop cultural, is exactly what is usually cherished about educational technology, and in such cases the use of educational technologies can in fact be said to ‘enhance’ the activities in the classroom’ (Aagaard, 2017, p. 1135).

However, the counterpart to outside-in is the movement inside-out of the classroom brought about by technologically mediated distractions. He refers to this movement as ‘the great escape’ because it takes students away from their immediate educational surroundings: ‘Just as laptops and tablets open up the possibility of bringing the outside world into the classroom, they also constitute a backdoor through which students may occasionally escape’ (Aagaard, 2017, p. 1137). This distraction can be described as a kind of absence-in-class that can have the same negative effects on school outcomes as more traditional absence-from-class (Jonasson, 2011 in Aagaard, 2017, p. 1137). Such digitally mediated withdrawal of mental presence in class is exactly what teachers tend to dislike about educational technology. In these circumstances the use of educational technology does not enhance, but rather invades or supplants learning. The first ‘outside-in movement’ is part of a communal experience in which there is a one-to-many relationship where students and teacher face the smartboard, and the external world is curated for the educational situation here-and-now. In the second ‘inside-out of movement’ there are multiple one-to-one relationships between distracted students and their devices, and the screens become individual portals leading from an educational situation to the outside world. Aagaard (2017, p. 1139) concludes that ‘[t]his movement enacts an antagonistic student-teacher relationship in which the teacher becomes a watchful eye from whom students must conceal their activities’. For the purposes of my thesis, Aagaard’s (2015, 2017) work on students’ ‘inside-out movement is particularly relevant.

Aagaard (2017) presents two pertinent findings about students’ inside-out movement that transports them away from their educational circumstances. First, even though distracted students do not pay attention to educational practices, that does not mean that they are totally absorbed in their off-task activities to the extent that they do not register what else is happening in the classroom. In fact, they are constantly on the alert,
ready to switch screens to academically relevant displays whenever a teacher tries to approach them. ‘It is like
trying to observe a mirage: You can gaze at it from a distance, but if you try to approach it, it dissolves and
disappears right in front of your eyes’ (p. 1137). Second, concealment is key when it comes to technological
distraction in class. Therefore, the materiality of the classroom matters as to how far students stray from the
educational circumstances. Students in the front-rows are less inclined than back-row students to stray far
from the educational agenda, as they are seated closer to the teacher’s field of view.

Aagaard describes how the the teacher in class argued that students have always found ways to disengage
from learning activities, suggesting that digitally mediated distractions were nothing new. His argument seems
to suggest that digitally mediated distraction just alleviates a pre-existing psychological tension. Aagaard
agrees that distraction has always been part of the classroom, yet he disagrees with the instrumentalist
 presumptions. Instead, he maintains that the sudden impulse to engage with social media arises only in
partnership with the technologically mediated opportunity to do so, that is, the impulse does not exist separately
from educational technologies, because ‘technologies co-shape our ability to even catch a glimpse of such
goals, and therefore also set them as goals’ (Kiran & Verbeek, 2010, p. 418 cited in Aagaard, 2017, p. 1139).

Aagaard also addresses students’ experiences with off-task use of educational technology, and highlights four
different aspects. First, student use of technology for off-task practices is ubiquitous. They read, write and
hand in assignments on laptop, but also engage in social media, games, chat and surf online. When asked if
they engage in off-task use of educational technology in class, the students ‘usually sent me a puzzled look
before responding “of course”. (…). Most students have Facebook open all day, and some students even
watch videos on YouTube and play games during class’ (Aagaard, 2015, p. 93). Second, students
experienced a prereflective attraction towards certain frequently visited websites, such as Facebook. That is,
they experienced a deceptive pull to distraction: “[student:] I don’t know whether this is relevant, but I’m aware
that it’s wrong, so I try, and have especially tried lately, not to do it. I think it’s really hard, because it pulls you
in. It’s a habit you have. When you open the Internet, you just go to Facebook’ (Aagaard, 2015, p. 93).
Aagaard maintains that students’ acquired habits turn the perceived affordances of these websites ‘magnetic’
(Aagaard, 2018). Third, students are most likely to succumb to off-task practices when the material of the
lesson is experienced as too hard (i.e., students give up and go on Facebook) or too easy (i.e., no need for
students to sit idly by). Forth, the structure of the lesson is another element in off-task use. Students tend to go
off-task during transitions and short breaks, and when lessons are considered ‘boring’. They find it especially
hard to pay attention to teacher presentations over an extended period of time (see also Blikstad-Balas,
2012). ‘They become drowsy, lose focus, and go off-task to take breaks’ (ibid, p. 94).

In order to theoretically account for why students use educational technologies for off-task practices Aagaard
(2015) develops the notions of habitual distraction and mediated impatience. Habitual distraction refers to the
prereflective attraction towards frequently visited websites.

‘Habitual, because it is explainable neither in terms of mental choices nor mechanical reactions to
stimuli, but as deeply sedimented relational strategies. Distraction, because being drawn-towards
(‘at-tracted’) unrelated websites means being drawn-away (‘dis-tracted’) from educational activity.
This is neither a willful choice, nor an involuntary reflex triggered by pop-ups and text movements.
Habitual distraction challenges the dichotomous division of attention as either endogenous or
exogenous’ (ibid, p. 95)

Mediated impatience refers to the perception of lectures as boring. Aagaard observes that technologies do
more than meet a fixed need (‘relieve boredom’); they present new options that may change the perception of
its users. This means that the degree to which a lesson is perceived as ‘boring’ is not necessarily just an
experience existing independently of the available digital distractions, and is then alleviated by engaging in distractions. 'When a lesson is experienced as boring, this may to a certain extent be because technological alternatives are constantly available and ready to be utilized at a whim. This can be described as a kind of mediated impatience' (ibid, p. 95). I would complement his argument with the observation that professionally designed digital software is particularly alluring due to its persuasive design aligned with user preferences (see Chapter 3).

Aagaard (2016, p. 1139) asserts that students’ engagement with irrelevant digital distractions in class may enact an antagonistic student-teacher relationship. While Aagaard (2016, p. 1137) identifies and illustrates how students dodge the teacher’s ‘watchful eye’, his analysis is limited to a post-phenomenological perspective. For the purposes of my thesis, I seek to acquire a deeper understanding of how the antagonistic student-teacher relationship influences how educational technology is used for distractive purposes in class.

2.2.2 Student-teacher negotiations over the use of digital devices in class
Brooke Dinsmore (2019) specifically addresses power and resistance as key factors in affordance analyses regarding classroom integration of educational technology (see affordance theory in Chapter 3). Her study concerns teacher and student negotiations over connected educational technology in the classroom. She finds that while teachers want to protect the classroom as an educational space, students are primarily interested in safeguarding their social interactions from authority figures: ‘Teachers used their authority to regulate student engagement with mobile technology in the classroom. However, teachers’ efforts were both unsupported by the technical features of mobile devices and challenged by students’ adeptness with technology. Teachers therefore felt as though they were fighting an uphill battle’ (Dinsmore, 2019, p. 665).

Both Aagaard (2016) and Dinsmore (2019) emphasise that the materiality of educational technology interacts with and enacts an antagonistic teacher-student relationship. Dinsmore (2019, p. 665) explains how both parties mobilise their respective capacities to shape the actualisation of affordances towards desired ends: ‘Seeing technology as potentially disruptive, teachers seek to maximise control over students’ use of devices to maintain their own authority in the classroom. Meanwhile, youth work to protect their social media and smartphone use from adult surveillance in order to keep their social spaces private’ (Dinsmore, 2019, p. 666). She comments that previous research tends to study these two groups separately, that is, educational technology scholars study teachers in the classroom, while new media scholars emphasise youth practices in and outside school, thus minimising the power dynamics inherent in the relationship between teachers and students. Dinsmore asserts that both students and teachers operate on a cultural logic that defines the social and the educational as distinct and oppositional (Dinsmore, 2019, p. 669). The social sphere encompasses students’ relationships and interactions with each other in and especially outside school. The educational sphere includes academic study, teacher instruction and student learning (see also Blikstad-Balas, 2012, who distinguishes between vernacular and dominant literacy practices).

Importantly, teachers experienced that the mobile phone undermined the boundary between work and leisure, and thus challenged the preservation of the academic space. In response to this challenge, teachers employed strategies of restriction and differentiation to maintain the educational boundary. Restriction strategies entailed imposing a physical distance between students and their phones, for example, by requiring students to hand in their phones as they entered class (see also Aagaard, 2017, suggesting closing the laptop’s lid). Some teachers confiscated phones if students used them openly in class. Differentiation strategies entailed distinguishing between educational and social uses of technology. Only educational uses were sanctioned in the classroom. Thus, teachers opting for differentiation strategies were ‘left to act upon students’ perceptions of smartphones within the classroom’ (Dinsmore, 2019, p. 671). However, students tended to resist teachers’ efforts to maintain the educational boundary, and teachers often used the language
of ‘battle’ and ‘war’ to illustrate their interactions with students over phones. Similarly, Aagaard (2017) comments that the twin dynamics of ‘outside-in’ and ‘inside-out’ challenge the traditional idea of schools as privileged ‘in their seclusion from the rest of society’ (p. 1141). The barriers to society are therefore not just limiting barriers that restrict educational practices to the claustrophobic area of the classroom but may also be protective barriers that secure educational activities from being absorbed in everyday life (etymologically, the Greek skhole means ‘a keeping clear, a holding back’). This resonates with Biesta’s assertion that the normative base of formal education must remain relatively independent of the shifting trends in society, that is, ‘good’ education cannot be judged based on how functional it is for current needs of society. In fact, ‘good’ education may require a certain degree of dysfunctionality (Biesta, 2013).

Dinsmore (2019, p. 672) shows that the students viewed the ‘blurring of the physical and digital through contextual mobility [using the Internet] as an ordinary part of everyday life’, and employed strategies for maximising use to counter teachers’ efforts to curb social uses of technology in class: ‘Come on, I have friends I want to talk to!’. In practice, students responded to teachers’ classroom strategies by hiding or limiting social use (see Aagaard’s finding that concealment is key to digitally enabled distraction in class). The students did not see school regulations or teachers’ strategies as a strict demand, but rather as a kind request that ‘discouraged contextual mobility [using the Internet] but allowed strategic boundary breaches’ (Dinsmore, 2019, p. 672).

Dinsmore’s study shows that a compelling account of students’ off-task use of educational technology in class needs to take into account the elements of power, resistance and conflict. Her findings indicate differences in how students and teachers perceive technology in the context of school pertaining to the cultural logic of separation between the social and the educational. Dinsmore suggests that the availability of contextual mobility via students’ digital devices challenges teachers’ ability to manage classroom space at the same time as it grants students additional autonomy. Teachers have to use their institutional power to distinguish between legitimate and illegitimate uses of educational technology in class and try to enforce that distinction by restriction or differentiation strategies, often with little success. Dinsmore comments that scholars have addressed how the affordances of connected technology affect relationships, but that her case demonstrates the need to study how relationships shape the perceived availability of these affordances. Her study shows how the power struggle between teachers and students about the boundary between legitimate and illegitimate uses of ET in class was based on a cultural logic of separation between the social and the educational. The outcome was an uneasy ‘armistice’ that entailed sacrifices on both sides, and as part of the bargain certain ET affordances were defined as out of bounds. Overall, Dinsmore shows that students’ off-task use of educational technology cannot be understood in isolation from the institutional frames and social relationships that operate in the classroom. Quite the contrary, Dinsmore demonstrates that the actualisation of the off-task affordance of ET in class (see Affordance Theory in Chapter 3.2) happens by means of the contextual frames, thus limiting the explanatory power of conjectures that hinge on a conceptualisation of agency as something that resides within the individual student, rather than in the dynamics of relations between people, and between people and technologies (i.e., ‘sovereign agency’, ‘relational agency’ and ‘new material agency’; see Article 3).

2.2.3 What do students use their laptops for during instruction?
Blikstad-Balas’ (2012) study of Norwegian upper secondary students complements Aagaard and Dinsmore by conceptualising the tension of off-task use of educational technology as one inherent in the interplay of dominant and vernacular literacy practices. The distinction between ‘vernacular’ and ‘dominant’ literacies is based on whether the literacies are determined and regulated by others or are the result of individual choice. She states that her ‘main argument for the use of [the] dichotomy between dominant and vernacular literacies when doing educational research inside the school system is that the school domain is associated with the
dominant categories of literacy' (Blikstad-Balas, 2012, p. 84). The research focus is on how literacy practices are enacted across domains, but with a special emphasis on the ‘vernacular practices permeating school contexts that are mediated by classroom Internet access’ (Blikstad-Balas, 2012). She limits her attention to student activities during teacher presentations.

There are six findings in her study that I find particularly important for the purposes of this thesis. First, there is a clear tendency across subjects that students primarily use educational technology for vernacular purposes during teacher presentations: ‘[V]ernacular activities such as games, reading newspapers, checking out what is new on Facebook and reading blogs, are what the students for the most part use their laptops for during teacher presentations.’ Her findings indicate that students engage to a large extent in literacy practices that are not integrated in the school domain in any way. Instead, the texts serve students’ desire for entertainment using vernacular literacies. The students are well aware of the situation and express that their vernacular practices are problematic. Second, there are no immediate consequences for opting out during teacher presentations. Blikstad-Balas maintains that there is a clear tendency in her data that teachers apply no sanctions to combat these vernacular literacy practices. This means that students are free to decide for themselves. What they use their laptops for during each lesson ‘[student:] depends entirely on what I feel like doing’. Third, students decrease vernacular literacy practices during lessons if the subject is experienced as ‘hard’ and thus demands that they pay attention and take notes. ‘[I]n history and philosophy, I always take notes, because it's so hard’. It follows that they pay less attention in subjects perceived as easy, ‘but if we feel like not paying attention during Norwegian we are on VG [news] or Facebook or whatever’. Fourth, the students experience that they are drawn to distraction, just as Aagaard (2017) reported from his studies: ‘I don’t know, it’s just so natural to log onto Facebook, it’s like a habit, in a way. If you go on the Internet you just go to Facebook, kind of, you just check if something has happened’.

Fifth, students’ vernacular literacy practices in class are exacerbated by the fact that teachers always publish their powerpoint-slides on the school’s Learning Management System (LMS). By making the presentation available the students feel that they do not need to pay attention during the lectures: ‘[student:] it’s like, he [the teacher] puts out everything he says in key words, on the Internet, so there is really no point in even being there’ (Blikstad-Balas, 2012). However, when they try to engage with the teacher’s dominant literacy text later on, they lack the support of the teacher and the text becomes incomprehensible: ‘[Student 1] ‘and sometimes it’s just—some only have key words so when you are going to see through and check what they did during class you don’t really understand what they did’. [Student 2] ‘no, you don’t understand anything of what they have tried to say’.

Sixth, the prospects of a deadline for an assignment or an important test induces students to consult the teacher’s presentation and increase their engagement in dominant literacy practices. However, there is a crucial lack of simultaneity between teachers’ and students’ dominant literacy practices, that is, they rarely participate simultaneously in communal dominant literacy events. ‘When the teacher is actually giving the presentation, the students are busy doing other things; first and foremost being entertained on the Internet. (…) [T]eachers and students do not operate on the same time scale’ (Blikstad-Balas, 2012). Hence, she demonstrates a problematic side of the idea that connected technologies enable learning anytime and anywhere (see, e.g., Bernacki et al., 2020).

The last finding is reflected in Aagaard’s (2017) observations about how outside-in and inside-out are performatively different in the classroom. While the first outside-in movement (Marilyn Monroe) is integrated in a communal experience involving pedagogical curation, the second inside-out movement (off-task use) enacts an individual experience that entails content concealment. In the first situation, there is a one-to-many
relationship where the collective attention of both teacher and students is drawn to Marilyn Monroe on the smartboard. The external information is thus curated and used in favour of the here-and-now situation in the classroom. Aagaard comments that the alignment of bodies and direction of attention creates a communal experience (Aagaard, 2017). In the second situation, there are many one-to-one relationships between distracted students and their digital devices. Far from being communal, the screens become individual means of escape from the immediate educational circumstances to the world outside (Aagaard, 2017). He concludes that the lines of attention involved in the two cases are quite different, not just because of the mental dynamics, but also in terms of the configuration of bodies, screens, sounds, chairs and tables.

2.3 Identifying extant research gaps

The studies presented in this chapter are meant to frame and situate the research presented in this thesis. This chapter is certainly not intended as a review of all relevant research conducted within the broad field of educational technology on the topic of off-task use in class. As mentioned in Chapter 1.3 there is a lack of studies of the dynamics involved in off-tasking. I have therefore decided to focus on qualitative studies and leave out quantitative studies (see for example, Ott et al., 2018) in this overview. In addition, there is a large body of pertinent previous research outside the field of ETR (for research on grit, self-discipline and perseverance see, e.g., Duckworth & Seligman, 2005; Duckworth et al., 2016; for research on self-regulation failure and procrastination see, e.g., Steel, 2007).

The main research question in this thesis concerns how to understand the fact that students engage in off-task use of ET in class. Despite years of research, official recommendations and policy initiatives, many students still struggle with multitasking in class. The studies presented in this chapter indicate widespread off-task use of educational technologies in class. There are indications that the students have developed deep-rooted habits pertaining to frequently used webpages and applications (Aagaard, 2018). Since these are prereflective and embodied, students are not likely to be able to switch them off when entering a classroom in which the same webpages or applications are readily available. Next, students have been granted a large degree of freedom in terms of the use of educational technology. This situation should be seen as the outcome of negotiations between students and teachers based on power and resistance over where to draw the line between educational and social uses of educational technology (Dinsmore, 2019). Despite high degrees of freedom, concealment is a key process in students’ off-task uses of educational technology. They are well aware that their activities are neither condoned nor conducive for optimal results and tend to hide their activities from the teacher. Furthermore, previous research indicates that the structure of the lesson is involved in students’ off-task use, highlighting transitions between activities and teacher lectures as situations in which students are particularly prone to become distracted. This is related to how students experience the lessons as either too difficult, too easy or too boring. Aagaard suggests that the perception of being bored must be seen in relation to the nature of the alternative practices that are present in the situation. He suggests that lectures are boring relative to Facebook, online games and surfing the web. Moreover, the individual nature of off-task uses of educational technology leads to a lack of simultaneity and communal experiences in the classroom. Instead of bringing the world into class (outside-in) to enrich and invigorate the experience of formal learning, students are mentally transported out of class (absence in class) via digitally mediated distractions (inside-out). Students pick up on the dominant literacies in difficult subjects and in preparation for assignments or tests, but operate on different time scales from their teachers. Even the teachers’ presentations posted online tend to provide little meaning if students did not pay attention during the actual presentation.

The studies provide valuable knowledge about the nature of off-task use of educational technology in class. Moreover, the studies provide tentative answers to why students go off-task and indicate how the process unfolds involving negotiations between teachers and students, dominant and vernacular literacies, drawing on
teacher strategies of restriction or differentiation and student strategies of concealment in a battle over the cultural logic of separation between educational and social uses of technology. Still, these findings also leave room for and spur further studies.

Overall, then, the first gap in extant ETR literature is therefore a lack of dedicated studies, with a limited focus on the dynamics involved in the transition between on- to off-task practices. This is important since research on off-task use has to take several factors into account at the same time. While separate empirical findings are valuable, previous research is less convincing when it comes to how they interact with off-task use as an outcome. From previous research, three main factors emerge as particularly relevant: 1) the person using the technology, 2) the technology itself and 3) the social, pedagogical and institutional context of the classroom. Aagaard has given a convincing account of how distractive habits influence students in class (person-technology-relationship), but does not address how this relationship interacts with the social, pedagogical or institutional frames of the classroom. Further, his theoretical commitments might make him less inclined to conduct variable-oriented quantitative studies than process-oriented qualitative studies.

This PhD project addresses the gap pertaining to the lack of quantitative studies that focus on relevant interactions between the students, technology and context by conducting a quantitative study using Structural Equation Modelling (SEM) that enables simultaneous analyses of relationships between multiple constructs. Due to the identified lack of previous research, I included constructs pertaining to the person (school-net-conflict, regulatory strength, school appreciation), to the technology (time spent online) and to the pedagogical context of the classroom (quality instruction, high expectations, classroom management) in the theoretically developed SEM.

Similarly, extant research indicates that students’ activities out-of-school influence their practices in school. Aagaard emphasises the development of distractive habits as important in this regard. However, out-of-school digital practices do not only create habits, but arguably also play a role in the development of interests and preferences (see Chapter 2.1.2 on the learning ecology approach). Previous research does not adequately address the interplay between students’ learning preferences and their use of technologies and so there is insufficient knowledge about how students’ appreciation of formal schooling relates to the use of ET in class and the use of connected technologies more generally. I addressed this void by developing an SEM that includes constructs related to students’ preference constructions, time spent online in class, school appreciation as well as how these contribute to students’ sense of digital agency in informal online learning.

As mentioned above, there is still a lack of previous studies that specifically address students’ own rich experiences with off-task use of ET in class to provide compelling conjectures about the dynamics involved in their transition from on-task work to actualising the affordances of off-task use of ET. Pieces of the puzzle have been presented in this research overview such as pertinent interaction patterns in the classroom and relevant structural institutional arrangements. In this PhD project I address this research insufficiency by conducting a targeted case study of students who experience a conflict between their school ambitions and their net-activities and habits (‘school-net-conflict’) in order to identify enabling conditions and triggers of off-task use of ET in class and to determine the nature of the discourses that students mobilise to explain their problematic behaviour.
3. Theoretical framing

In this chapter I explicate the conceptual and theoretical framework within which I conduct my research about net-related off-task practices. My main aim is to provide the reader with sufficient information about the theoretical choices I have made to assess the quality of theoretical application in terms of both rigor and relevance. First, a brief overview of critical realist ontological and epistemological assumptions is presented as a prelude to an explication of the critical realist-based affordance theory I use in this thesis. Affordance theory is my main analytical framework. By using affordance theory I do the theoretical groundwork for analyses that can advance understanding of off-task use of educational technology in class. Importantly, it theoretically explicates the relationship between technologies, individual users and the social, pedagogical and institutional contexts within which off-task practices take place. I end this chapter by presenting the paradox of educational technology research, that is, the tendency that successes are technologised, while failures are psychologised and why my theoretical framework provides a compelling alternative.

3.1 Critical realism

It is not my intention to provide a deep philosophical explication of the ontological and epistemological tenets of critical realism. I limit myself to a main outline that I hope can help readers understand the specifics of the critical realist version of affordance theory that I adhere to in this thesis. In addition, by employing the same ontological and epistemological assumptions in both the theoretical and methodological frameworks (see Chapter 4), I aim to create meta-theoretical coherence that can advance a principled framing of the different studies of which this thesis consists.

In this short overview of critical realism I will highlight two core principles that underlie my theorising: 1) the three-layered stratification of ontology and 2) the distinction between agency and structure. I start with the first principle pertaining to ontological stratification. Critical realism presupposes a three-layered stratification of ontology: the real, the actual and the empirical layers (Bhaskar, 1998a, 1998b). Importantly, critical realism takes the ontological position that social structures, material artifacts and conceptual and ideational entities such as language are real, that is, they exist independently of and precede any individual's perception of them, yet are constituted by collective human action (Fleetwood, 2005). Critical realists seek to explain how particular constellations of social structures generate the events they focus on in their research. Such constellations are referred to as ‘mechanisms’ and constitute the real layer in the critical realist stratification of ontology. The events that are generated by these mechanisms constitute the actual layer. Actual events that are subjected to research are understood on the basis of what is empirically observable. Critical realists view this empirical subset as the empirical layer in the stratification of ontology. Importantly, the empirical layer is the only one of the three layers that is available for observation at a particular time and place. Technological, conceptual or theoretical advances constantly change which actual events are available for observation.

Epistemologically, then, critical realists use inherently limited empirical information to try to explain events on the basis of generative ‘mechanisms’. This means that all knowledge claims are considered inherently fallible from a critical realist perspective. Critical realists use so-called retroduction in their efforts to infer the nature of mechanisms, that is, they work ‘backwards’ from empirical information about events to the underlying mechanisms that could logically have generated those events (Danermark et al., 2002).

Second, critical realism favours an analytical distinction between structure and agency. This is important because it opens up analyses of how structural properties constrain or enable agentic action and in turn how agentic action influences structural properties. This implies that ‘off-task use of ET in class’ is classified as agentic action. Notice, however, that some of the implicated structural elements are embedded in the phrase, cp. the terms ‘ET’ and ‘in class’, suggesting that they are central elements in analyses of students’ off-task
use. Critical realists consider structure and agency both temporally separate and separate in terms of their properties and powers (Archer, 1995). In terms of temporal sequence, social structures logically precede action by constituting the conditions within which for example, off-task use takes place. In turn, these actions contribute to the reproduction or change of the structural conditions (ibid.), that is, new emergent structures post-date the associated actions (Volkoff & Strong, 2013). Critical realist explanations must therefore account for how the interplay of structure and agency plays out in time. In terms of properties and powers, social and material structures are to some extent enduring and have the power to enable or constrain action. For example, school as an institution, education as an idea and digital technology as an infrastructure are all structures that teachers and students as institutional sets of actors must relate to in their day-to-day activities in class. In contrast, human agents have powers and tendencies such as ‘self-consciousness, reflexivity, intentionality, cognition and emotionality’ (Volkoff & Strong, 2013) and create meaning by way of cultural tools such as language, concepts and theories. Agents can act on reasons by formulating plans and pursuing goals, that is, they have the power to maintain or modify the structures around them by doing things.

3.2 Affordance theory
The three separate studies reported in the three published articles each has their own theoretical underpinnings and applications. Since an extended abstract is expected to create a coherent whole on the basis of the separate studies, I reasoned that a more encompassing theory that could theorise digital technologies in relation to users and the social, pedagogical and institutional contexts of use would be fitting for a study of students’ off-task use of ET in class. Therefore, affordance theory seemed a natural choice.

Affordance theory was originally formulated by James J. Gibson in his classic book The Ecological Approach to Visual Perception (1979).xi In contrast to orthodox psychology at the time, Gibson maintained that the meaning of things in the environment could be directly perceived, that is, values and meanings are somehow external to the perceiver. He defined an affordance in the environment as ‘what it offers the animal, what it provides or furnishes, either for good or ill (…). I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment’ (Gibson, 1979). Instead of understanding the relationship in terms of how a subjective observer endows the objective environment with meaning, he maintained that affordance is neither an objective nor a subjective property, but both at the same time. That is, affordance bridges the distinction between subjective and objective since it is both an element of the environment and of behaviour, both material and mental, according to Gibson. It is clear that he considered affordance a relational concept. Take a pencil as an example of how the relational aspect of Gibson’s affordance theory should be understood. To an educated person the pencil affords writing, in addition to a number of other affordances such as back-scratching, stabbing and bookmarking and so on. However, to an infant a pencil does not afford writing and probably not back-scratching nor bookmarking either. Thus, it becomes clear that what a pencil affords has to be measured relative to the person, not just in terms of its physical properties. This entails that Gibson understands affordances as real possibilities for action that exists whether a person recognises them or not. Notice how this idea about the reality of affordances corresponds with the critical realist tenet of the existence of a real ontological layer explicated above. Gibson further maintains that ‘what we perceive when we look at objects are their affordances, not their qualities. We can discriminate the dimensions of difference if required to do so (…), but what the object affords us is what we normally pay attention to’ (Gibson, 1979). He shows how infants attend to the affordances of things, that is, what they can do with them, and only later can discriminate and combine the qualities that specify things, such as shapes, colours and materials.

The last element I want to include about Gibson’s original formulation of affordance theory concerns the idea that some affordances are beneficial and some are not. An example he uses is the affordances provided by
the brink of a cliff. On the one side it affords falling off; on the other it affords walking along. Similarly, a knife affords cutting, but also being cut. Gibson stresses that these positive and negative affordances are properties of things taken with reference to an observer, but not of the subjective experiences of an observer. According to Gibson, positive and negative affordances are not subjective values added to neutral perceptions. The fundamental take-away of Gibson’s theory of affordance is that things themselves are intrinsically involved in accounts of their meaning, because although one can do a number of different things with any thing, one cannot do anything with anything. Certain uses are simply not possible, since objects will object (Graves-Brown et al., 2013, p. 85). Arguably, since Gibson’s theory of affordances is an account of meaning that can exist independently of language, symbols and categories, it cannot make full sense of experiential or cultural categories. Instead, Gibson considered it a serious attempt to define the conditions of possibility for the evolution and development of language and representational systems (Gibson, 1986).

It was Donald A. Norman who first applied affordance theory within the field of educational technology in his work on design in the area of human computer interaction (HCI). His classic work *The Psychology of Everyday Things* (1988) (later editions titled *The Design of Everyday Things*) became immensely influential. Norman used the term affordance to refer to the ‘perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used’ (Norman, 1988). He asserted that affordances provide strong clues as to how to operate things; for instance, slots are for inserting things into while knobs are for turning. The key issue for Norman was that the user should know what to do just by looking, that is, the design should be intuitive, with no picture or instruction and no thinking required. For Norman, affordances were one design principle among many. In addition to affordances, good design relied on conceptual models, that is, good design is an act of communication between the designer and the user in which all the communication is achieved by the outward form of the device itself. Norman emphasised that the shape of the thing must furnish clues required for its appropriate operation, thus distributing knowledge between the head and the world. This means that for Norman, bad design is when instructions have to be supplied, such as ‘insert this way’ or ‘push here’. A critical distinction introduced by Norman was between real and perceived affordances. When he asserted that a thing was well designed, he implied that the real affordances were communicated via its design in such a way that the real affordances were intuitively perceived by a user. Moreover, a good designer ensures that suitable actions are perceptible, while unsuitable ones are invisible, according to Norman.

Working within the field of HCI, Norman was clear that his design principles also applied to computers. In fact, he deliberately did not use computers and other digital devices as examples because he wanted to show that the principles applied to the design of everything from doorknobs to nuclear power control rooms. In response to what he conceived as misuse of the term, he made clear that the designer’s task in relation to graphical, screen-based interfaces was to provide perceived affordances since the computer system already came with built-in real affordances:

The computer, with its keyboard, display screen, pointing device and selection buttons (for example, mouse buttons) affords pointing, touching, looking and clicking on every pixel of the screen. Most of this affordance is of little interest for the purpose of the application under design. In this circumstance, designers sometimes will say that when they put an icon, cursor, or other target on the screen, they have added an ‘affordance’ to the system. This is a misuse of the concept. The affordance exists independently of what is visible on the screen. Those displays are not affordances; they are visual feedback that advertise the affordances: they are the perceived affordances. Perceived affordances are sometimes useful even if the system does not support the real affordance. Real affordances do not
always have to have a visible presence (and in some cases, it is best to hide the real affordance) (Norman, 2002)

From Norman’s principles of intuitive design sprang a new set of design principles—so-called persuasive design—that have influenced how current ubiquitous digital technologies are perceived and used (see, e.g., Fogg, 2009). Norman’s original idea was that appropriate use was communicated via the design features in an intuitive manner, with no thinking required. Persuasive design takes this one step further. Good design is not only intuitive, but persuasive. This is not an insignificant change, as it implies explicit manipulation of users for the purpose of persuasion. Arguably, the change reflects a new business model that is based on capturing and keeping users’ attention and thus provide paying advertisers the opportunity to manipulate them (Zuboff, 2019). In persuasive design the aim is to make users perform a target behaviour. B. J. Fogg, a behavioral scientist at Stanford University and head of the ‘Behavior Design Lab’, developed the influential ‘B=MAP-model’ that simply means that behaviour (B) takes place when Motivation (M), Ability (A) and a Prompt (P) come together simultaneously (Fogg, 2009). Fogg explicitly states that his model is useful in analysis and design of persuasive technologies (Fogg, 2009). Current digital products are designed to influence and encourage users to make certain decisions and perform target behaviours. Tech giants rely on extensive research to map users’ motivation and ability using Artificial Intelligence and Machine Learning (see, e.g., Zuboff, 2019). User data is therefore often referred to as the new oil (see, e.g., ‘The world’s most valuable resource is no longer oil, but data’, The Economist, 2017). A new saying has emerged that ‘if it’s free, then you’re probably the product’.

The key takeaway from this in relation to the current thesis is that while there has been a massive and rapid increase in built-in, physical, real affordances linked to the ongoing digitisation of everyday life, there has been a parallel refinement of persuasive design relying on user data. AI and machine learning open up technologies to ‘use’ or ‘read’ users (Zuboff, 2019). This undermines the credibility of the instrumental determinist (see Chapter 2.2.1) claim that the targeted digital distractions directed at today’s students are no different from the distractions of the past, or only serve to alleviate the same type of preexisting psychological tension. Unlike distractions of the past, some applications frequently used by young people today are explicitly and purposely designed to create that psychological tension with the aim to establish and maintain behavioural habits (see Aagaard’s concepts ‘mediated impatience’ and ‘habitual distraction’ in Chapter 2.2.1). Norman used the term perceived affordance for the social signifiers used to communicate the appropriate actions of a technology. The verb ‘to perceive’ is generally understood as the act of becoming conscious of something and thereby to realise and understand. In persuasive design, the social signifiers are used to manipulate user action, that is, the opposite of making people conscious. For the purpose of my thesis, I therefore replace Norman’s term with the more appropriate ‘deceived affordance’, as the verb ‘to deceive’ is generally understood as the act to deliberately make someone believe something that is not true.

3.2.1 Actualisation of off-task affordance in the classroom

In Chapter 2, I briefly presented three different strands of extant research that highlighted how students’ digital life-worlds were connected to formal education. From previous research I concluded that the nature of the off-task activities, such as social media, games, YouTube, chat, online newspapers and Netflix, is inherently implicated in off-task use of ET. Arguably, the warrants for that conclusion are strengthened based on the theorising of how these technologies are purposefully designed for attracting and keeping the attention of users. Keeping this in mind, I would argue that contemporary classrooms in which students have relatively easy access to their everyday, habitual uses of connected devices are imbued with and in fundamental ways are shaped by the omnipresence of distractive affordances. Students quickly learn to anticipate the possibilities for off-task use of educational technology before even entering the classroom and thus before any
of these possibilities are actualised in practice. It is this potential for action that critical realists refer to as ‘affordance’. Ontologically, they see it as a tendency or a so-called ‘mechanism’ at the level of the real that has the potential to generate events. This means that affordance denotes the functional possibilities for engagement in everyday use of ET in class. In turn, this possibility of off-task use of ET in class is involved in a situated process of generating specific off-task uses of ET by specific students for specific purposes in specific situations in class. In critical realist terms, a mechanism at the level of the real generates an event at the ontological level of the actual. That is, the affordance of off-task use of ET in class is actualised in practice. While ‘affordance’ is a functional term connecting functionalities of technology to reasons for use, processes of actualisation of affordance, on the other hand, are highly situated and as such involve specific students, specific technologies and specific social, pedagogical and institutional arrangements unfolding at a specific time.

The ubiquity of digitally mediated distractive affordances shapes how students perceive the contemporary classroom. They see the possibility for engaging in a range of everyday digital activities that play roles in and have overlapping functions in their lives. Analytically, I find it useful to distinguish between activities that serve primarily cognitive and meaningful functions such as reading online news, searching for information, checking the bank account or booking an appointment or a holiday (Ito et al., 2010). Affective functions, include a whole range of activities that provide short term gratification and mood adjustment such as playing games, chat, social media and watching YouTube or Netflix (see for example, Parry & le Roux, 2019) and behavioral functions stem from prerractive habits emanating from deeply sedimented relational strategies with digital media (see, e.g., Aagaard, 2017). Since there is such a close alignment between what the technology has to offer and the functions students seek to fulfull (see, e.g., Leonardi, 2011 on the imbrication of human and material agencies), the ease with which students can fullfill the desired functions and the allure of the digital temptations’ persuasive design, students tend not to experience these affordances as neutral, but as exerting a magnetic pull (Aagaard, 2017), being particularly ‘potent’ (Anderson & Robey, 2017), that is, students are drawn to distraction (Aagaard, 2015). Students’ experiences of the contemporary classroom are thus mediated by the conspicuous omnipresence of distractive affordances. Arguably, the constant presence of plaeasurable action alternatives mediates just how tedious or how hard students perceive school work, how often and for how long they allow themselves to take a break and how much time and effort they are willing to invest trying to solve a challenging educational task. Overall, I would argue that the attraction and availability of short-term gratifications mediates the relative ease with which students delay gratifications for the long-term goal of school achievement (see temporal hyperbolic discounting theory used in Article 2).

The social aspect of affordances is theorised by Leonardi (2013) in his differentiation between individual, shared and collective affordances. While an individual affordance is actualised by a single actor that acts independently of others, a shared affordance refers to the same affordance that is actualised by a number of people in similar ways. A collective affordance is actualised by many people doing different things to achieve a common goal. From an organisational perspective, I would claim that the use of ET in class is intended to be an actualisation of the collective affordance of education. That is, while the individual student uses ET for different things in the classroom, each use is supposed to be a step towards achieving the institutional goal of education. This is a reason why many schools have official rules and regulations against off-task use of ET. However, drawing on previous research (Chapter 2) the current use of ET in class does not seem to constitute an actualisation of a collective affordance of education. On the contrary, previous findings indicate a discrepancy between individual goals and institutional goals regarding ET use in class as reflected in the identified antagonistic teacher-student relationship. However, individual students’ actualisation of ET’s off-task affordance does not take place independently of the other students and many students seem to actualise off-
tasking in similar ways. Similarly, previous research identifies common social norms among students that allow off-task use of ET in class as a contributing factor for going off-task. This implies that off-task use of ET in class can be described as a shared affordance in which each instance is a step away from achieving the collective affordance of education that ET was originally intended to achieve. Moreover, the social acceptance among peers is likely to increase the relative potency of off-task use and make it more difficult for individual students to delay gratification to achieve their academic ambitions. Scholars have emphasised the increased importance of students’ abilities of self-regulation as formal education turns increasingly digitised and individualised (see, e.g., Duckworth & Seligman, 2005). Based on the previous research and theorising presented here, however, I would claim that students’ appreciation, sense of belonging and positive associations with formal schooling as an institutional enabler of their education are more fundamental at a time when digitisation challenges the very idea of education and the institution of school as we know it.

In Chapter 2, I mentioned two conflicting discourses existing in the field of educational technology research side-by-side: technological determinism and technological instrumentalism. Technological determinism is characterised by an exclusive focus on how technology drives the development of culture and society, and determinists’ preconceived notions of the virtues of technology often lead them to voice hyped claims about the connectivity of educational technology (see Chapter 2). The topic under exploration in this thesis—students’ off-task use of educational technology in class—would therefore be ascribed to the affected students’ innate psychological tendencies. Paradoxically, instrumentalists would tend to draw the same conclusion. From their perspective people are in total control of their actions and technology is merely a neutral tool. It follows that misuse of technology is the sole responsibility of the user. This means that off-task use of educational technology is a symptom of an underlying individual problem unrelated to the technology itself. In my view both approaches are reductionist in that they fail to provide compelling accounts of how affordances are actualised by means of the messy realities of the classroom.

The actualisation of off-task use of educational technology in situated classroom contexts is at the heart of the research agenda in this thesis. In order to deepen our understanding of how and why, where and when students engage in off-task use of ET, my research seeks to explore recurring patterns of how individual students interact with educational technology within the social, pedagogical and institutional frames of the classroom. Since each off-task event involves inherently unique configurations of individual, technological and contextual elements, I limit myself to try to identify some commonalities and converging patterns. I am primarily interested in exploring the interaction between triggers and enabling conditions involved in the transition from on-task work to off-task use of ET in the classroom, thus retaining the analytical distinction between social structure and agentic action that is central in critical realism.

In the first quantitative study reported in Article 1, the relationship between technology and students was seen in relation to key elements in the pedagogical context of the classroom. Multivariable analyses such as SEM used in study 1 are particularly conducive for identifying interrelations between several constructs at the same time, thus indicating potential mediating and moderating constructs (see Chapter 4). In addition, the study is particularly pertinent for identifying counter-intuitive associations that generate research interest and further studies. In the second quantitative study reported in Article 2, the relationship between technology and student was seen in relation to students’ preferences for either formal schooling or online culture and their sense of digital agency. SEM was used in study 2 as well, thus sharing the same advantages mentioned above in relation to study 1. In the qualitative case-study reported in Article 3, I sought an emic, insider perspective of the ‘on- to off-task-transition’ in class. I analytically distinguished between triggers and enabling conditions in line with local causality in critical realism and analysed students’ discourses using four conceptualisations of agency as analytical framework.
I limit my exploration of these complex actualisation processes to certain factors that previous research indicates can have a bearing on off-task use of ET. Drawing on findings from Article 1, I show how quality aspects of teaching (quality instruction, high expectations, classroom management), school appreciation, time spent online and school-net-conflict are related to off-task actualisation. Drawing on findings in Article 2, I reveal how conceptions of school and learning (school culture versus online culture) are implicated in how students understand off-task practices in class. Drawing on findings in Article 3, I indicate how students see the influence of their personality, their peers and their actions, their teachers and their teaching and the subjects and institutional frames on their off-tasking. As mentioned above, I am primarily interested in exploring triggers and enabling conditions of the transition from on-task work to off-task use of ET in the classroom.
4. Methodological framing

This chapter is dedicated to the explication of the research methodology used in this thesis. I start with a brief introduction to the way I have used critical realism as the overarching methodological framework (4.1). Next, I present and problematise my use of a mixed methods approach (4.2), followed by an explication of the methodological design, encompassing participants (4.3), data (4.4) and analyses (4.5) used in the three studies of which this thesis consists. The chapter ends with a discussion of relevant aspects of research credibility (4.6).

4.1 Philosophical framing

Critical realism is used as meta-theory for both the substantial affordance theory (Chapter 3.1) and the research methodology in this extended abstract. While I elucidated pertinent ontological and epistemological tenets for my version of affordance theory in the previous chapter, here I will account for why critical realism is a compelling meta-theory for my methodology. Since my thesis comprises two quantitative studies and one qualitative study, it is important that the methodology can theoretically account for how these studies are related to each other. I intend to show that an explicit principle of integration based on a critical realist framework turns isolated studies into a transparent and coherent whole whose research impact is greater than that of its parts. While the stratification of ontology and the analytical separation between structure and agency was expounded upon in Chapter 3.1, the emphasis in this chapter is on how critical realism substantiates the compatibility of methods thesis and thus legitimates my mixed methods methodological approach and multiple method design.

According to Maxwell and Mittapalli (2010), critical realism is compatible with essential methodological characteristics of both qualitative and quantitative research. I assert that this congruence enables communication and collaboration between my two quantitative studies and one qualitative study and thereby actualises the compatibility of methods approach that contends that combining quantitative and qualitative methods is appropriate in many settings (Teddlie & Tashakkori, 2010). Greene (2007, p. 82) maintains that critical realism welcomes and even requires a combination of methods and is not unsettled by questions about incommensurable philosophical assumptions. This rejection of the incommensurability of paradigms thesis represents the border between proponents of mixed methods research and methodological purists.

Critical realism as a highly appropriate alternative for mixed methods research in the way it combines a realist ontology, that is, that there is a real social world that exists independently of our perceptions, theories and constructions, with a constructivist epistemology, that is, our understanding of the social world is inherently a construction made from our own perspectives. Moreover, critical realism acknowledges the reality of our perspectives and thus the value of using an interpretive approach for exploring these (Maxwell & Mittapalli, 2010). In line with this, I used an interpretive approach in my qualitative study to explore and gain an insider view (emic) of how the students experienced and articulated their problematic off-task use of ET in class. Yet, in my two quantitative studies, a variable oriented, outsider view (etic) is utilised to identify pertinent regularities based on the critical realist tenet of the existence of a real social world. Thus, the critical realist ontological and epistemological assumptions provide perspectives for viewing the world, exposing phenomena and creating understanding that would be hard to obtain with other meta-theoretical lenses.

A distinctive feature of critical realism is that it denies the possibility of absolute and certain knowledge of the world and hence is open to the possibility of alternative valid accounts of any event, phenomenon or practice. Moreover, it considers that all theories about the world are based on a specific point-of-view and therefore that
all knowledge is inherently partial, incomplete and fallible (Maxwell & Mittapalli, 2010, p. 150). Shadish, Cook and Campbell (2002) maintain that all scientists are epistemological constructivists and relativists in the sense that they believe that both the ontological sphere and the spheres of values, ideologies, etc. are involved in the construction of scientific knowledge. Overall, the general characteristics of critical realism can be summed up as (a) a commitment to the existence of a real world, (b) a recognition that reality places constraints on concepts, (c) a conception of truth that goes beyond mere internal coherence and (d) a commitment to the existence of a stable knowledge of the world.

4.2 Mixed methods methodology

There are several different definitions of mixed methods research (MMR). In this extended abstract I draw on Teddlie and Tashakkori (2010, p. 5) and their definition of the methodology of mixed research as:

the broad inquiry logic that guides the selection of specific methods and that is informed by conceptual positions common to mixed methods practitioners (for example, the rejection of ‘either-or’ choices at all levels of the research process). Rejection of the ‘either-or’ leads to a guiding methodological principle of MMR: methodological eclecticism, which means that practitioners of mixed methods select and then synergistically integrate the most appropriate techniques from a myriad of QUAL, QUAN and mixed strategies to thoroughly investigate a phenomenon of interest.

Similarly, Creswell (2010) emphasises that mixed methods research begins with realising that a person’s method is linked to that person’s philosophy, that is, that the design is framed within a broader philosophical tradition. In my case, critical realism constitutes the broader philosophical tradition that frames my use of MMR in this extended abstract. In Leech (2010, 257) Jennifer Greene defines mixed methods research as the intentional use of more than one method, methodology and/or methodological tradition in the same study or program of research. Methodological traditions include the assumptions of philosophical paradigms, as well as disciplinary and theoretical perspectives. And mixing can occur on some or all of these levels (…)

Creswell and Greene, as well as Teddlie and Tashakkori, stress the conceptually informed and broad logic of inquiry that guides the selection of specific methods and the view that mixing can take place on some or all of the levels of method, methodology or methodological traditions. The MMR methodology in this thesis is in line with this thinking. Thus, my critical realist philosophy informs the use of methods in this thesis. However, I only apply the intentional use of more than one method at the program-level of research, not in the same study. The research design of the overall study is therefore best characterised as a multiple methods design (Morse, 2010, p. 340), since it consists of ‘two or more studies using different methods, which address (…) different parts of the same research question or programmatic goal’ and each study is largely self-contained, complete and published as a separate article. Morse (2003, p. 190) defines multiple methods-design as the use of two or more research methods, each used rigorously and thoroughly in itself, in the same project. She (ibid., 196) adds that a multiple methods design is particularly suitable when several studies are interconnected with a broad topic and designed to answer an overarching research question. This understanding of multiple methods-design corresponds well with the extended abstract as an academic genre that is intended to create a coherent whole based on separate studies reported in separate articles and is thus a compelling research design for my PhD project.

Since each study in a multiple methods design is largely self-contained, I will in the following show how the overall methodological drive in this PhD project corresponds with MMR principles. I do this by elucidating how
my use of MMR relates to dominant ideas about the general purposes and rationales for mixing methods. According to Greene, Caradelli and Graham (1989) the general purposes of mixed methods research is triangulation, complementarity, development, initiation and expansion. Similarly, Collins, Onwuegbuzie and Sutton’s (2006) rationales for mixing methods include participant enrichment, instrument fidelity, treatment integrity and significance enhancement. As for the first five general purposes, the mixed methods methodology used in this thesis does not aim to generate triangulation of findings in a strict sense, since it is contestable whether the same phenomenon is under scrutiny. Instead, the findings in each study are intended to be complementary pieces of an overall programmatic research puzzle. Their main contribution lies in how reflection is stimulated through the etic discovery of broad patterns of regularities and thus the dim contours of possible mechanisms and the emic in-depth exploration of the most promising and interesting dim contours. I will therefore argue that the issue of complementarity is addressed in that each study elaborates on the other, thus providing illustrations, enhancement and clarification of findings from one study with the results from the other studies. The purpose of development and initiation are not directly applicable in this thesis. In terms of the purpose of expansion, my MMR methodology expands the breadth and range of inquiry by using SEM in conjunction with qualitative methods of inquiry for different inquiry components, that is, adjusting the methods to the type of inquiry I intended to carry out.

I turn now to Collins, Onwuegbuzie and Sutton’s (2006) four rationales for mixing approaches, that is, participant enrichment, instrument fidelity, treatment integrity and significance enhancement. First, the methodological framing of this thesis enabled an optimisation of the sample and thus provided participant enrichment. I used findings from the two quantitative studies as theoretical rationale for the purposive sampling of participants in the subsequent qualitative study. I used the theoretical construct (‘school-net-conflict’) as basis for a simple descriptive analysis of the 60 schools in my quantitative sample and was thereby able to isolate schools with comparably high mean values among the students with regard to the school-net-construct. I selected one of the high-conflict schools and conducted a simple survey-study (N=109) to identify candidates who experienced a school-net-conflict. I selected the 11 participants in the qualitative case study based on these survey results and conversations with the responsible teachers. The purposive sampling procedures increased the chances that the participants were appropriate for inclusion based on my specific research agenda. Instrument fidelity and treatment integrity, however, were not applicable rationales for mixing methods in my thesis. Indirectly, however, instrument fidelity is a possible extension of my research findings, in that the qualitative findings of students’ understanding of agency failure can inform the construction of more robust and fine-tuned models for future testing. Finally, I will argue that my MM design contributes to significance enhancement by providing thickness and richness of data and thus augmenting interpretation and usefulness of results. For instance, the regularities identified between school-net-conflict and self-regulatory strength among 3,400 students in study 1 were brought to life in study 3 by the in-depth exploration of the interrelationships between students’ conceptions and thus meaning-making processes and the situations their explanations referred to.

Critical realism provides a particularly suitable framework for studies that integrate both reason-explanations and causal-explanations as in the qualitative study reported in Article 3, since both phenomena are considered real and thus candidates for inclusion in critical realist explanations. Overall, I claim that my use of quantitative and qualitative methods that tap into facets of the same complex phenomenon with international versus local samples in different studies and are linked via purposive sampling provides a comprehensive picture of off-task use of ET in class as an expression of the interplay between informal online learning and formal education among secondary students. The study relied on development since the sequential collection and analyses of data across the studies opened up to letting converging or diverging results from one study
influence the next in terms of implementation, measurement and sample decisions, but also substantially as the identification of unanticipated regularities begged further inquiries. Moreover, the thesis relies on development understood as expansion as the stepwise order of studies was conducive for goal-directed expansion of pertinent phenomena, but also for the development of salient hypothetical configurations of phenomena by drawing on the results of one study to inform the next.

4.3 Multiple methods multiphase design

As mentioned, the research design of my PhD project is best characterised as a multiple methods design since it consists of three independent studies that address different part of the same overarching research question: What factors can account for students’ off-task use of ET in class? Obviously, a single PhD project can only contribute to a very modest extent. In my case, I first chose to focus on students’ self-regulatory strength and map its relationship with salient antecedents such as quality instruction, school motivation, time spent online in class and school-net-conflict. Next, and based on a rationale to address a wider expanse of the overall research problem, I chose to focus on the importance of students’ learning-oriented use of informal online practices and to map its relationship with salient antecedents such as students’ preference constructions in terms of online culture and school culture, time spent online and school associations. The identified importance of the school-net-conflict from study 1 informed the use of the constructs of online and school culture in study 2, but also the choice of topic and sample for the last, qualitative study 3. Instead of further expanding the number of salient research topics, the results from studies 1 and 2 called for deeper understanding of the school-net-conflict dimension and its identified association with time spent online in class. I therefore chose to address students' understanding of the agency-failure involved in problematic off-task practices in class and considered that an in-depth, emic, qualitative approach was required to provide rich enough data of both the situational specifics and students’ meaning-making processes. Thus, the choice of different methods was primarily made to address substantive issues, that is, the overarching research question and the two sets of sub-questions—(a) interactions in the classroom that enabled the actualisation of off-task affordance of ET in class and (b) structural contexts conditioning the pertinent interactions—were key considerations for using a mixed methods methodology and a multiple methods multiphase design.

As mentioned above, however, a person’s philosophy is tied to their choice of methods and I use critical realism as a single alternative philosophical framing for my mixed methods methodology. It is important to note that this philosophical framing did not just provide an abstract ontological, epistemological and methodological foundation, but perhaps more importantly framed the substantive concerns and thus the research questions mentioned above. That is, critical realism provided a particular way to understand and perceive the world via the three-layered stratification of ontology (real, actual and empirical) and structure-agency-relationship (analytically and temporally separate) as elucidated in Chapter 3.1. From this point of view, the philosophical framing is by definition inherently involved also in substantive concerns and thus the research question cannot be understood as separate from the implicit or explicit philosophy from which it emanates.

As mentioned, the multiple methods-design comprises three separate but interlinked studies: two quantitative studies and one qualitative study. The two quantitative studies contribute with an outsider-perspective (etic) and the single qualitative study provides a complementary insider-perspective (emic). As such, the overall project consists of one quantitative phase and one qualitative phase. Hence the approach can be classified as a multiphase design (Creswell, 2013; Creswell & Clark, 2011) and is more accurately characterised as an equal status, exploratory, sequential design (Ivankova et al., 2006), or QUAN → QUAL (Creswell, 2010). In
order to help visualisation, I have tried to summarise some main features of the design in the figure below.

*Figure 1: Equal status, exploratory, sequential design (QUAN → QUAL)*

The sequential timing of the studies enabled me to analyse data stepwise and use the results from one study to inform the next. The general design features were planned before the start of the project, but the details of each study were allowed to emerge (Creswell, 2010) as the project went forward. This let me plan for unanticipated results or perspectives (Schoonenboom & Johnson, 2017). I will discuss the links between the two phases in more detail below.

Phase 1 consists of two different quantitative studies and I account for the details in Articles 1 and 2. However, since the sampling, data collection and data analyses are quite similar I will treat them both as Phase 1 in the following. I will only comment on instances of divergence if relevant for the multiple methods-design. Phase 1 and 2 had different periods for data collection, separate but connected student samples and different methods for data collection and data analysis. Table 2 shows the periods for design completion and corresponding data collection and analyses for Phase 1 and 2, respectively.

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</table>

I designed the main outlines of phase 1 and 2 together with the Prime Investigators in the L21-project (Professor Lars Vavik and Professor Gavriel Salomon). The final version of the design for Phase 1 was completed in 2013 together with the student survey. The comprehensive student survey was the basis for both quantitative studies, that is, the two studies in phase 1 used the same respondents. The main stages in the process from designing Phase 1 to the construction of Structural Equation models are presented in table 3.
Table 3: Main stages in Phase 1 from design to development of Structural Equation Models.

<table>
<thead>
<tr>
<th>PHASE 1</th>
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<tbody>
<tr>
<td>Stages</td>
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<td>3</td>
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I finished the design of Phase 2 in 2014, drawing on two preliminary findings from Phase 1:

1. School-net-conflict was a key factor in that it showed large negative associations with self-regulatory strength and positive associations with the time students spent online in class (Article 1)

2. Time spent online in class was negatively related to students’ school culture preferences and positively related to their online culture preferences (Article 2)

Based on these findings, I decided to focus exclusively on off-task use of ET in class among students who experienced a school-net-conflict. Thus, the theoretical rationale for the sampling procedures for Phase 2 became ‘school-net-conflict’ and the multiphase design enabled purposive participant enrichment to the overall project. The sampling procedure for Phase 2 consisted of a Principal Component Analysis (PCA) that singled out variables from patterns in students’ answers that loaded on a theoretically derived school-net-conflict dimension. Then, I combined the pertinent variables into a single construct (‘school-net-conflict’). Next, I conducted simple descriptive quantitative analyses to show the mean values of the school-net construct at the school level and consequently selected a Norwegian upper secondary school with the highest school-net-conflict among the 60 schools in the quantitative sample. Finally, the gateway-teacher at the school helped organise a simple survey among 109 of the students to identify ‘school-net-conflict’ candidates. Based on the survey results, I contacted and informed 11 students about the project and they all consented to participate.

The identification of pertinent regularities linked to students’ school-net-conflict in Phase 1 provided the rationale for the purposive sampling in Phase 2. In addition, the identification of a positive association between ‘school-net-conflict’ and the time students spent online in class was interesting and raised questions. Internet use at school was supposed to stimulate students’ motivation and learning, not be associated with and perhaps contribute to a motivational conflict. The nature of students’ off-task use of ET thus emerged as a central theme in Phase 2 and in particular, students’ conceptions of the agency-failure involved in problematic off-tasking. The main stages in the process from designing Phase 2 to conducting theoretical coding based on transcriptions of interviews are presented in table 4 below.
As mentioned, Phase 1 influenced Phase 2 in interesting ways. However, I maintain that the relationship between the two phases was reciprocal. Insights from Phase 2 also influenced and shed new light on theories and concepts and thus findings from Phase 1. In particular, the theoretical exploration of students’ understanding of agency-failure in off-task use of ET required the use of a four-factor typology of different agency conceptualisations. The first of these conceptualisations is termed ‘sovereign agency’ and thus conceives agency as an individual capacity, something an individual can possess. The term was used to describe so-called ‘self-theories’. The dependent variable in the first quantitative study in Phase 1—‘self-regulatory strength’—would then fall under this ‘sovereign’ conceptualisation of agency. The insight of typologies of agency from Phase 2 linked all three studies closer to the concept of agency. It is important to note that while versions of ‘sovereign agency’ (self-regulatory strength and agency in informal online learning/digital agency) were used as desirable outcomes of antecedent factors in Phase 1, students’ meaning making using an agency-typology analytically was investigated in Phase 2. Arguably, research efforts intending to show which instructional factors provide students with agency are of little value unless researchers take into consideration how students mobilise certain conceptions of the term for specific purposes. Thus, while versions of ‘sovereign agency’ were the dependent variables in the quantitative studies 1 and 2, the qualitative study 3 showed that the students mobilised all four conceptualisations to account for different elements and processes of the agency-failure involved in their problematic off-task use of ET in class. However, the dominant frame of reference was ‘sovereign agency’, indicating a psychological and individualistic understanding of the term. These theoretical reflections were made possible by the overall mixed methods methodology and multiple methods multiphase design by the sequential use of etic and emic approaches to the overall research endeavour. Table 5 is a visualisation of some key design aspects in Phase 1 versus Phase 2.

Table 4: Main stages in Phase 2 from design to theoretical coding.

<table>
<thead>
<tr>
<th>PHASE 2</th>
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<tbody>
<tr>
<td>Stages</td>
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<tr>
<td>1</td>
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</tbody>
</table>
Table 5: Key design aspects in Phase 1 versus Phase 2.

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample</strong></td>
<td><strong>Sample</strong></td>
</tr>
<tr>
<td>Convenience sample</td>
<td>Purposive sample (based on identified levels of school–net-conflict)</td>
</tr>
<tr>
<td>80 schools: 20 Norwegian, 24 Finnish, 16 Swedish</td>
<td>1 Norwegian upper secondary school</td>
</tr>
<tr>
<td>3,400 students aged 15–18 in Norway, Finland and Sweden</td>
<td>11 students aged 15–18 in Norway</td>
</tr>
<tr>
<td><strong>Data collection</strong></td>
<td><strong>Data collection</strong></td>
</tr>
<tr>
<td>Survey: questionnaire</td>
<td>Semi-structured focus groups</td>
</tr>
<tr>
<td><strong>Data analysis</strong></td>
<td><strong>Data analysis</strong></td>
</tr>
<tr>
<td>(SPSS &amp; AMOS)</td>
<td>(HyperRESEARCH)</td>
</tr>
<tr>
<td>Structural Equation modelling (SEM)</td>
<td>Thematic/content coding (cycle 1)</td>
</tr>
<tr>
<td></td>
<td>Theoretical coding (cycle 2)</td>
</tr>
<tr>
<td><strong>Analytical tools</strong></td>
<td><strong>Analytical tools</strong></td>
</tr>
<tr>
<td>Hypothetical model of theoretically pertinent factors</td>
<td>Cycle 1 (data-driven): ‘triggers’ &amp; ‘enabling conditions’ (drawn from critical realist conception of cause)</td>
</tr>
</tbody>
</table>

4.4 Research credibility

The credibility of research concerns the overall quality and the defensibility of research findings, that is, the overall validity of research. Onwuegbuzie and Johnson (2006, p. 48) assert that the validity issue depends on the quality of a study, its parts, the conclusions drawn and the applications based on it. In this section, the validity issue is referred to as research credibility. Pertinent issues to address in this regard include reliability, validity, generalisability and research ethics. There are many types of validity and reliability and there are many types of threats to validity and reliability. While these threats cannot be erased completely, their effects can be attenuated by paying attention to validity and reliability throughout the research process (Cohen et al., 2017, p. 245). In the following, I address research credibility by first discussing the three studies’ reliability. Then, I elucidate the issues of construct validity, internal validity and external validity in relation to the two quantitative studies. Next, the credibility issue pertaining to the qualitative study is approached by considering descriptive validity, interpretive validity, theoretical validity and external validity from a critical realist point of view. Finally, I address the mixed methods validity of the three studies combined.

4.4.1 Reliability

Cohen, Manion and Morrison (2017, p. 268) refer to reliability as a term that encompasses dependability, consistency and replicability over time, over instruments and over groups of respondents. This means that for research to be reliable it must show that if it were conducted on similar groups of informants in similar contexts, then the findings would be similar. They maintain that both quantitative and qualitative research must be reliable but add that the two are reliable in different ways.

In the quantitative research reported in this thesis, I comment on two main reliability types: reliability as stability and as internal consistency, as well as the reliability of the data-collection instrument (questionnaire). The stability type of reliability refers to consistency over time, over similar samples and over the instrument used. Since the survey used for the quantitative data collection (studies 1 and 2) was only used once, the relative stability in terms of yielding similar data from similar respondents over time is not applicable. However, reliability as stability also concerns stability over similar samples. Ideally, during piloting the questionnaire I should have conducted a test/re-test of the whole or parts of the questionnaire to measure reliability over a
sample. This is a limitation in the quantitative study. Reliability as internal consistency pertains to the relationships between items in multi-item scales. A common measure of this type of internal consistency is the Cronbach alpha that shows the correlation of each item with the sum of all the other relevant items. Table below shows the Cronbach Alpha for all constructs included in studies 1 and 2. With Cronbach alphas ranging from .62 to .87, all the constructs were found to have acceptable to good internal consistency according to the benchmark of .70 set by Nunnally and Bernstein (1994).

<table>
<thead>
<tr>
<th>Construct</th>
<th>No. of items</th>
<th>Finland</th>
<th>Sweden</th>
<th>Norway</th>
<th>Nordic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Study 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-regulation</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School-net-conflict</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School appreciation</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher’s explanatory skills</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher’s expectations</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher’s classroom management</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Study 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online attitudes</td>
<td>3</td>
<td>.86</td>
<td>.85</td>
<td>.85</td>
<td>.85</td>
</tr>
<tr>
<td>School culture</td>
<td>2</td>
<td>.72</td>
<td>.66</td>
<td>.71</td>
<td>.68</td>
</tr>
<tr>
<td>Online culture</td>
<td>3</td>
<td>.72</td>
<td>.70</td>
<td>.74</td>
<td>.71</td>
</tr>
<tr>
<td>School characteristics</td>
<td>3</td>
<td>.73</td>
<td>.84</td>
<td>.82</td>
<td>.81</td>
</tr>
<tr>
<td>Digital agency</td>
<td>4</td>
<td>.67</td>
<td>.70</td>
<td>.71</td>
<td>.70</td>
</tr>
</tbody>
</table>

Finally, the reliability of the questionnaire depends on its length, characteristics of the participants and the nature of the variables measured. A potential threat to my questionnaire’s reliability was its length. The questionnaire contained 130 items and the students used approximately 45 minutes to complete the survey (see Appendix 4). The overall L21-project used the instrument to collect data for several work packages and not just for my PhD project. Consequently, it contained many items unrelated to my research agenda. In an effort to try to counterbalance the negative effect, I explicitly informed the students in writing on page 1 of the questionnaire. In addition, I instructed the country-coordinators to tell the gateway teachers to inform the students and then stay in the classroom with the students while they filled out the questionnaire. In addition, the fact that the students were between 15 and 18 years old and attended general studies secondary education made me hopeful that most would have the patience required to complete the questionnaire. Moreover, I piloted the statements they were required to respond to, checking for user-friendliness and comprehensibility, thus securing that the questionnaire’s level of difficulty was within reach of most students. Furthermore, the high number of respondents (N=3,400) and thus great heterogeneity of the group increased the reliability of the instrument despite its length. Overall, the benefits of collecting survey data across three countries to cover several research needs were considered more important than the potential reliability threat posed by the questionnaire’s length. However, the experience of punching the answers of 3,400 students to 127 statements (431,800 individual answers) was not a pleasant one, which increased the potential of inaccuracy in punching.

Since the third study is based on qualitative interview data, reliability refers to the degree of fit between what researchers record as data and what is going on in the pertinent research setting. That is, reliability is about accuracy and comprehensiveness of scope (Bogdan & Biklen, 1992 referred to in Cohen, 2017, p. 270). Based on an understanding of reliability as the fit between data and the natural setting, it encompasses comprehensiveness and detail, authenticity and fidelity to real life, context- and situation-specificity and meaningfulness to participants (Cohen et al., 2017, p. 271).

In practice, to optimise the fit between data and the natural setting I had to acknowledge and attenuate the impact on reliability from the inherently situated nature of the interview interaction involving pre-established
structures of meaning, power and norms (see, e.g., Giddens, 1979, pp. 92–93). First, to explore how young people perceive off-task use of ET requires an openness regarding the categories used to define response alternatives, that is, students’ own categories are important findings in and of themselves (Kallio & Häkli, 2013) as they are important meaning-making tools. Therefore, I decided to conduct five semi-structured focus groups with four pairs of students and one group of three. Furthermore, in advance of each focus group the students were provided with the opportunity to give me input via mail regarding topics they wanted to talk about regarding the use of ET in class, but they did not receive the interview guide. This way the students were prepared for the focus groups the following day, but not confronted with the conceptual framework implicit in the interview guide.

Second, I made sure that the students in each group were friends to avoid the social dynamics in the groups hindering free exchange of views and perspectives. Moreover, I wanted to lessen the impact of the inherent asymmetry of power between the researcher and the students by creating an informal atmosphere in the room by offering them fruit and something to drink and talking informally about everyday issues. Third, I guaranteed their anonymity and emphasised that there were no right or wrong answers, that is, they were not to adhere to established norms and did not have to worry about any normative sanctions. Furthermore, to make the students relax and not feel that they had to perform, I started the formal interview with an open, ice-breaker question about pros and cons with having access to ET in class and at school.

Overall, I chose focus groups to enable interaction among the interviewees (Creswell & Poth, 2018) and to facilitate students’ drawing on each other’s responses and providing me with a broad understanding of their experiences and perceptions of ET use in class (Vaughn et al., 1996). The semi-structured group conversations accommodated both individual and collective points of view, indicating both possible patterns and noticeable exceptions about the themes in the interview guide, which included (a) school-net-conflict, (b) actualisation of off-task use of ET in class (see Interview Guide in Table 7 below). Thus, my role was to facilitate interaction between individual perspectives that emerged during the discussion. The semi-structured interview guide (Kvale & Brinnmann, 2015) consisted primarily of topics related to the students’ experiences with and understanding of a ‘school-net-conflict’ and the dynamics involved in the actualisation of off-task use of ET in class. The interview guide provided a general direction to the conversation, while opening up for elaboration and follow-up questions adapted to each group and to individual students. Generally, the students participated actively in the conversation, but sometimes they provided brief answers instead of contributing to the discussion. I was able to invite students to provide examples, reflect on inconsistencies and explicate their statements through the follow-up questions and thus hopefully diminishing the dominance of potential opinion-leaders in the focus groups. In short, the strengths of my use of focus groups include open-ended questions, a flexible interview guide and opportunities for students to build on each other’s answers, while weaknesses include a restriction to self-reported data, group dynamics that might influence responses, groups interacting differently and limited insight into individual reasoning.
<table>
<thead>
<tr>
<th>Question/theme</th>
<th>Analytical focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Icebreaker: Existing ET use in class</td>
<td>ET use in class’. General experiences and insights. New perspectives?</td>
</tr>
<tr>
<td>Academic consequences</td>
<td>'School-net-conflict'. General experiences and perceptions. New perspectives?</td>
</tr>
<tr>
<td>Example of distraction from observation (same day or day before) as starting point. Move on to other instances of off-tasking</td>
<td>Actualisation of off-tasking in context. The influence of ET, individual characteristics and interaction with peers, teachers and school subjects. New perspectives? Perceptions: Dominant frames of interpretation?</td>
</tr>
<tr>
<td>Cool-off: Ideal ET use in class?</td>
<td>'Ideal state of ET use in class’. Recommendations as translation of experiences and perceptions. New insights?</td>
</tr>
</tbody>
</table>

Lincoln and Guba (1985, pp. 108–109) prefer the term dependability to reliability in qualitative research. A measure to increase dependability is conducting member checks or so-called respondent validation. In the qualitative study, I carried out member checks with two of the original students both six months and two years after the focus groups to increase dependability. I experienced that the selected students in both cases verified my interpretations, but that the second member check was more like a new focus group. While my interpretations of the original focus group were confirmed, the students were more interested in the changes that had occurred in the interim regarding the scope, nature and reasons for their problematic off-task practices. This was a missed opportunity in that I did not anticipate and prepare for another focus group. It also demonstrated that I should be cautious in placing too much emphasis on their confirmation, since the member checks included a new social situation with new constellations of relationships and reliability threats related to the original focus group. Relatedly, Hammersley and Atkinson (1983) warned that students are not in a privileged position to act as the only commentators on their action (referred to in Cohen et al., 2017, p. 271).

According to Kleven (1995), qualitative researchers can address reliability by posing three broad questions. Would the same observations and interpretations have been made if observations had been conducted at different times? Would the same observations and interpretations have been made if other observations had been conducted at the time? Would another observer, working in the same theoretical framework, have made the same observations and interpretations? I will comment on all three below in relation to the conduct of the qualitative study 3.

First, the five focus groups were all conducted within one week of the preliminary observations made by gateway teachers. The timing was purposive since I used recorded observations in the observation forms of off-task practices by the participants as ‘anchors’ and ‘prompts’ in the focus groups. That is, the observations helped focus the conversation (‘anchor’), but also stimulate students’ thinking and talking (‘prompts’). The use of the preliminary observations was a positive experience since the conversation quickly turned to specific situations and instances and the processes involved in these concrete instances of off-task use of ET. Still, would the same observations and interpretations have been made if conducted at another time? In terms of the details of the conversation, examples, illustrative examples, etc., the same observations would not have been made for the simple reason that the preliminary observations would not have been the same. However,
the general issues that the examples and illustrations were about and my interpretations would arguably have been consistent as indicated by the member checks. The original intention was to focus on processes at the micro-level, for example, the scope and influence of online access, the role of individual characteristics, the role of peers, teachers and school subjects and using ‘triggers’ and ‘enabling conditions’ as principles guiding the conversation (cp. interview guide). However, the conversations covered a broader area of influences than I had anticipated, moving beyond the micro-level and touching on elements such as the grade- and test-based institutional incentive regime and the influence of past experiences at lower secondary school and visions and plans for their future. During the focus groups, I also tried to conduct mini-member checks by voicing how I understood their statements for confirmation.

Second, would the same observations and interpretations have been made if other observations had been conducted at the time? Each focus group lasted between 30 and 45 minutes and we conducted five such focus groups. It is possible that if we had asked additional questions or probed for elaboration new information would have surfaced, potentially influencing the interpretations made. However, I experienced that the number of new perspectives and amount of reasoning decreased from one focus group to the next as the field gradually became satiated. Still, five focus groups were perhaps too many to dismiss the possibility of fresh, new insights emanating from conducting additional interviews.

Third, would another observer, working in the same theoretical framework, have made the same observations and interpretations? To address this reliability issue, a fellow researcher was always in the room with me during the focus groups. Both of us took and compared field notes, as well as discussed in depth the contributions of each focus group in relation to the theoretical framework and overall research agenda. In terms of data analyses, I worked closely with two colleagues in the thematic and theoretical coding of the data, allowing for reflexivity by repeatedly discussing, comparing and contrasting our interpretation of the data in relation to the theoretical framework. Despite our cooperation, our interpretations did not always align and in such instances my view prevailed. I did not formally measure inter-rater reliability and this is a potential limitation of the study.

4.4.2 Validity

It is common to consider a piece of research as valid if the warrants that support it are well founded and thus make the research conclusions and explanations defensible in the face of alternative conclusions and explanations. That is, validity refers to the extent to which interpretations of data are warranted by the theories and evidence used (Cohen et al., 2017). Hence, researchers are required to be transparent about the theoretical frames and the evidence that they use to connect data with the conclusions they draw from the data. Alternative definitions regard validity as a demonstration that an account precisely represents the features that it is intended to describe, explain or theorise (Winter, 2000, 1 cited in Cohen et al., 2017, p. 245).

This section discusses the issue of validity in my PhD project. I suggest that the term validity is applicable to quantitative, qualitative and mixed methods research, but how I apply validity to different types of research varies. Thus, the meaning of validity differs between the approaches. I intend to indicate these differences and demonstrate fidelity to and abide by the required principles of validity for each. Moreover, I intend to show how I minimise the impact of validity threats at each stage.

According to Cohen et al. (2017, p. 252), both qualitative and quantitative methods can address internal and external validity. A broad understanding of internal validity that crosses over the quantitative-qualitative divide entails that research must be able to demonstrate how the explanation of a particular event or set of data is
sustained by the data and theoretical framing (Shadish et al., 2002, p. 37). Both quantitative and qualitative research adhere to the ideal of the **accuracy** and **correctness** required to produce this type of research. 

**External validity** concerns the extent to which results can be generalised beyond the sample, case, setting, time or situation, that is, it refers to the **transferability** of findings. Even though quantitative and qualitative research tend to approach the issue of generalisability differently, both positions must attend to and show how they handle the issue of external validity. In the rest of this section, I address possible internal and external validity threats concerning the quantitative studies 1 and 2 (Phase 1) and the qualitative study 3 (Phase 2) respectively. I explain how I went about minimising the impact of these threats and end by explicating how I approached validity issues related to the use of multiple methods-design in a mixed methods methodology based on critical realist assumptions.

Phase 1 consists of two quantitative cross-sectional studies that draw on data collected using a questionnaire (see reliability above) administered to 3,400 Norwegian, Swedish and Finnish secondary school students and that use Structural Equation Modelling as the mode of analysis. I will consider construct, internal, external and overall validity for the two studies together because the validity threats are similar in both studies and this extended abstract is already overextended.

4.4.2.1 **Construct validity**: The question of construct validity concerns the extent to which we have reason to believe that the indicators adequately represent the theoretical construct, that is, the inference ‘from what we have seen to what we call what we have seen’. Construct validity is also defined as the degree of correspondence between the construct as it is defined (theoretically) and the construct as it has been operationalised (measured). The term ‘operational definition’ specifies how to measure a concept and the measure is a sample of the possible indicators of the construct (see, e.g., Kleven, 2008; Shadish et al., 2002).

The SEMs used for analysis in the two studies consists of several constructs (seven constructs in study 1 and six in study 2, see Chapter 4.4.1 above). SEMs with this many constructs are very difficult to make with acceptable fit indices and pass several other statistical requirements for rigor. One way to adjust models to accommodate these requirements is to reduce the number of variables of which a construct consists, while retaining acceptable alpha coefficients (between $\alpha = .62$ and $\alpha = .87$ in study 1 and $\alpha = .68$ and $\alpha = .85$ in study 2). The models thereby adhere to the strictures of rigor while facing threats to construct validity. However, this is a case of a trade-off in that I could not get both optimum fit indices and measures of rigor and at the same time constructs with no construct underrepresentation and no construct-irrelevant variation in relation to the underlying theory. Thus, the internationally validated scales from which indicants are drawn contain many more indicator variables to minimise construct underrepresentation and construct irrelevance. In these studies, the use of as few as two indicants might pose a threat to construct validity even though the alpha scores are satisfactory due to the possibility of a high degree of construct underrepresentation.

In addition, some of the constructs draw on scales developed by the project when no internationally validated scales were suitable. Some of the indicants do not fully represent the constructs they are supposed to represent, thus increasing threats to construct validity. A further empirical assessment of whether the measured construct behaves as I would expect the theoretical construct to behave (criterion-related validation), could have shed further light on whether to keep or reject these indicants as an operationalisation of the constructs in question. However, by using the constructs in the SEMs, the measured constructs, for example, ‘teacher expectation’, behave in a way that is consistent with our expectations of the theoretical construct, thus increasing the trust in the construct validity. Still, given the possible threats to validity, further validation of these scales is required.
4.4.2.2 Internal validity: Internal validity concerns the inference from observed covariation to the interpretation that something is an effect of another thing. A typical example would be the validity of an inference about whether observed covariation between treatment and the presumed outcome reflects a causal relationship from treatment to outcome. In practice, by claiming internal validity we judge the extent to which ‘relevant evidence supports that inference as being true or correct. Usually, that evidence comes from both empirical findings and the consistency of these findings with other sources of knowledge, including past findings and theories’ (Shadish et al., 2002, p. 34). John Stuart Mill’s conception of the cause-effect relationship (drawing on David Hume’s regularity account of causation) is often used as a framework of reference for establishing internal validity in quantitative research. He claims that causal inference depends on three factors (Shadish et al., 2002, p. 6): (1) the cause must precede the effect in time, (2) the cause and effect have to be related and (3) other plausible explanations of the cause-effect relationship must be ruled out. It follows that threats to internal validity based on this understanding of the cause-effect relationship concerns the warrants used for inferring sequence, inferring relationship and inferring the elimination of plausible alternatives. A true experiment is therefore a research design that meets the following three demands. (1) All experimental studies manipulate the treatment to force it to occur before the effect, (2) experiments can establish whether the cause covaries with the effect and (3) experiments with randomised assignment ‘make a lot of alternative explanations implausible by ensuring that they are randomly distributed over the experimental conditions’ (Shadish et al., 2002, p. 6). However, correlational designs cannot draw on all these advantages, that is, it is often debatable whether the proposed cause preceded the alleged effect and whether alternative plausible explanations of the identified relationship are untenable.

For the quantitative studies in Phase 1, I collected questionnaire data and articulated causal hypotheses in the form of structural equation models. I set out to explore the extent to which the independent variables can ‘explain’ the dependent variables (students’ regulatory strength and agency in informal online learning). To satisfy Mill’s first demand (temporality), I would need to present a compelling case for why the independent variables precede the dependent variable in time. I chose to be very cautious, stating that the hypothesised causal relationships can go either way. Similarly, I avoid using causal language, sticking instead to correlational language. However, I sometimes chose to use causal language to indicate what might be at stake, but then add that this is given that the theoretical associations embedded in the structural model are indeed valid. In relation to the problem of establishing temporality in a cross-sectional study, I theoretically assume that teachers’ influence precedes students’ responses (for example, regulatory strength in Article 1) based on previous research. Still, I caution that the causal processes can go in either direction.

In terms of Mill’s second demand (relation), I present path coefficients that suggest that the independent and dependent variables are related. However, I do not elaborate sufficiently Mill’s third demand to rule out alternative plausible explanations for the identified associations. I therefore miss an opportunity to minimise further threats of internal validity. Instead of seriously discussing and dismissing plausible alternatives on a rational basis, in Article 1 I state on a general basis ‘omitted variables that may have influenced the overall model or variables that are not included in the model could be important’.

4.4.2.3 External validity: In terms of external validity, Phase 1 presents findings relevant for the sample of 3,400 students who answered the questionnaire, but at times, these are generalised to apply to ‘Nordic secondary school students’. First, the sample is not Nordic as such, but consists of students from Norway, Sweden and Finland. However, the main problem is the use of a convenience sample. I cannot statistically infer that random and systematic errors are equally distributed in the convenience sample as in the population of all secondary students in Norway, Sweden and Finland. It follows that the sample might or might not be
A randomised sample from a well-defined population of secondary students would statistically have ensured representability and would therefore reduce the threat to external validity. In my case, to generalise the findings from sample to population is statistically untenable. To counter the weakness of a convenience sample, I increased the number of participating students and schools and secured a diversification of geographical locations in the three countries. The resulting scope and heterogeneity of the sample (3,400 secondary students from 60 different schools from different parts of the countries) are factors to include in a substantial assessment of external validity. It is possible to argue substantially that there is no reason why the sample is not largely representative, given the efforts made to minimise external validity threats. Still, any reference to ‘Nordic secondary students’ must include an explicit statement of the caveats discussed above.

4.4.2.4 Descriptive, interpretive and theoretical validity from a critical realist point of view: From a critical realist perspective, validity concerns the nature of the accounts, conclusions or inferences drawn from data. That is, critical realists understand validity primarily as a property of accounts. Maxwell (2012) argues that accounts in qualitative research are mainly concerned with three broad categories of understanding and three corresponding kinds of validity: (1) descriptive validity, (2) interpretive validity and (3) theoretical validity. Maxwell sees the issue of generalisability (referred to as ‘external validity’ in the previous section) as a separate issue from validity proper for qualitative research. Still, in the account of a CR-inspired framework for validity presented below, (4) generalisability is included as a fourth dimension.

Descriptive validity denotes the concern of most qualitative researchers with the factual accuracy of their account, that is, they are not fabricating or distorting the utterances they heard or behaviours they saw. Did the informant really make that statement, or did one mishear, mistranscribe or misremember their words? These matters of descriptive accuracy are crucially important since they form the foundation upon which all the subsequent validity categories are built. The category of descriptive validity refers to ‘acts’ rather than ‘actions’, that is, activities ‘seen as physical and behavioral events, rather than in terms of the meanings that these have for the actor or others involved in the activity’ (Maxwell, 2012, p. 135). There are two main characteristics linked to descriptive concerns. First, they all refer to specific events and situations, that is, the issue of generalisability or representativeness is not involved. Second, disagreements about descriptive accuracy can in principle be resolved by access to appropriate data, for example, an audio recording to determine if a person made a particular statement during an interview. In other words, the participants are not in disagreement about the meaning and appropriateness of the terms used to describe events and actions. They only disagree about the accuracy of the application of the term. If one of the participants in the discussion challenges the applicability of the term used (for example, challenge the use of ‘throwing’ in what the student did with the eraser), this would change the type of validity at stake from descriptive to theoretical (construct validity). ‘Descriptive understanding pertains, by definition, to matters for which we have a framework for resolving (…) disagreements’ (Maxwell, 2012, pp. 136–137). Thus, descriptive validity concerns the factual accuracy of a researcher’s account of what happened in the context of data collection (Johnson &
Christensen, 2017). To ensure the accuracy of my account of the interviews conducted in Phase 2, I audio-recorded each focus group and had a professional company transcribe the interviews verbatim. Moreover, to limit threats to descriptive validity I double-checked the transcripts by listening through the interviews while reading the transcribed texts and correcting any inaccuracies in the process. Illustrative excerpts from the transcriptions are included in Article 3 to provide readers with the opportunity to assess the quality of my inferences.

Interpretive validity concerns the quality of the account of ‘participants’ perspectives’. In other words, interpretive validity refers to the nature of the account that describes what objects, events and practices mean to the people themselves (also referred to as ‘emic’ validity). The aim is thus to comprehend phenomena based on the perspectives and categories of participants in the situation studied (‘emic’ perspective), not based on the researcher’s perspectives and categories (‘etic’ perspective) (Maxwell, 2012, p. 138). It follows that accounts of participants’ perspectives tend to use terms derived from the participants’ own language and are ‘experience-near’. Maxwell (2012, 139) comments that ‘[i]t is (…) generally accepted by social theorists that any valid account or explanation of a social phenomenon must respect the perspectives of the actors in that situation, although it need not be centred on that perspective’. I took three steps to limit threats to the interpretive validity of my study. First, I always had a fellow researcher with me while conducting the focus groups. I thereby used the opportunity to discuss participants’ perspectives and interpretations with a peer after the interviews. Secondly, if the participants used a concept or provided an explanation during the interview that I did not fully understand or found ambiguous, I either asked for elaboration or briefly provided my understanding and asked for confirmation. Thus, I tried to limit the chances that I did not get access to their perspectives. Third, I also sought participant confirmation of my accounts of their perspectives in the two stages of member-checking six months and two years after the focus groups.

Theoretical validity refers to an account’s validity as a theory of some phenomenon. It means that the researcher labels for example, a student throwing an eraser at the teacher—in which descriptive validity is at stake—as an act of resistance, in which theoretical validity is at stake. In other words, the researcher applies the theoretical construct ‘resistance’ to the descriptive and interpretive understanding of the action, that is, this aspect concerns construct validity (‘the validity of the concepts themselves as they are applied to the phenomena’ (Maxwell, 2012, p. 140)). The connection between this act of ‘resistance’ and other factors such as the teacher or the school constitutes a claim of theoretical relationship, that is, this aspect concerns internal validity (‘the validity of the postulated relationships among the concepts’). According to Maxwell (2012, pp. 140–141), what counts as theoretical validity depends on ‘whether there is consensus, within the community concerned with the research, about the terms used to characterize the phenomena’. Thus, theoretical validity regards issues that do not go away with agreement on the facts of the situation (descriptive and interpretive validity), that is, what is at stake is ‘the legitimacy of the application of a given concept or theory to established facts’ (Maxwell, 2012, p. 141). In practice, theoretical validity explicitly addresses the theoretical constructions that the researcher brings to or develops during the study (Maxwell, 2012, pp. 139–140).

The theoretical constructions I brought to Phase 2 include the analytical concepts used for thematic and theoretical coding during the data analyses. The thematic coding was data-driven and thus ‘experience-near’ in the sense that I used participants’ own interpretations and concepts as the basis for the thematic codes and thus sought to reduce threats to interpretive validity (see above). Still, theoretical constructs and theoretical assumptions were present even at this stage of the data analysis process. ‘Triggers’ and ‘enabling conditions’ were used to identify pertinent utterances and to categorise the different thematic codes. I listed some codes under ‘triggers’ and some under ‘enabling conditions’. I adapted these terms from the critical realist
understanding of causality as mechanism (triggers) + context (enabling conditions) = outcome (problematic off-task practices). As such, the use of these concepts also constituted a claim of theoretical relationship.

However, since theoretical validity is assessed by the consensus of the research community, threats to theoretical validity were minimised by adhering to and showing fidelity to the principles of the critical realist methodological framework of my thesis. The theoretical coding was theory-driven and I therefore used the typology of agency conceptualisations—not participants’ own concepts—as the basis for the theoretical codes. To minimise threats to the theoretical validity of the account, I had two colleagues conduct both the thematic and theoretical coding in parallel with me (see reliability above). By engaging at all stages of the analytical process in discussions with peers about the applicability of the four types of agency for specific utterances, I hoped to minimise threats to theoretical validity.

4.4.2.5 External validity in single-case studies: As mentioned under reliability above, the qualitative case study in Phase 2 relies on a non-probability, purposive sampling. In fact, since the purposive sampling was based on the sample used in Phase 1, the most fitting term is sequential mixed methods sampling. I used purposive sampling because I needed access to people who had in-depth knowledge about the school-net-conflict and problematic off-task practices by virtue of their experience. ‘There is little benefit in seeking a random sample when most of the random sample may be largely ignorant of particular issues and unable to comment on matters of interest’ (Cohen et al., 2017, p. 219). My concern was to acquire in-depth information from those who were able to give it. The sequential mixed methods sampling made it possible to purposefully identify a sample of students that met the sampling criterion ‘experienced a school-net-conflict’ (Cohen et al., 2017, p. 219). The focus in Phase 2 was to provide an in-depth, rich, emic description of the experiences of the 11 students, that is, they represented primarily themselves. If other groups found that the description of the sample students’ situation applied to them, this type of naturalistic generalisation was a bonus, not a necessity.

However, Yin (2018) comments that external validity can be addressed by careful use of theory in single-case studies enabling replication studies. This kind of analytic generalisability may be possible, that is, ‘where a research strives to generalize from a particular set of findings to some broader or more enduring theory’ (Cohen et al., 2017, p. 284). Based on Yin’s view, Phase 2 might also contribute to the formulation of a broader theory regarding the processes involved in problematic off-task practices, thus claiming some ‘analytic generalisability’. External validity must also take into consideration the likelihood of comparability and transferability of the case to other contexts. To accommodate for comparability and translatability (Cohen et al., 2017, p. 255), I tried to provide a clear, detailed and in-depth description making it possible for others to judge the extent to which my findings are generalisable to their situation. These kinds of non-statisitical generalisations are inherently based on judgments and rational arguments. Thus, the generalisation over time is primarily a question regarding temporal proximity and what important changes may have occurred in the meantime. Similarly, generalisations over situations and over groups and persons rely primarily on similarities and differences between situations and persons studied and the situations and persons we draw our inferences about (Kleven, 2008). Since a generalisation is based on rational arguments, it is important to keep in mind Cronbach’s advice: (1) at first consider results (knowledge claims) to be context-bound, (2) consider generalisations as work hypotheses rather than conclusions, (3) study the same phenomenon in other contexts and compare the results and (4) pay attention to exceptions as well as to cases confirming the pattern, since exceptions may indicate context-specific conditions (Cronbach, 1975, referred to in Kleven 2008).

4.4.2.6 Validity in mixed research: An important principle in MMR is that the combination of quantitative and
Qualitative methods, approaches and concepts have complementary strengths and non-overlapping weaknesses (Onwuegbuzie & Johnson, 2006, p. 48). Thus, weakness minimisation is a central validity type in MMR (Johnson & Christensen, 2017). Arguably, Phase 1 and Phase 2 have few overlapping weaknesses. I maintain that the quality of the design reduces the probability that the integration of quantitative and qualitative components yields additive validity threats and thus is a measure to minimise weaknesses. Keeping each study relatively separate (multiple methods design) and using a sequential, multiphase approach accommodates that Phase 1 informs Phase 2, helping to address several of the five empirically derived, general purposes of mixed-methodological research studies of Greene et al. (1989). First, the design opens to triangulation in the sense that I seek convergence and corroboration of findings from Phase 1 and Phase 2 that study the related phenomena. Next, I address the issue of complementarity by letting each phase elaborate on the other, thus providing illustrations, enhancement and clarification of findings from one method with the results from the other. However, my design does not satisfy Greene's purpose of development, that is, using the findings from one method to help inform the other method. As for the purpose of initiation, the findings from Phase 1 uncovered contradictions and paradoxes related to the relationship between school and informal online culture that re-framed the research in Phase 2 (see reliability above). Finally, I would argue the design meets the purpose of expansion in that the design expands the breadth and range of inquiry by using a quantitative cross-sectional study for one inquiry component and a qualitative case study for another, thus adjusting the methods to the type of inquiry I wanted to carry out. Furthermore, the study complied with two of Collins, Onwuegbuzie and Sutton’s (2006) four rationales for mixing approaches, that is, participant enrichment, instrument fidelity, treatment integrity and significance enhancement. First, as mentioned above, I based the purposive sample in Phase 2 on the sample in Phase 1 and thus the MM design helped optimise the sample and provide participant enrichment. Second, instrument fidelity and fidelity of intervention were not pertinent rationales nor results of my design. Finally, I maintain that my MM design contributed to significance enhancement by providing thickness and richness of data and augmenting interpretation and usefulness of the results.

4.5 Ethical considerations

The first two studies presented in Articles 1 and 2 are based on the answers of 3,400 secondary school students in a comprehensive questionnaire concerning various aspects of digital practices in and out of school. All participants were informed about the project and that they could withdraw at any time. All students present at the time of the administering of the questionnaire chose to participate. The respondents gave their informed voluntary consent before filling out a paper-based questionnaire (see Appendix 2). It was not pertinent to the research agenda to identify respondents. Therefore, all completed questionnaires were anonymous. Similarly, the data analyses concern identifying patterns of associations between variables and constructs on an aggregate level and the data is not de-aggregated to the level of class or individual. The anonymity of the participants is therefore well preserved as confirmed by the approval of the Norwegian Social Science Data Services (NSD) (see Appendix 1).

The third study presented in Article 3 is based on transcriptions of interview data from five focus groups involving a total of 11 students. The only relevant criterion for inclusion in the study was students' sense of school-net-conflict. Based on the quantitative studies, I could break down data to the level of individual schools, enabling me to compare the mean level of the construct school-net-conflict among the participating schools. The school with the highest mean score was identified and contacted. After receiving the approval from the principal to conduct research (see Appendix 3), I developed a simple questionnaire intended to identify students who experienced a school-net-conflict. A total of 109 students gave their consent and
answered the questionnaire after being informed about the project and the possibility to withdraw at any time (see Appendix 2). Each student used a unique code on their questionnaire to enable their identification. The code key was secured in the school’s safe and it was destroyed as soon as the purposive sample of 11 students was secured. The students voluntarily participated after being informed about the project and that they could decide to withdraw their consent at any time. Furthermore, they were assured that their teachers would not have access to their statements to avoid the students worrying about potential negative consequences so that they felt free to say what they wanted. The focus groups were audio-recorded and the interview data transcribed. The audio files were kept on a separate recording device. They were securely deleted after the transcription was completed. The students were reminded to avoid the use of identifiable names before the interviews were conducted. No names were mentioned in the sound files. It is not possible to identify individuals directly or indirectly based on the data analyses conducted or the reporting of results in Article 3.

All respondents involved in my PhD project were well-informed about the project and their right to withdraw at any time. Moreover, they were informed about the intended use to which the resulting data were put. All participants gave their informed, voluntary consent. The procedures used for data collection and data analyses were conducted in line with the ethical guidelines made by the Norwegian Social Science Data Services (NSD) and the National Committee for Research Ethics in the Social Sciences and the Humanities (NESH). The NSD assessed and approved the data collection procedures that needed approval (see Appendix 1).
5. Presentation of findings

In this chapter I present a summary of each of the three articles including title, aim, method, findings and discussion with theoretical framework and conclusion.

5.1 Summary of the articles

The aim of this thesis has been to gain deeper understanding of students' off-task use of ET in class seen from the perspective of secondary school students in Norway, Sweden and Finland. This overarching aim has been explored through three different studies: two quantitative (etic) and one qualitative (emic) study.

5.1.1 Article 1


As the title suggests, the aim of this article has been to empirically explore pertinent antecedents of secondary school students' regulatory strength using Structural Equation Modelling (see Chapter 4). Regulatory strength is thus the dependent factor in the model. The antecedents include three teaching-related factors (teachers' expectations; teachers' explanatory skills; teachers' classroom management), two factors related to students' motivation (students' appreciation for school; students' experience of school-net-conflict) and one factor related to students' use of the Internet in class (time spent online). The relationships thus included in the theoretical model and subsequently empirically tested were based on pertinent results from previous research. The results were discussed in light of three strands of theory (hyperbolic discounting theory, restrained teaching (Didaktik) and ICT affordances). As accounted for in Chapter 4, survey answers from a convenience sample of 3,400 Nordic secondary school students are the basis for the empirical testing of the theoretical Structural Equation Model. Considering that the model comprises a total of 12 separate hypotheses, only the most salient findings are presented in this extended abstract.

First, students' ability to self-regulate in digitised, connected classrooms seems closely associated with their sense of a school-net-conflict. The large negative path coefficient between the two factors indicates that the stronger the students' sense of a motivational school-net-conflict, the less are they able to exercise self-regulation in technology-rich classrooms. The time students spend online in class does not seem to be directly related to their sense of self-regulatory strength. However, time spent online does show a moderate positive association with school-net-conflict, indicating that the more time students spend online in class, the stronger their sense of motivational conflict. Indirectly, then, time spent online in class is related to students' sense of self-regulatory strength by way of the factor of school-net-conflict. Since the theoretical basis for the model is not strong enough, it is not possible to infer strong causal conclusions from these results (see Chapter 4). If the identified relationships are indeed causal, however, they indicate that the way students are allowed to spend time online in these classrooms contributes to their sense of school-net-conflict, which in turn is severely undermining their self-regulatory strength.

Second, students' ability to self-regulate shows a moderate positive association with their appreciation of schooling. The moderately large path coefficient between the two factors suggests that the more students appreciate schooling, the better are they able to exercise self-regulation in technology-rich classrooms. The three teaching-related antecedents—teachers' expectations, teachers' explanatory skills and teachers' classroom management—show small or no direct associations with self-regulatory strength, that is, expectations, classroom management and explanations vary independently of students' self-regulation. However, the three teaching-related antecedents show moderate to large associations with students' school
appreciation and thereby do seem to have an indirect, positive relationship with students' regulatory strength. Provided that the identified path-coefficients indeed represent causal relationships, the results indicate that students' appreciation of schooling is conducive to their ability to exercise self-regulation in digitised, online classrooms. Moreover, it seems as if improvements in teachers' explanations, expecting more of students and enforcing classroom management, do not improve students' self-regulatory ability directly. The results suggest that these influences are dependent on school appreciation for contributing overall to self-regulatory strength, that is, increased efforts to manage classrooms, provide quality explanations and expect more of students might well have overall negative effects on self-regulation among students who do not appreciate school in the first place.

Third, given the validity of causal assumptions, the overall model provides empirical evidence that the cumulative positive effects of teachers' explanatory skills, their efforts to regulate students' classroom behaviour and their expecting the very best of the students are undermined by students' sense of being trapped between two worlds—one with digital distractions and one with real world demands; one dominated by instant gratification and one requiring its delay. At the very least, the results imply that providing good teaching with self-regulation effects in instructional environments with open net-access is challenging and hinges on students' appreciation of schooling.

In the study I argue that students are faced with software professionally designed to capture and maintain as much of students' attention as possible (see Chapter 3 on persuasive design). Thus, the combination of open Internet access and high student autonomy in upper secondary schools puts a premium on the successful exercise of regulatory strength, but has made it increasingly difficult to do even in the presence of good teaching. In line with hyperbolic discounting theory, the reward of instant gratification overshadows the long-term reward of academic success. Furthermore, while one might argue that it is the individual's responsibility to pay attention and to keep focus, recent research indicates that the degradation of focus is not merely individual, but social (Sana et al., 2013). This means that the exercise of regulatory strength is adversely affected even if the student is just in direct view of the screen of a distracted peer. There is also a concern that it becomes gradually more acceptable to succumb to instant gratification and that educationally meaningful tasks that are not instantly intrinsically motivating are not carried out with the required investment of mental effort to develop important higher-order thinking skills and depth-oriented knowledge (Salomon, 1983). In fact, the empirical findings in study 1 might indicate that the current provision of Internet access in classrooms is detrimental to the fulfilment of students' academic ambitions and, possibly in the long run, detrimental to students' sense of personal agency stemming from mastery experiences of overcoming obstacles by sustained effort in a school setting.

5.1.2 Article 2

As the title suggests, the aim of this article has been to empirically explore pertinent antecedents of young people's beliefs about agency in informal online learning using SEM to analyse survey answers from a sample of 3,400 Nordic youth aged 15–18 (see Chapter 4). Agency in online learning is thus the dependent factor in the model. The antecedents include two student preferences regarding their learning (net-induced self-determination of learning aims, content and processes, i.e., 'online culture', or institutionalised schooling as they currently experience it, i.e., 'school culture'), one factor related to students' use of the Internet in class (time spent online), one factor related to students' associations of schooling (school associations) and one factor related to good attitudes (attitudes). The relationships thus included in the theoretical model and
subsequently empirically tested were based on pertinent results from previous research. The results were discussed in light of learning ecology theory (see Chapter 3). Considering that the model comprises a total of 14 separate hypotheses, only the most salient findings are presented in this extended abstract.

First, students’ agency in online learning is closely associated with the student preference for ‘online culture’. The moderate to large positive path-coefficient between the two factors suggests that the more students’ prefer ‘online culture’, the stronger their sense of agency in informal online learning. The time students spend online in class is also positively related to ‘digital agency’, with a moderate direct association and small indirect association via online culture. The results indicate that the more time students spend online in class, the stronger sense of digital agency and the more students prefer ‘online culture’. As was the case with Article 1 outlined above, the theoretical basis for the model is not strong enough to infer strong causal conclusions based on these results (see Chapter 4). However, if the identified relationships are indeed causal, they indicate that ‘online culture’ contributes to a large extent to the development of digital agency, while time spent online in class influences students’ digital agency only to a moderate extent.

Second, students’ agency in informal online learning also seems to be quite closely related to the student preference ‘school culture’. School culture also seems to be indirectly associated with digital agency via school associations. There is a large positive path-coefficient between school culture and school associations, which in turn is positively related to digital agency to a moderate extent. The results indicate that the more students appreciate schooling and have positive school associations, the stronger their sense of digital agency. If these path-coefficients were indeed expressions of causal relationships, it seems as if schooling, perhaps contrary to expectations, contributes to a moderate extent to the fostering of students’ agency in informal online learning.

Third, the results show a large negative association between online culture and school culture and a moderate negative association between time spent online in class and school culture. In other words, the more students’ prefer online culture or spending time online in class, the less they appreciate institutionalised schooling. Thus, online culture and school culture are strongly antagonistically related, despite the fact that both seem to be positively related to digital agency. Similarly, the results indicate that time spent online in class is also antagonistically related to school culture, yet to a lesser extent. In fact, ‘time spent online in class’, despite taking place in a school setting within institutional frames and preferably for educational purposes, seems to have more in common with the values and norms linked to online culture than with school culture and might thus point in the direction of a motivational conflict that derives not only from the presence of alluring micro-level action alternatives, but from more substantial differences, for example, related to the distribution of power between teachers and students.

Forth, given the validity of causal assumptions, the overall model provides empirical indications that both online culture and school culture contribute substantially to students’ agency in informal online learning. Still, their internal relationship is strongly antagonistic, indicating the existence of a wide gap between the two (see for example, Buckingham, 2007). It is also noteworthy that the factor of time spent online seems to be closer to online culture than school culture, despite taking place within the institutional frames of school.

The seemingly paradoxical finding that both online and school culture are significant contributors to students’ digital agency is explained in the article by reference to previous research conducted by Van Deursen et al. (2011) where they demonstrate that digital agency consists of two analytically and empirically separate skill sets: medium-related Internet skills and content-related Internet skills. Based on their discovery, I argue in Article 2 that online culture contributes to the development of technical medium-related Internet skills, while school culture fosters strategic Internet use, that is, content-related Internet-skills. This helps to explain why the two preference constructions are both antagonistically related internally and significant contributors to the
development of agency in online learning. The finding that time spent online is negatively related to school culture suggests that while provision of Internet access can be a central and constructive element within the classroom’s infrastructure for learning (Ott et al., 2018), it can also represent a competing set of discourses about learning (see for example, Loveless & Williamson, 2013). If this is the case, schools’ efforts to capitalise on young people’s digital proficiencies and thus vitalise formal schooling through open access in class might have the opposite effect.

5.1.3 Article 3

As the title suggests, the aim of this article has been to explore in depth how a purposive sample of 11 Norwegian upper secondary school students explains the reasons for their off-task use of ET in class using a typology of agency as theoretical framework. The students were carefully selected as suitable informants based on findings from the quantitative study presented in Article 1 in that they report to have experienced a conflict between their school aims and ambitions and their Internet activities and habits (school-net-conflict). In this qualitative case study, interview-generated data (5 x 45 minutes) were analysed using content- and theoretical coding in HyperRESEARCH. The central question was what kind of conceptualisation of agency the students mobilise in order to explain why they engage in problematic off-task practices in class.

First, the students provided nuanced and rich descriptions of the processes involved in the transition from on-task to off-task use of ET in class. Their descriptions linked enabling contextual frames such as the ubiquitous availability of online devices and teachers who do not hold students accountable for breaches of school regulations with sudden trigger events such as receiving a message or watching a nearby peer going off-task. The enabling contextual frames presented by the students encompassed individual tendencies, availability of digital distractions, *de facto* norms among peers in class, teacher and school subject characteristics, pedagogical approaches, institutional grade-centred incentive regimes operationalised through tests and a time orientation characterised by ‘slack’. These conditions enabled a number of triggers according to the students: for example, an instant need to check what was going on in social media, receiving a text, watching a nearby peer go off-task, sudden loss of perceived task-value (too boring, too easy or too difficult) and perceived break entitlement. These contextual frames and instant triggers were intrinsically linked to each other.

Second, the theoretical framework consisted of a typology of four different conceptualisations of agency: sovereign, relational, ecological and new material. The four were used analytically to capture respectively: agency as a characteristic of the individual, agency as a characteristic of relations between people, agency as a practical-evaluative capacity drawing from past experiences and plans for the future and agency as the constantly changing constellation of relationships between things and humans. The findings indicated that the students mobilised primarily sovereign conceptions of agency as responsible for the agency-failure involved in their problematic off-task use of ET, that is, the dominant frame mobilised by all 11 students revolved around the issue of an individual, innate, trait-level lack of self-control. Relational, ecological and new material aspects were only indirectly responsible, by way of how they influenced their innate self-regulatory weakness.

Third, there were two notable exceptions to the main pattern. First, five of the students referred to the institutionalised grade-centred, test-based incentive regime as a primary reason for off-task practices, that is, off-task practices as an ecological agency-failure. The reason was that effort investment in class was a waste of time since the students knew that the final grade was based almost exclusively on the results on a handful
of tests. This turned off-task use of ET in class into a rational alternative to effortful school work. Second, a majority of the students referred to the way the online activities themselves were a prime reason for off-task practices, that is, off-task practices as a new material agency failure. The reason was that the available activities online seemed to exert an independent ‘pull’ causing pre-reflective, habitual off-task practices among students in class.

Drawing on Bernstein (2000), I argued in Article 3 that students’ discursive repertoire is limited by the culturally available reservoir expressed in, for example, policy formulations by the OECD and in national curricula. Previous research (see Biesta, 2011 in Chapter 2) suggests that there has been a movement towards a learnification of the educational endeavor even in the Nordic countries. According to Biesta, learnification is essentially an individualising language promoting a vision of a learner identity (Loveless & Williamson, 2013) as a self-responsibilised, lifelong learner exercising agency in, not through or with, the surrounding social, temporal or material contexts. However, in terms of problematic off-task use of ET tightly linked to in-situ debilitating conditions and triggers, the individualising language has policy and individual repercussions. In terms of policy, by individualising the problem, the solutions are geared at changing the individual by providing self-regulation strategies and meta-cognitive skills, that is, ‘learning to learn’ (see, for example, the Norwegian National Curriculum (LK20)). The efficacy of these measures are supported by a large body of previous research (see for example, Duckworth et al., 2019; Steel, 2007) and are in and of themselves not problematic. However, by disregarding the relational, ecological and new material aspects of the problem, policy is not formulated to address these issues and hence a multipronged, systemic approach is overlooked, that is, individual change takes precedence over alteration of problematic social, relational, temporal and spatial dynamics. For the individual struggling with off-task use of ET that hinders them from achieving their academic aims and ambitions, understanding their problems exclusively in sovereign terms adds insult to injury and their sense of personal worth and identity could be detrimentally affected.
6. Discussion of findings
The current chapter is dedicated to a discussion of findings related to the overarching aim in this thesis, that is, to gain a deeper understanding of students’ off-task use of ET in class. The overarching research question is thus: What factors can account for students’ off-task use of ET in class? I deemed two sets of sub-questions necessary for answering the overarching research question: (1) questions related to pertinent interactions in the classroom that enabled the actualisation of off-task use of ET (for example, who did what, when, why, against what opposition, what compromises and concessions were involved?) and (2) questions related to the structural context of these interactions, that is, the prior structural context conditioning the pertinent interactions (for example, the source of motives and positions, what was wanted and not wanted, strategies adopted, norms and regulations, institutional roles and commitments). While extant research provides excellent accounts of some of these interactions and conditions, there are to the best of my knowledge no previous off-task studies in the field of ETR dedicated to the principled integration of findings based on an analytical distinction between interactions and structural conditioning (see Chapter 6.1).

As mentioned in Chapter 2, the research frames used in this extended abstract include research dedicated to the relationship between in- and out-of-school learning (the subject didactical, the learning ecological and the normative approach) and research on the situated actualisation processes of off-task use of ET in class. The theoretical frame used in this thesis (Chapter 3) is a critical realist version of affordance theory that enables a device-centred understanding of off-task use of ET in class (see Selwin & Aagaard, 2021).

I am aware that the research agenda is overly ambitious, yet I consider the benefits to surpass the drawbacks as there has been a lack of extant research that actively seeks to integrate different strands of studies within encompassing theoretical frameworks (see Chapter 1.2). In addition, it is important that practice-oriented research strikes the right balance between the need for rigour and relevance. Therefore, based on theoretical transparency, my intention has been to systematise my findings in a way that can help students and teachers make informed choices regarding off-task use of ET in connected classrooms and policy makers draft better regulations and enhance the quality of public debates by demonstrating that it is often not possible to single out ‘the responsible’ because compromise and concessions are involved and agents act within emerging structural contexts that inherently enable or constrain actions.

In the first subchapter (6.1), I discuss how the separate findings from the three studies of which this thesis consists contribute to expanding the understanding of off-task use of ET in class based on previous research (Chapter 2) and affordance theory (Chapter 3). The theoretical and methodological choices that I consider foundational for the expansion of knowledge are explicated in respective sub-chapters on theoretical contributions (Chapter 6.2) and methodological contributions (Chapter 6.3). Next, I point out some key limitations in this PhD project (Chapter 6.4) before I end with a presentation of key implications for practice and future research (Chapter 6.5).

6.1 Empirical contributions
In this chapter, I will present seven empirical contributions to the field of ETR and area of off-task use of ET in class (see Chapter 1). I draw on the basic assumption that students’ use of connected technologies out-of-school influences their use of the same technologies (ET) in-school (see, e.g., Selwin & Aagaard, 2021). This means that students’ perception of the range and potency of ET’s action possibilities (‘affordance’, see Chapter 3) is inherently linked to their established strategies of use out of school (cp., Aagaard, 2017, ‘relational strategies’). I argue in the following that students experience ET as a significant risk-factor regarding remaining on-task and fulfilling academic ambitions. Risk-factors increase and mitigating factors decrease the likelihood of off-task use of ET in class. However, it is the perceived potency of the combined risks relative to
the potency of mitigating factors that decides whether an instance of off-task use of ET in class is initiated (‘actualisation’ of affordance). ET is therefore a necessary but an insufficient condition for off-task use of ET in class. This integrative framing of off-task use of ET builds upon and extends extant research that tends to focus on specific mechanisms and factors (see Chapter 2).

The first empirical contribution concerns the common assertion that classroom management, better quality instruction and high expectations are important mitigating factors by discouraging off-task use of ET. However, the quantitative findings in study 1 indicate that the correctness of the assertion hinges on students’ appreciation of formal schooling, that is, any positive influence of these three factors on regulatory strength is mediated by school appreciation. Therefore, it is likely that these instructional factors are only mitigating factors for students who are well-adapted to formal schooling and they might represent a risk-factor for students who are not.

While so-called technological determinists (see Chapter 2) would tend to downplay the role of ET in relation to negative side effects of ET integration in school, my second empirical contribution (study 1) suggests that ET and students’ experience of ‘school-net-conflict’ is thoroughly involved in their ability to exercise self-regulation in class. There is a particularly large negative path-coefficient between school-net-conflict and regulatory strength. By extension, these are highly potent risk-factors that increase the likelihood of off-task use of ET in class, while quality teaching and school appreciation seem to be less potent mitigating factors according to these path-coefficients.

A key reason for introducing online access and connected technologies into classrooms was to reinvigorate formal schooling by capitalising on young people’s ‘funds of knowledge’ and the assumed power of informal learning processes (see for example, the ecological approach to in- and out-of-school learning presented in Chapter 2). However, my third empirical contribution indicates that the relationship between ‘online culture’ and ‘school culture’ is highly antagonistic considering the very large negative path-coefficients identified in study 2. Contrary to expectations, the results indicated that the use of ET in class had more in common with ‘online’ than ‘school’ culture, that is, a preference for individual freedom to choose learning content and processes over institutionalised schooling. Arguably, this finding indicates that ET can be more disruptive to formal schooling than anticipated and thus debilitate rather than rehabilitate. By extension, the affinity between ET use in class and the freedom associated with ‘online culture’ is another indication that ET is potentially a risk factor that increases the likelihood of off-task use of ET in class. Moreover, the negative path-coefficient between ET use and school culture is an indication of the relatively weak potency of ET as a mitigating factor by the way of integrating and utilising ET for educational purposes in class.

While the first three empirical contributions identified certain aggregate regularities in students’ experiences based on an etic approach using SEM in studies 1 and 2, the fourth empirical contribution stems from the emic in-depth study of how students who experience a ‘school-net-conflict’ describe the situated classroom dynamics involved in their own problematic off-task use of ET. As the term ‘school-net-conflict’ indicates, the students share similar ideas regarding what constitutes appropriate action to promote their school ambitions, such as to stay focussed and engage with the academic material, stay attentive in class and plan for timely completion of work. These actions are generally related to positive feelings of goal attainment and self-worth (see, e.g., Parry & le Roux, 2019). The students in this study aimed, but occasionally failed, to achieve a balance between their academic and non-academic goals involving off-task use of ET in (and outside) class. Corroborating and expanding previous research (see Chapter 2), the study identified several risk factors:
1. Connected technologies: ubiquitous ease of access, the same technology for work and pleasure, postponement of work an option, persuasive design linked to identified use patterns

2. Individual level: lack of self-discipline, lack of strategies for self-regulation, habitual behaviour, mood adjustment and fear of missing out (FOMO)

3. Teacher: lack of teacher enforcement of official regulations, ‘kind’ teachers

4. Peers: social norms normalised off-task use of ET in class and peers’ off-task use acted as triggers, soothing the feeling of a bad conscience

5. Tasks: subjective experience of loss of task value (too easy, too difficult, too boring, options available for attending to the task later at home), seek to satisfice rather than optimise by strategic allocation of effort

6. Institutional: the most important tests determine the final grades, making hard work in class futile. Too many subjects in parallel forcing students to prioritise the most important (final) subjects and tests

Conversely, mitigating factors were often the opposite version of the original risk-factor, such as limited access to ET in some classes, strict teachers enforcing the regulations (relatively rare), sufficient self-discipline, peers working on-task, experience of increased task value in terms of performance goals (tests, assignments), personal engagement with the subject matter, the right level of difficulty (not too easy nor too difficult) and limited opportunities for attending to the material later. Overall, the students in study 3 experienced quite frequently that the impulse to initiate off-task use of ET in class was stronger than the impulse to remain on-task despite their best intentions. The findings indicate that it is the subjective experience of potency of the combined risks relative to the potency of the combined mitigating factors that is key to unlocking students’ off-task use of ET in class. Arguably, in instances when the potency of risks outweighs the mitigating factors, all that is needed for off-task use to commence is a trigger event.

The fifth empirical contribution relates to factors that the students experience as triggers of off-task use of ET. As mentioned above, the events that trigger off-tasking only become ‘triggers’ because of a student’s subjective experience of the overall potency of off-task affordance at that particular time and place. By extension, if the experienced potency of the mitigating factors outweighs the risks, it is less likely that ‘triggers’ would make students initiate off-tasking. Seven triggers were identified in study 3: (1) notifications (chat, Facebook, Snapchat etc.); (2) peers going off-task; (3) sudden loss of task value; (4) transitions between activities in class; (5) habitual impulses, (6) fear of missing out (FOMO) and (7) perceived break entitlement.

In addition to findings related to triggers and enabling conditions, the sixth empirical contribution pertains to the discourses these students mobilised to attribute blame for their problematic off-task uses of ET. As mentioned in Chapter 5, the findings indicate a predominantly individualistic understanding about a lack of self-discipline as a relatively stable personality trait. That is, the students are technological instrumentalists (see Chapter 2) in terms of viewing digital distractions as neutral means to alleviate pre-existing psychological tensions. Seen in relation with the previous contributions explicated in this chapter, these discursive characteristics might be indicative of a broader trend towards a so-called ‘learnification’ of the educational endeavour (see Biesta in Chapter 2). This resonates with extant research that mentions a striking lack of simultaneity between teachers’ and students’ work with dominant school literacies in ET-rich classrooms (see Blikstad-Balas, 2012 in Chapter 2) and ET as a ‘great escape’ from the communal circumstances of the classroom to one-to-one, individual experiences online (see Aagaard, 2017, Chapter 2). This development can be seen as part of a broader trend
among young people to organise their relationships according to the tenets of ‘networked individualism’ in increasingly networked societies (see Wellmann et al., 2000 in Chapter 1).

One of the enabling conditions identified in study 3 that corroborates extant research (Blikstad-Balas, 2012; Aagaard, 2017; Dinsmore, 2019) regards the normalisation of off-task use of ET in class. Quite contrary to explicit regulations banning off-tasking, the de facto social norms regulating ET usage is formed in a bottom-up manner accommodating the existing balance of power between teachers’ institutional focus on the preservation of the educational space and students’ social activities online. Extant research stresses that ET creates an antagonistic teacher-student relationship in which concealment is key (Aagaard, 2015). Ideally, the integration of ET in classrooms should enhance and enrich education for all students through the actualisation of a truly educational collective affordance (see Chapter 3). However, the findings presented here indicate that individual desires are the dominant motivation for students’ use of ET in class.

6.2 Theoretical contributions
In this chapter, I will first elucidate the theoretical contributions by using a critical realist version of affordance theory and will focus on four aspects: (1) ET as product of human action, (2) ET as medium of human action, (3) institutional conditions of interaction with ET and (4) institutional consequences of interaction with ET. Next, I explain why I began this project with a sovereign conceptualisation of agency (that is, self-regulation in study 1) and ultimately used a four-factor typology of conceptualisations of agency as theoretical frame in study 3.

The critical realist version of affordance theory used in this thesis enables a multilevel exploration of off-task use of ET in class. This is primarily a result of the analytical separation of the concept ‘affordance’ from the ‘actualisation’ of affordance. I will focus on four key aspects. First, the theoretical framework shows how ET is a product of human action both in terms of its design and its use. The concept of ‘affordance’ encompasses the material aspect of pertinent hardware and software, but also the inbuilt design features, so-called social signifiers, that are used to promote certain target behaviours (see ‘deceived affordance’ in Chapter 3). Connected technologies are thus imbued with material properties and interpretive schemes that are the products of the situated human action of the developers and designers. However, while pre-digitised technologies provide static interpretive schemes for users to appropriate, digitisation, artificial intelligence (AI) and machine learning (ML) make it possible for connected technologies to use interpretive schemes to interpret their users (see for example, Zuboff, 2019). This means that the human component in the creation of advanced technologies is primarily limited to the hardware and by providing connected technologies with the appropriate interpretive scheme by way of programmed algorithms. The user data are then automatically processed and the content is adjusted accordingly. Machine Learning (ML) is thus a branch of artificial intelligence that can learn from data, identify patterns and make decisions with limited human intervention (ibid.). It is important for analyses of off-task use of ET to recognise how these advanced connected technologies work in order to grasp why they are perceived as ‘magnetic’ (Aagaard, 2017). However, the inbuilt properties and interpretive schemes are merely possibilities for action that are impotent in the absence of users. Users thus constitute these technologies and make them potent by way of their interaction with technologies.

In using connected technologies, users interpret, appropriate and manipulate them in different ways depending on various individual and social factors. Theoretically, the concept of ‘actualisation’ of affordance accounts for and engenders analyses of the situated process of off-task use of ET in the classroom. While the inbuilt properties and interpretive schemes of connected technologies help explain their potential potency, the process of actualisation enables understanding of how these technologies are interpreted, appropriated and manipulated by users in context. That is, ET is physically constructed by actors working with hardware and
design and ET is socially constructed by actors via the various meanings they affix to it and the different features they focus on and routinely use (Orlikowski, 1992).

Second, the critical realist affordance theory shows how connected technology mediates human action. Contemporary connected technologies are not a neutral means to an end (see Chapter 1), but facilitate and contrain human action via their provision of properties and interpretive schemes often tailor-made to attract individual users’ attention. This is important for studies of off-task use of ET in class since students have already interpreted, appropriated and habitually use the relevant applications in situated out-of-school contexts where technology often mediates pleasurable and fulfilling experiences. While the label of connected technology changes to educational technology in school, students are still left to handle the same perceived potency emanating from their routinised and habitual out-of-school use of the inbuilt design and interpretive schemes for the purpose of short-term cognitive, affective or habitual gratification.

Third, ‘actualisation’ of affordance highlights the importance of contextual factors influencing how students interpret, appropriate and put technology to use. It is therefore crucial to understand how the institutional conditions of students’ interaction with ET are involved in their off-task use of ET in the classroom. There are at least three sets of relevant conditions: structures of signification (that is, the meaning of ET use in class), structures of domination (i.e., the power to influence the use of ET in class) and structures of legitimation (i.e., the norms for appropriate use of ET in class). It follows that these structures exert influence on students’ off-task use of ET in class.

As I expressed in Chapter 3, the official rationale for integrating ET in class is usually to invigorate and improve education. That is, the individual uses of ET in class should ideally contribute to the actualisation of the shared affordance of education (see Chapter 3). Arguably, this constitutes the most important institutional structure of meaning that furnishes a shared understanding and thus mediates communication regarding ET in school. Arguably, in students’ interaction with ET in class this shared understanding is not only part of the background, but is inherent in the interaction itself as the core of mutual knowledge students draw on in their ongoing interaction with ET in class. In turn, their interaction reinforces or transforms this institutional structure of meaning. Next, there is a formally embedded asymmetry of power between teachers and students in terms of the authoritative and allocative resources they can use to influence how ET is used in class. For example, teachers can draw on their formal institutional authority to enforce their conception of educational uses of ET through strategies of restriction or differentiation (see Chapter 2), while students can resist and undermine teachers’ efforts and thus engage in off-task use of ET despite restrictions. This asymmetry of power constitutes an important part of the institutional structure of power that conditions students’ off-task use of ET in class (see Dinsmore, 2019 in Chapter 2). Power is therefore a crucial element in analyses aiming to understand students’ off-tasking. Lastly, institutional structures of norms exert influence on how students interact with ET in class as they constitute the official view of what uses of ET are appropriate in the classroom context. These official norms are articulated in formal rules and regulations and are embedded in the professional role of teachers and in the informal expectations embedded in the institutional role of student. Off-task use of ET is usually considered inappropriate according to these institutional norms. This normative structure is thus a key condition for students’ interaction with ET in class.

Finally, affordance theory enables the articulation of conjectures about institutional consequences of interaction with ET. While students’ interactions with ET in class are conditioned by the structures of meaning, power and norms in school, in turn, their interactions either reinforce or transform the same structures. This means that while their personal interactions with ET have a direct influence on local conditions, they can also have indirect and unintended effects on the institutional context. When students conform to the official
structures and thus use ET for educational purposes based on the definitional power of teachers and in line with established normative rules, they unwittingly sustain the organisational structures in which ET is deployed. However, when they do not use ET as intended and the divergent use is widespread and ‘normalised’, they can undermine, transform or replace official structures with new informal structures. By extension, the students can thus unwittingly and step-by-step change the institutional context of ET use in class and undermine the strategic objectives of the implementors of ET in school. Arguably, this unintended side effect of off-task use of ET is reflected in previous research, corroborated by the empirical contributions in this thesis and finds expression at both the intra- and inter-personal levels. Intrapersonally, the school-net-conflict can thus be regarded as an uneasy armistice between students’ appropriation of both the official interpretive schemes of school and their appropriation and routinised use of the embedded interpretive schemes of connected technologies. Their knowledge and reflexivity is limited to some extent by unconscious sources of motivation and the situated nature and unintended consequences of their action (cp. ‘deceived’ affordance in Chapter 3). Interpersonally, the uneasy armistice is reflected in the antagonistic teacher-student relationship (see Aagaard, Blikstad-Balas & Dinsmore in Chapter 2) and the empirically identified discrepancy between the official and the actually operating de facto norms regarding off-task use in the classroom. Overall, the divergent use of ET for off-task purposes challenges (a) the meaning of ET by weakening the cultural logic of separation between work and play, (b) the definitional power of ET to the favour of students over teachers and (c) the official norms of appropriate uses of ET to the favour of de facto norms based on existing patterns of off-task practices in class. As Dinsmore (2019) comments, teachers often use the language of ‘battle’ and ‘war’ to illustrate their interactions with students over ET, as both parties mobilise their respective capacities to shape the actualisation of affordances towards desired ends; teachers seek to maximise control over students’ use to maintain authority in class, while students seek to protect their social media and smartphone use.

I now turn to the theoretical contribution related to my journey from subscribing to a sovereign conceptualisation of agency in the form of ‘self-regulation’ in study 1 to ultimately using a four-factor typology of conceptualisations of agency as theoretical frame in study 3. A main theoretical contribution in this thesis pertains to how multiple perspectives regarding one focal phenomenon provide opportunities for a principled integrative analysis using the critical realist combination of epistemological relativism (weak) and ontological realism as a platform for engaging with both emic and etic research.

In the emic study presented in Article 3, I engage with how students explain their problematic net-related off-task practices. This means that I try to grasp how students who struggle to keep focus in class reason and create meaningful narratives about their off-task use of ET. At the start of this PhD project I planned to use self-regulation theory as an analytical framework in this study and thus provide a theoretical link to the study presented in Article 1 in which self-regulatory strength is the dependent variable. However, as the project progressed and the data from the focus groups was collected I decided that a multipronged analytical framework would better fit my research purposes. If I had stuck to the original plan, I would have theoretically analysed the data exclusively using a sovereign conception of agency. Instead, I used a newly developed typology of agency that included sovereign, relational, ecological and new material conceptions of agency (Charteris & Smardon, 2018). I knew that this choice could potentially reduce theoretical rigor as the four conceptions draw on different ontological and epistemological assumptions. However, I maintain that my choice contributed to strengthening the study’s relevance.

The multipronged approach helped reveal how the students themselves based their explanations on basic assumptions about sovereign, relational, ecological or material agency and how the frames provided by the idea of individual responsibility dominated their thinking about their experienced agency failures regarding off-task use of ET in class. Moreover, the theoretical framework opened up to finding a conspicuous gap between
their dominant instrumentalist understanding of off-tasking as an individual failure and their rich stories about how their off-tasking was actualised in class. These stories included references to the influence of connected devices and their temptations, the influence of strict or kind teachers, easy or difficult subjects, the influence of the practices of peers and the *de facto* classroom norms regarding off-tasking and institutional incentive regimes that decreased the value of making an effort in class and increased the value of tests and grades in a way that made students continuously judge whether the content in class was worth the investment of mental effort. While a grounded approach would probably have revealed a similar empirical landscape, it would not have provided me with the analytical frames that helped me identify the presence of a gap, nor link the analysis to central policy documents that have increasingly gravitated towards individualised ideas about education as pointed out by, for example, Biesta (2013) in his analysis of the learnification of education.

For students who experience that they cannot resist the ubiquitous presence of digital temptations and feel that they waste too much time online, the fact that they are taught to understand their problem in individual terms adds insult to injury. Not only are they required to attend an instructional environment that debilitates their ability to self-regulate as digital distractions are readily available, teachers do not enforce official rules against off-tasking and the *de facto* norms in class deem off-task use of ET appropriate. In addition, they experience that the failure is individual and intimately linked to durable and trait-like personality factors: ‘I am easily distracted’. On the one hand there is a complex process of actualisation of off-task use of ET in class in which the school itself plays a crucial role by the way it handles digital distractions at an institutional level and on the other hand individual students are left to cope the best they can in an instructional environment that is imposed on them.

While the reduced quality of learning emanating from off-task use of ET in class might affect students’ overall understanding and grades, experiencing repeated failures to self-regulate in a distractive instructional environment might detrimentally influence a student’s sense of self-efficacy and self-worth. It is likely that many students become caught in ongoing experiences of self-regulation failure and the associated procrastination cycle (Parry & le Roux, 2019) is related to negative emotions such as stress and anxiety, but also to weakened self-efficacy. Negative self-efficacy is found to mediate the influence of perceived goal-achievement on procrastination (Wäschle et al., 2014), which means that students with low self-efficacy are vulnerable to finding themselves in a vicious circle of procrastination. However, students with high self-efficacy are more likely to find themselves in a virtuous circle in which perceptions of high goal attainment strengthen self-efficacy and reduce off-task use of ET and procrastination, which in turn contributes to perceptions of high goal attainment. In the digital divide literature (see, e.g., Scheerder et al., 2017) emphasis has recently shifted from focusing on Internet access (first-level digital divide) and Internet skills and use (second-level digital divide) to focussing on the tangible outcomes of Internet use (third-level digital divide). It is worth exploring in more depth the type of third-level digital divide reflected in findings that indicate that students can be caught in vicious or virtuous circles of procrastination, especially since socioeconomic factors are identified as key determinants (Scheerder et al., 2017). In the introduction I presented results from a study of students’ achievements on a high stakes test pre- versus post-ban of mobile phones in class (Beland & Murphy, 2016). They found that the students with the lowest grades benefitted substantially, showing large and significant improvements in results post-ban. This might be an indication of the potential benefits of breaking these vicious circles of procrastination.

Relatedly, the theoretical framework helps to highlight that solutions to problems of off-tasking in class require a multipronged approach. By sticking to my original plan I would probably have recommended efforts geared at improving students’ meta-cognitive thinking and learning strategies as these would fit with the theory and extant research about the efficacy of the proposed measures (see, e.g., Duckworth et al., 2011 on the benefits
of mental contrasting and implementation intentions). I now think that these measures are necessary, but insufficient for solving the problem of off-tasking in class. Simultaneous and coordinated measures at the individual, relational, ecological and new material levels would probably have better chances for success. Individual measures could then be supported by social and relational structures affecting a change of the dominant norms in class that are more in line with official guidelines. Institutional changes could include reduced access to digital distractions in class, but also starting a movement away from the grade-based, instrumental incentive regime towards more effort-based and mastery-oriented incentive regimes (see, e.g., Resnick, 1995).

6.3 Methodological contributions

In this thesis I draw on a mixed methods methodology using a multiple methods design (see Chapter 4). Critical realism is used as alternative paradigmatic framework, thus anchoring the legitimation of integration of findings in the critical realist formulation of the relation between epistemology and ontology. Within the field of educational technology research (ETR), this kind of mixed methods research is relatively uncommon. The top journal *Computers and Education* has dominated the field of ETR for many years and of the articles published between 2017 and 2019 only 5.5% were mixed (Lai and Bower, 2020). In the context of Nordic ETR a similar pattern emerges. An overview of papers published in the *Nordic Journal of Digital Literacy* (NJDL) in the period 2006–2020 shows that 11.46% of the 192 papers examined used mixed methods, while the proportion increases to 24.4% in the papers published within the last four years (2016–2020) (Skaar & Krumsvik, 2020), with 16.4% quantitative and 59.2% qualitative articles.

Importantly, in each of the three papers that constitute this thesis I adhere to only one methodology. While I adhere to a quantitative methodology using SEM analyses in the first two articles, I use a qualitative case methodology in the last paper. This means that the research design of the PhD project is best characterised as multiple methods design (Morse, 2010). However, methodological pluralism is embedded in the overall mixed methods methodology that links the three articles together and is therefore an important mode of thought in this extended abstract. In terms of Jennifer Greene's (2007) overview of stances with regard to mixing methodologies, my approach is closely aligned with her alternative paradigm stance based on critical realism and thus rejects the incompatibility view of the purist stance. Based on the overall proportion of mixed methods studies published in ETR journals internationally and in the Nordic context, it is reasonable to assume that the number of studies using critical realism as the basis for an alternative paradigm stance to ETR is very small indeed. However, the most important question remains: What have I gained from using this mixed methods methodology stance?

First and foremost, the mixed methods methodology approach in this PhD project has enabled me to make use of the findings in the first study to inform the research focus on the second and third studies. In the first study I found interesting connections between time spent online, students' experience of a school-net-conflict and their ability to self-regulate in technology-rich classrooms. The findings indicated that time spent online in class might be detrimental to students' learning by way of digital distractions. However, a main reason for introducing connected digital technologies in class was to improve students' digital competence both in and outside of school. Study 1 did not address this issue and therefore I decided to explore the relationships between time spent online in class, learning preferences split into 'online culture' and 'school culture' and students' sense of agency in informal online learning (digital agency). The findings in study 2 confirmed that time spent online in class was significantly related to digital agency by way of online culture, but surprisingly, school culture also showed a positive association to digital agency. The most interesting findings in terms of the main research question in this thesis concerned how time spent online in class was negatively related to the learning preference ‘school culture’ and the very large negative association between online culture and
school culture. The findings indicated that spending time online in class promoted an alternative digital learning preference that seemed highly antagonistic to current schooling. This might entail that instead of vitalising and reinvigorating formal educational content and practices, introducing ET in class might have the opposite effect by undermining the very tenets the Nordic model of education is based on.

Studies 1 and 2 had uncovered the existence of many non-intuitive multivariate relationships presented in the first two articles of this thesis. Structural Equation Modelling proved suitable for testing theoretically informed hypotheses regarding how different constructs multivariately correlate with each other, thus taking into account the possibility for interaction effects between the different constructs included in the model and thereby showing possible mediating effects otherwise hidden from view in less advanced correlational analyses (Elster, 2007). At this point in the project I considered conducting another quantitative study and thereby base my thesis exclusively on an etic research approach. However, the etic, variable-oriented approach provided only clues as to the existence of and strength of relationships between constructs. It did not provide much information about why these relationships existed and how the pertinent processes unfolded. Based on the quantitative finding that time spent online in class was positively associated with students’ sense of a school-net conflict, I found it highly plausible that off-task use of ET was the mediating link. I therefore decided to limit the scope of exploration to this limited, but in my view crucially important factor to enable an exploration that was deep enough to indicate how and why students engaged in off-tasking in class. For this I needed an emic research approach that could help me understand how students experienced their off-tasking and how they reasoned and understood their experiences.

In the methods chapter I have presented how I used the large-scale quantitative studies (N=3,400) to get a purposive sample of 11 students who experienced a school-net-conflict. This means that findings from the first two quantitative studies informed the decision to focus on off-task use of ET, enabling me to identify a purposive sample of students in a systematic manner and by way of what they did not, showing the way to an emic research approach and providing a general empirical backdrop with which to relate the findings from study 3. This way of ‘building’ a project is typical for this kind of ‘sequential design’, in which different phases inform, build on and complement each other (see for example, Fetters et al., 2013, p. 2137). While the quantitative findings showed the existence and strength of associations, the qualitative findings showed their possible nature. Focus group interviews were well-suited to understanding the reasons for students’ off-tasking by obtaining descriptions of their experiences and explanations for their actions. At a content coding level the students’ descriptions of their experiences were treated as reflections of what really happened in class, cp. realism in critical realism, not just as constructed mental models. At this stage triggers and enabling conditions for their off-tasking were identified. However, the main thread of analytic effort in study 3 was invested in understanding the discursive repertoire that the students used to explain the reasons for their actions. This is a more analytical level than the mostly grounded content analysis conducted in Cycle One. The theoretical coding in Cycle Two enabled me to introduce the typology of agency as an analytical tool to interpret students’ explanations, allowing me to discuss not just the content side of how off-task practices were actualised in classroom practice, but gain a deeper understanding of the discursively constituted system of reasoning and thus their system of attribution of responsibility for off-task use of ET in class.

Overall, I maintain that my thesis is an example of how to implement a mixed methods methodology that comes close to what Pearce (2015, p. 46) considered the main rationale for mixing methodologies:

At times we aim to explore and discover and at other times we aim to test and confirm. Always operating from an inductive standpoint runs the risk of continually suggesting new and creative theory with no systematic assessment of when and where theory holds beyond the local setting. Using only
deductive procedures severely limits the possibility that new discoveries are made or previously unconsidered explanations for social behavior are obtained (Pearce, 2015, p. 46, quoted in Krumsvik, 2020).

I hope that I have demonstrated in this thesis that the strengths in one method can compensate for weaknesses in another and that while quantitative analyses can show the existence and strength of associations, the qualitative findings show the nature of those associations (Fetters et al., 2013). This entails interlinking different quantitative and qualitative factors in the overall project design and overall interpretation of findings in order to complement each other and to provide a more holistic and pluralistic analysis and understanding of the foci of research.

6.4 Limitations

After having explicated the various contributions of this thesis, I want to point out some key limitations. First, the quantitative studies in Articles 1 and 2 are based on questionnaire data collected at a single point in time. While this cross-sectional approach is suitable for exploring the current views of students, it is less compelling regarding studies of change or cause-and-effect relationships. Second, although the sample is as large as 3,400 students from 60 different schools in Norway, Sweden and Finland, it is not a random sample of a known population. This means that I cannot rule out the possibility that the sample is not representative of the whole student population and thereby has different properties and characteristics than the population. That is, the results based on data from the sample might be different from results based on population data. It follows that the statistical warrants for generalisations from the sample to a wider student population are weaker than I would have wanted. However, the large sample size and systematic efforts to avoid systematic errors (see Chapter 4) alleviate this weakness to some extent.

Third, the qualitative study 3 is based on data from a purposive sample drawn from the convenience sample in studies 1 and 2. The selection criterion was their experience of a ‘school-net-conflict’. While this made the study more targeted than studies of students’ experiences of ET use in class, it also limited the empirical foundation for theoretical development and for drawing analytical generalisations of the experiences of this specific student group. This means that I cannot rule out the possibility that the analytical generalisations fail to address pertinent elements of off-task use of ET experienced by other groups of students. Fourth, study 3 relies on interview data from five focus groups on which I conducted content (Cycle One) and theoretical coding (Cycle Two). Observations were conducted, but I considered the quality and systematicity of execution as too low to use the resulting observation data as an additional source of analysis. The observations were instead used as valuable ‘anchors’ and ‘prompts’ in the focus groups. The lack of high-quality observational data is unfortunate in a study of off-tasking since it would provide a layer of data that was not based on the reflexivity of the students and their ‘remembering selves’ (Kahneman, 2011). Since I did not collect other types of real-time data, the failure of the planned observation entails that the study lacks data on students as they experience off-tasking in class. Fifth, while the interview data provided valuable information about students’ experiences and types of explanations, a case study of off-tasking should ideally include a broader array of relevant types of data. According to the original plan for study 3 I was supposed to collect user data from the county’s central data system that could identify the types and frequency of activities that students engaged with during instruction. However, the complexity of privacy rights and regulations as well as finding practical procedures for data collection made it not worth my while. Data from documents, archival records, other forms of interviews and direct and participant observation could all have contributed to a more comprehensive case study of off-task use of ET in class.
Sixth, the alternative paradigm approach to MMR based on critical realist tenets enabled a principled communication and cooperation between the quantitative studies 1 and 2 and the qualitative study 3, as well as a dynamic of discovery based on its sequential exploratory design features. However, the critical realist approach also affects the way quantitative studies of regularities are interpreted and 'read'. In contrast to post-positivist readings of studies based on SEM, a critical realist reading would have to provide the necessary caveats relating to the preferred local ‘mechanistic’ causality and the involvement of context in all causal analyses (see, e.g., Reiss, 2011). In addition, a critical realist is required to include the possibility that there is an interaction or feedback loop (inherent in ‘open’ systems) that defies efforts to identify deterministic relationships. These difficulties are addressed by viewing the identified regularities as semi-regularities occurring in a system that is semi-closed, that is, to accept the idea of partial regularities and partially open systems. These caveats are meant to uphold the quality of communication and cooperation between the studies in this MMR-based thesis by retaining and adhering to the principle of integration.

6.5 Implications
In Chapter 1.1 I mentioned that this thesis was a part of a research project funded by the Norwegian Research Council’s (NRC) PRAKUT programme. I stressed that the project is practice-oriented and empirical and that the findings would have implications for students, teachers, teacher educators, school owners and policymakers (Chapter 1.2). I addressed these implications in the first part of this chapter before I elucidated the need for further research emanating from this thesis.

First, the most important implication for students is the need to understand how and why contemporary connected technologies are constructed and designed to attract and keep their attention. An increased awareness of how connected technologies unobtrusively shape their interactions towards certain target behaviours can enable students to make more informed choices concerning their appropriation and use of these technologies. Moreover, it is important that they realise that a prime rationale for this moulding of their interaction is to further the commercial interests of the developers and the companies that advertise on their platforms. In short, the most important implication for students is that they develop critical as well as medium and content-related digital literacy. In turn, this would entail that teachers and school-owners acknowledge that without critical digital literacy students are apt to fall back on a default individualistic interpretation of problematic use of ET with the associated issues of degradation of self-regulatory efficacy, negative affect and increased procrastination.

Furthermore, previous research and findings in this thesis suggest that understanding off-task use of ET in terms of innate, trait characteristics and individual responsibility affects the social dynamics of off-tasking in class. The findings in this thesis corroborate previous research in that individual acts of procrastination trigger other students’ off-task use of ET and thus it ‘spreads like an infectious disease’, according to an informant. As this pattern of practice becomes established and institutionalised, my findings indicate that it becomes part of the de facto normative framework for appropriate use of ET and thus off-task use of ET is normalised and constitutes an important structural condition for future use of ET in class. The struggle of individual students to remain on-task when faced with digital distractions is made much more difficult by this un-educational set of norms. Continued unreflective use of ET is clearly inappropriate and ineffective in these circumstances.

A possible way forward is for students and teachers to acknowledge and address the role of persuasive technologies themselves in distractive uses of ET in class, that is, a new material conceptualisation of agency. Moreover, they need to acknowledge and address the role of the relational dynamics referred to above, that is, a relational conceptualisation of agency. Finally, they need to acknowledge and address the role played by an instrumental test- and grade-based institutional incentive regime that devalues the investment of effort in class
and mastery-oriented learning. Overall, the implication would be a multilevel understanding and approach to students’ off-task use of ET in class that focussed on (a) the degree, type and range of online access in class, (b) the development of alternative relational dynamics based the common good and (c) the development of assessment regimes that promote cooperation, investment of effort and a mastery-orientation to learning. This multilevel approach would not replace, but supplement individual measures emphasising self-regulation strategies and meta-cognitive awareness.

However, without the willing cooperation of the students themselves, these measures have only limited chances of success. The findings in this thesis suggest that students’ acceptance and appreciation of formal schooling plays a crucial mediating role for interventions to have the intended positive effects. Therefore, it is paramount that students, teachers and school-owners together work systematically to strengthen the communal function of education by building robust class communities where students feel safe and at home. Drawing on the three stands of previous research on in- and out-of-school learning (Chapter 2), schools and teachers need to (a) reconnect and recalibrate their day-to-day activities to the overarching purposes of education: qualification, socialisation and subjectification (Biesta, 2011), (b) de-emphasise individualised and decontextualised pure mentation and re-emphasise shared learning and meaningful contextualisation (Resnick, 1988) and (c) acknowledge that investment of effort and grit crucially hinges on students’ appreciation of schooling and stimulation of their interest and motivation (Barron, 2009).

6.5.1 Avenues for further research

Drawing on the reflections above, I assert that further research is required pertaining to the development of a theoretical model for off-task use of ET in class. The work on this off-task model is well underway. The model will have to be based on the state of the art and include the most pertinent structural conditions identified in this thesis. Based on the theoretical contributions presented above, the model would have to include a ‘trigger activation threshold’ above which the triggers identified in Chapter 5 would succeed at instigating a student’s off-tasking. This threshold indicates that the subjectively perceived potency of off-tasking exceeds the potency of remaining on-task. The model could serve as a point-of-departure for future studies of off-tasking, but also for interventions in- and out-of-school to understand and address the nature of distractive uses of connected technologies and resulting procrastination.

Therefore, the natural next step would be to operationalise the theoretical model. Users of the operationalised model could rate each structural condition on a scale from 0 (low potency) to 10 (high potency) based on their personal experiences with off-tasking in a particular class or at school in general. The relative potency of each condition would necessarily vary according to the perceptions of the student and thus be a helpful illustration of the range of influence of each condition relative to the individual user. Drawing on the presumption that it is the combined potency of all structural conditions that matter in terms of individual instances of off-task use, the student’s rating of each condition is combined to make an overall off-task susceptibility score. If the operationalised model has ten individual conditions, the score would be somewhere between 0 and 100. However, the overall score would not in itself express the likelihood of off-tasking, since the ‘trigger activation threshold’ would vary from student to student. For example, for a student with a trigger activation threshold at 75, an overall susceptibility score of 72 would indicate that a trigger would not succeed in instigating off-tasking by that student. However, for a student with a threshold at 70 and a susceptibility score of 72, a trigger would induce them to engage in off-tasking. However, what would be the basis for setting a threshold score? Theoretically it makes sense that the factor is a relatively stable element in relation to a student’s tendency to go off-task in class. By extension, the ‘activation’ threshold must be understood as a subjectively perceived, relatively stable element in students’ relation to formal schooling, that is, an element through which other
influences are ‘filtered’ and mediated and thus by which other influences are understood. At first, I considered using a psychological construct such as trait-like distractibility or impulsivity. However, I rejected the idea based on my misgivings of individualised conceptions of education and the empirical findings in this thesis. Instead, I found it more in line with my reasoning, previous research and my empirical findings to use a construct of ‘school appreciation’ as a measure for the trigger activation threshold. Theoretically, this would imply that the more a student has internalised the tenets of formal schooling, the less likely they are to engage in irrelevant off-task use of ET in class. I consider this a reasonably compelling presupposition. By operationalising this ‘school appreciation’ construct, the model is ready to be used by individual students, teachers and school-owners as a practical tool to assess the likelihood of off-tasking for individual students, groups of students or the student population at a school. With minor adjustments, the ‘Arnesen off-task model’ could be used by students in higher education, students working from at home or even by professionals working from home.

My prime motivation for conducting this work is to improve the situation for students. However, to make use of research-based knowledge, practitioners need to fit it into their practical reasoning and that requires a mental model in which theoretical inputs are organised and made sense of relative to practitioners’ existing understanding. This extended abstract is thus a rare opportunity for me to try to increase the practice-relevance of the separate articles by actively seeking ways to interrelate and integrate findings into a coherent whole that more closely resonates with practitioners’ practical reasoning. Arguably, the development of the off-task model that is based on the idea that it is the perceived potency of the combined risk-factors relative to the combined mitigating factors is a promising starting point for further research. It follows that the identified triggers (Chapter 6.2) are inherently linked to subjectively experienced levels of overall off-task potency and will only succeed when the experienced level exceeds a certain ‘activation’ threshold. If the potency level is below this threshold, a ‘trigger’ will not initiate an instance of off-task use of ET since the impulse to stay on-task is greater than the impulse to go off-task. The findings in the current study suggest that students’ appreciation of formal schooling constitutes such a threshold. I have empirically demonstrated how positive associations between quality aspects of teaching and regulatory strength were mediated by school appreciation and a large and growing body of extant research confirms the importance of students’ sense of belonging and other non-cognitive factors (Farrington et al., 2012).

The most important advantage of modelling the pertinent findings is that the great variability of students’ off-task use of ET in class can be theoretically accounted for. It is thus possible to move away from static lists of off-task inducing factors towards a dynamic understanding of the inherent variability involved in individual students’ off-tasking (for example, variation related to their habitual distraction, their perception of task value, subjects, teachers and the institutional frames) and the inherent variability between peers (some students hardly ever go off-task, while others are frequently off-task), between classrooms (in some classes there is hardly any off-tasking), between schools and even school systems (see for example, the identified country differences between Norway, Finland and Sweden in Arnesen, 2016). In the age of COVID-19, with so many working from their homes, the model could even help improve the working conditions for students and professionals by identifying the potency of risks versus mitigating factors in the home. For professionals, the activation threshold could be, for example, work appreciation.

6.5.2 Concluding remarks
The development of this research-based theoretical off-task model is potentially important not just for further research, but for students, practitioners, school owners and policy makers. Students can test themselves by filling out a digital form and receive feedback on the individual risk-factors and the overall potency of risk.
relative to mitigating factors. They can thus address the factors that are most potent in their learning lives. By administering this kind of form in class, teachers can not only make students aware of the main enabling conditions and their own problems, but also get an overall impression of the gravity of the problem in the class overall. Processes of school development in which the form is used every six months are pertinent, proportional and non-invasive ways of engaging with the problem of off-tasking. Moreover, specific problems could be identified and dealt with individually by more targeted procedures. It is a middle-of-the-road alternative to either banning connected technologies in class altogether, and by implication educationally conducive uses of ET, or failing to address the issue in all its complexity by defining the technology itself ‘off-limits’ and thus reducing off-task use of ET in class to a matter of individual self-regulation failure, or teachers’ lack of pedagogical flair, that is, the tendency within ETR to technologise successes and psychologise or pedagogify failures. In my approach, connected technology itself is not ‘off-limits’ as a large body of extant research converges on the view that perceived ubiquitous access, increasing levels of habitual distraction and constant presence of potent digital distractors are important risk-factors. However, bans should be proportional responses to a well-defined and empirically identified problem. Enforced bans at schools and in classrooms in which the problematic aspects are efficiently and directly addressed would be disproportionate and might even be un-educational. The development of students’ digital literacy is too often directed towards issues of technical proficiencies, while key critical aspects of current mega-trends in the Data Age are overlooked. Instead of bans, I suggest that students should be challenged to engage with persuasive design, digital habits and addiction, ET and effects on learning and learning processes, conceptions of education, what user-generated data are used for, what interests are behind the technologies and what consequences this can have for well-functioning societies and democracy itself. The engagement of the young in current issues is evident regarding climate change and saving the external environment. Yet, at the same time the young seem less aware of how they are used in the ongoing corporate takeover of the public sphere and how connective technologies are involved in shaping and changing the interpersonal climate and their own ‘inner’ environment.

The prolific writer and philosopher Bernard Stiegler, who founded ‘the Institut de recherche et d’innovation (IRI)’ at the ‘Centre Georges-Pompidou’, argued that individuals and society at large are increasingly influenced by algorithms and automated systems, fuelled by economic rather than human interests. For example, a Facebook feed is algorithmically devised to keep the user inside its digital walls so that they can be exploited for profit. He saw that people entrusted their rationality to computational technologies that stopped them thinking authentically. He maintained that in the Digital Age the global economy, fuelled by computational ‘reason’ and motivated by profit, is foreclosing the space of independent thinking for most people in the sense that people remain oblivious to the fact that their thinking is inherently constricted by lines of code that anticipate and actively mould consciousness itself. Stiegler used the term ‘proletarianisation’ to signify the threat that computational thinking poses to the human spirit itself. As mentioned in the introduction, ETR has a particular responsibility to engage with these critical perspectives (see Chapter 1.2) and I hope that recent efforts by leading scholars and journals to enhance criticality and link ETR to key societal developments will inspire students, teachers and teacher educators to endorse a critical approach to connected technologies, thus complementing technical and medium-related digital literacy with a focus on developing students’ critical literacy.
References


Young, M. F. D. (2008). *Bringing knowledge back in: From social constructivism to social realism in the sociology of education* (pp. XX, 247). Routledge.


Appendix 1: NSD approval

TILBAKEMELDING PÅ MELDING OM BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 29.06.2012. Meldingen gjelder prosjektet:

30967 Learning in the 21st century: pilot study: fokusgruppeintervju
Behandlingsansvarlig Høgskolen Stord/Haugesund, ved institusjonens øverste leder
Daglig ansvarlig Lars Vavik

Etter gjennomgang av opplysninger gitt i meldeskemaet og øvrig dokumentasjon, finner vi at prosjektet ikke medfører meldeplikt eller konsesjonsplikt etter personopplysninglovens §§ 31 og 33.


Vedlagt følger vår begrunnelse for hvorfor prosjektet ikke er meldepliktig.

[signature removed]    [signature removed]

Bjørn Henrichsen
Mads Solberg

Kontaktperson: Mads Solberg tlf: 55 58 89 28
Vedlegg: Prosjektvurdering
Personvernombudet for forskning

Prosjektvurdering - Kommentar

Prosjektet utforsker forholdet mellom skole og ungdoms digitale livsverden. Dette er en pilotstudie for utprøving av ulike kategorier og konstrukt som skal danne grunnlag for en større survey på et senere tidspunkt.

Utvalget består av 10-12 fokusgruppeintervju med ca. 10 deltakere per gruppe med elever i 3. klasse vgs. Totalt består utvalget på 120 individer (ungdom 16-17 år samt voksne).


Personvernombudet kan ikke se at det i prosjektet behandles personopplysninger med elektroniske hjelpemidler, eller at det opprettes manuelt personregister som inneholder sensitive personopplysninger. Prosjektet vil dermed ikke omfattes av meldeplikten etter personopplysningsloven.

Det forutsettes at forsker gjør utvalget oppmerksom på at slike opplysninger ikke skal fremkomme i forkant av gruppeintervjuene. Det tas høyde for at det kan fremkomme indirekte personidentifiserende opplysninger i forbindelse med intervju, men all den tid lydopptakene ikke behandles på eller overføres til en datamaskin, vil denne behandlingen ikke være omfattet av meldeplikten. Lydopptakene oppbevares nedlåst og slettes etter transkripsjon, senest ved prosjektsslutt.

Personvernombudet legger til grunn at man ved transkripsjon av intervjuer eller annen overføring av data til en datamaskin, ikke registrerer opplysninger som gjør det mulig å identifisere enkeltpersoner, verken direkte eller indirekte. Alle opplysninger som behandles elektronisk i forbindelse med prosjektet må være anonyme. Med anonyme opplysninger forstås opplysninger som ikke på noe vis kan identifisere enkeltpersoner i et datamateriale, verken direkte gjennom navn eller personnummer, indirekte gjennom bakgrunnsvariabler eller gjennom navneliste/koblingsnøkkel eller krypteringsformel og kode.
Appendix 2: Information letter to students

HSH
v/ Thomas Arnesen, stipendiat ved forskingsprogrammet
“Learning in the 21st century”

Informasjonsbrev

Tilhøvet mellom ungdoms bruk av digitale media og skulens formål og struktur er eit mykje debattert tema både i forskarkrinsar, i media og elles. Foreldre vert stilte overfor denne problemsstillinga nærast dagleg. Prosjektet “Learning in the 21st century” tek opp dette tema for å forstå betre kva som faktisk går føre seg, og på det grunnlaget antyde måtar å byggje bru mellom den digitale livsverda til elevane og skulens føremål. Eit viktig ledd i prosjektet er å kartlegge korleis ungdom og lærarar sjølve opplever dette tilhøvet.

For å få data om ungdoms eigne erfaringar og haldningar, kjem eg til å gjennomføre totalt 10-12 fokusgruppeintervju med elevar ved norske vidaregåande skular. Kvart intervju vil ta om lag 1,5 time. Lydopptak av intervjua vil bli transkriberte og i den prosessen vil evt. namn bli anonymiserte. Så snart transkripsjonen er ferdigstilt, vil lydopptaket bli sletta. Prosjektet er meldt inn til NSD (Norsk Samfunnsvitenskaplige Datatjeneste) og forpliktar seg dermed til å følgja norsk lov om personvern og datalagring.

Med venleg helsing
Thomas Arnesen, stipendiat ved Høgskolen Stord/Haugesund
e-post: thomas.arnesen@hsh.no
Tlf: 53491313 Mob: 94972020

--------------------------------------------- SAMTYKKESKJEMA (Vert fylt ut på skulebesøk) ---------------------------------------------

Set eitt kryss:

JA Eg har motteke skriftleg og munnleg informasjon og er villig til å delta i studien

NEI Eg har motteke skriftleg og munnleg informasjon, men er IKKJE villig til å delta i studien
Informasjon om spørreundersøkelse ved X skole

I Norge har vi vært raske til å gjennomføre ganske omfattende endringer der elevenes tilgang til informasjonsteknologi har blitt tillagt stor betydning. Ungdoms utstrakte bruk av digitale medier på fritiden har gjerne blitt brukt som argument for at også skolene må benytte seg av de nye mulighetene som er tilgjengelige. Noen skoler har bestemt at elevene skal ha åpen internetttilgang i de fleste fag. Samtidig rapporterer mange skoler om negative erfaringer knyttet til at elevene har vanskelig for å konsentrere seg om skolearbeidet, om mobbing i sosiale medier, og om lærere som er usikre på hvordan de best skal forholde seg til den nye virkeligheten.

Det Norske Forskningsrådet (NFR) har gitt Høgskolen Stord/Haugesund i oppdrag å gjennomføre et projekt der vi blant annet vil kartlegge hvordan ungdommen selv vurderer verdien av sine digitale aktiviteter i forhold til sin egen utdanning. Gjennom å svare på spørreskjema er elevene ved X skole med i det norske utvalget på rundt 1200 elever. I tillegg deltar rundt 2000 elever i Sverige og Finland i undersøkelsen. Resultatene vil gjøre oss i stand til å identifisere og beskrive eksempel der elevenes digitale erfaringer brukes positivt for å nå skolens målsetninger. Ved å delta i prosjektet, får skolen tilgang til alle eksempler på god praksis, metodiske opplegg og forslag til tiltak som kan komme skolens faglige praksis til gode.


Med vennlig hilsen
Lars Vavik
prosjekleder
Appendix 4: The questionnaire


There are 130 items in total of which half are drawn from well-established scales, while the other half is developed specifically for Learning in the 21st century by Professor Gavriel Salomon and Professor Lars Vavik based on results from a small-scale pilot-study.

The first 10 items deal with background variables such as age, gender, socio-economic status, hours spent online at school and at home per day, what online activities do the students engage in on a daily basis and their grades in mathematics, first language, second languages and science.

The next 15 items are meant to measure students’ attitudes toward school in terms of whether education is deemed important, that school is relevant etc. Then there are 13 items designed to measure students’ attitudes towards their digital habits in terms of relevance for future life and prospects, that being online are used for quality learning, etc. In the following 11 items these two “worlds” are brought together in the sense that they are meant to measure students’ views about the relationship between new media practices and education, e.g., “being online is more important than school for my future”, “I lose focus on schoolwork when I use PC at home” etc.

The next 12 items are designed to measure the extent to which students respect the institution of schooling, the teachers, and its contents, e.g., “my parents would be very proud if I became a teacher”, “I admire students who do well in school”. A related set of 6 items (Student related aspects of school climate scale, PISA, 2009) follows; meant to measure problems relating to disrupting/disrespectful behavior, such as truantaing, noise in class and bullying.

The following 6 items are meant to measure the extent to which attending school or being online develops certain positive attitudes, e.g., “respect for others”, “honesty”, “good behavior” and “active participation”.

The next set of items (11) measures the strength of students’ associations when it comes to schooling, e.g., to the question: “what do you first and foremost associate with schooling”, the students are to state to which degree they disagree or agree to “hard work”, “serious study”, “indifference” etc.

Then follows the self-control scale, consisting of 7 items, such as “I manage to work effectively to achieve long term objectives”, “I have problems concentrating” “I manage to resist temptations”. This is an “aptitude” scale which will be used as a control scale. (Tangney & Baumeister: Self-control scale 2004)

The focus of the questionnaire changes in the last part. The students are told to think about either lessons in English as a foreign language or mathematics (50% of students each). The reason for the selection of these two school subjects is that of the contrastive content and epistemological structures, and the relative ease or difficulty of relating them to young people’s new media practices. The first 12 items (Approaches to learning scale, PISA, 2009) deal with learning strategies (memorization, elaboration and control strategies) the students employ (“I try to find out how the subject material can be useful outside of school”), then follows 5 items (Disciplinary climate scale DESCLIMA, PISA, 2009) about the classroom environment when working with the subject material (“when we work with English in class, the students don’t pay attention to what the teacher is saying”), and then there are 7 items (Teachers’ stimulation of reading engagement (STIMREAD), PISA, 2009) related to certain types of teacher behavior in class (“the teacher asks questions which challenges the students to improve their understanding of a text”).

The first (Teachers’ use of structuring and scaffolding strategies (STRSTRAT), PISA, 2009) of the last two scales (6 and 7 items) deals with teacher behavior related to feedback practices and the use of dialogue with students concerning how to understand tasks (“the teacher explains in advance what is expected of the students”), and the last scale (Kognitive Lernaktivität: Prenzel, Duit, Euler, Lehrke & Seidel, 2001) measures the extent to which the students understand and can make use of teacher explanations (“I understand the teacher’s explanations”), in addition to some control items relating to learning strategies (“I think through different ways to understand and solve the tasks I work with”).

Questionnaire (in Norwegian)

Sørreskjemaet tar ca.45 minutter å fullføre, og kartlegger dine synspunkter angående forholdet mellom læring i og utenfor skolen, og rollen nye digitale praksiser spiller i så henseende. Før du starter vil vi minne deg om at det ikke fins rette eller feil svar. Det eneste som teller er dine sanne meninger og synspunkt. Vær vennlig og svar på de følgende påstandene ved å velge det svaralternativet som ligger nærmest ditt eget synspunkt.
A. Hvor mange timer bruker du på Internett per dag på skolen? (sett en ring rundt rett svar)
0-1 time 1-2 timer 2-3 timer 3-4 timer 4-5 timer flere enn 5 timer

B. Hvor mange timer bruker du på Internett per dag utenfor skolen?
0-1 time 1-2 timer 2-3 timer 3-4 timer 4-5 timer flere enn 5 timer

C. Hvor gammel er du?
13 år 14 år 15 år 16 år 17 år 18 år

D. Er du jente eller gutt?
Gutt  Jente

E. Hvor mange bøker er det i hjemmet ditt?
0-10 bøker 11-25 26-100 101-200 201-500 flere enn 500

F. Hva bruker du Internett til, til daglig? (sett ring rundt alle svaralternativ som passer)
Sosiale medier  Spill  Google  Konsumere musikk/film/TV-serier
Skrive blogg  Lese blogg  Produsere skriftlig/bilder/film  Lese/lese nyheter

G. Hva var din siste terminkarakter i disse fagene? Matte= Norsk= Engelsk= Naturfag=

I hvilken grad er du uenig eller enig i de følgende påstandene? (1=helt uenig, 6=helt enig)
1. Skolen får meg til å gjøre mitt aller beste
2. Jeg hater skolen
3. Skolen er en god forberedelse på livet utenfor skolen
4. Det er viktig å lære fag som norsk, matte og historie på skolen
5. Jeg liker skolelæring
6. Skole er kjedelig
7. Jeg prøver alltid å gjøre mitt beste på skolen
8. Skolen hjelper meg med å få gode arbeidsvaner
9. Det er vanskelig å være konsentrert på skolen
10. På skolen blir ikke mine tanker og meninger tatt på alvor
11. Skolen bør introdusere meg for kunnskaper og ferdigheter som det er vanskelig å lære på fritiden
12. Skolen er tydelig på hvilke holdninger, kunnskaper og ferdigheter som er viktige
13. Skolen gjør at jeg forstår bedre verden omkring meg
14. Jeg tilegner meg den viktigste kunnskapen på skolen
15. Skolen gir meg mer selvtillit til å si hva jeg mener

I hvor stor grad er du uenig eller enig i de følgende påstandene? (1=helt uenig, 6=helt enig)
1. Det å tilbringe tid online er bortkastet tid
2. Jeg klarer meg ikke uten nettlagang
3. Det hender at jeg føler meg mer ensom etter å ha brukt tid på sosiale medier
4. Jeg våger bare å delta i diskusjoner dersom de finner sted online
5. Erfaringene med å være online styrker min evne til å delta i diskusjoner
6. Det å være online hjelper meg med å utvikle gode arbeidsvaner
7. Online blir mine tanker og meninger tatt på alvor
8. Når jeg er offline, lengter jeg ofte etter å tilbringe tid online
9. Når jeg er online, lengter jeg ofte etter å tilbringe tid offline
10. Mine digitale vaner gjør at jeg bruker mindre tid på å møte folk ansikt til ansikt
11. Jeg utnytter mulighetene nettet byr på til å tilegne meg kunnskaper og ferdigheter som er viktige på skolen
12. Nettet gjør at jeg forstår bedre verden omkring meg
13. Jeg dyrker flere personlige interesser online enn offline

I hvor stor grad er du uenig eller enig i de følgende påstandene? (1=helt uenig, 6=helt enig)
1. Nettbrukom er viktigere enn skolen for framtida mi
2. Mine digitale vaner er et hinder for å oppnå mine skolemålsetninger
3. Vi trenger ikke skolen lenger, vi kan lære det vi trenger på nettet
4. Jeg vil lære det som passer meg, når det passer meg, ikke møte på skolen for å lære det som står i læreplanen
5. Min motivasjon for nettaktiviteter forsvinner i det øyeblikket de blir brukt til skoleformål
6. Leksene burde være å se filmklipp der fagstoff ble presentert, og at vi diskuterte innholdet i klassen
7. Leksene burde være å løse oppgaver knyttet til faginnholdet læreren presenterer i klassen
8. Jeg ville være mer motivert for å lære skolens innhold dersom flere av mine digitale fritidsaktiviteter ble integrert i skolearbeidet
9. Jeg mister fokus på skolearbeidet når jeg bruker PC hjemme
10. Jeg mister fokus på skolearbeidet når jeg bruker PC på skolen
11. Skolen burde få meg til å tenke gjennom verdien av mine digitale aktiviteter og vaner

I hvor stor grad er du uenig eller enig i de følgende påstandene? (1=helt uenig, 6=helt enig)

1. Jeg respekterer læreryrket
2. Lærerne mine er eksperter i fagene sine
3. Jeg respekterer voksne generelt
4. Jeg ser opp til elever som gjør det godt på skolen
5. Jeg ser opp til lærere som stiller strenge krav til orden og oppførsel
6. Jeg ser opp til lærere som det er lett å snakke med
7. Jeg ser opp til lærere som stiller høye faglige krav
8. Jeg kunne godt tenkt meg å jobbe som lærer i framtida
9. Nesten ingen av vennene mine kan tenke seg å bli lærere
dersom jeg utdannet meg til å bli lærer
10. Foreldrene mine ville blitt veldig stolte av meg dersom jeg utdannet meg til å bli lærer
11. De fleste lærerne mine er flinke til å lære fra seg
12. De fleste lærerne mine får meg til å forstå hva jeg må gjøre for å bli bedre i fagene

I hvor stor grad er følgende et problem i din klasse? (1=ikke veldig liten grad, 6=ikke veldig stor grad)

1. Skulking
2. Bråk og uro
3. Elever som mangler respekt for lærere
4. Elever som truer eller mobber medelever
5. Elever som mobber lærere
6. Lærere som mobber elever


1. Respekt for andre
2. Ærlighet
3. God oppførsel
4. Aktiv deltagelse
5. Nære vennskap
6. Kritisk holdning til informasjon

Hva forbinder du mest med skole? (1=helt uenig, 6=helt enig)

1. Hardt arbeid
2. Kaos
3. Seriøse studier
4. Unnasluntring
5. Framtidig liv og jobb
6. Likegyldighet
7. Meningsfylt innhold
8. Tilfeldige aktiviteter
9. Lærerikt
10. Engasjert deltagelse
11. Sosial arena

I hvor stor grad er du uenig eller enig i de følgende påstandene? (1=helt uenig, 6=helt enig)

1. Jeg klarer å motstå fristelser
2. Jeg gjør en del ting som ikke er bra for meg, dersom det er moro
3. Jeg skulle ønske jeg hadde mer selvdisiplin
4. Folk sier jeg har sterk selvdisiplin
5. Fortynter hindrer meg i å få utført arbeidsoppgaver
6. Jeg har problemer med å koncentrere meg
7. Jeg klarer å arbeide effektivt for å oppnå langsiktige mål

Når du jobber med engelskfaget, hvor ofte gjør du følgende? (1=aldri, 6=alltid)

1. Jeg prøver å huske alt som står i teksten
2. Jeg prøver å huske så mange detaljer som mulig
3. Jeg leser teksten mange ganger
4. Jeg prøver å knytte nytt fagstoff til det jeg allerede har lært i dette eller andre fag
5. Jeg prøver å finne ut hvordan fagstoffet kan være nyttig også utenfor skolen
6. Jeg prøver å styrke forståelsen av fagstoffet ved å knytte det til mine egne opplevelser
7. Jeg prøver å forstå fagstoffet bedre ved å knytte det til noe som kunne skje i virkeligheten
8. Jeg prøver å finne ut hvilke fagbegrep jeg ennå ikke helt har forstått
9. Når jeg jobber med faget, begynner jeg med å finne ut nøyaktig hva det er jeg trenger å lære
10. Når jeg jobber med faget, sjekker jeg med jevne mellomrom om jeg har forstått det jeg har lest
11. Når jeg jobber med faget, forsikrer jeg meg om at jeg husker de viktigste poengene i teksten
12. Når jeg jobber med faget og det er noe jeg ikke forstår, søker jeg etter tilleggsinformasjon for å gjøre det klarere

I hvilken grad er du uenig eller enig i de følgende påstandene om klassemiljøet når dere jobber med engelskfaget? (1=helt uenig, 6=helt enig)

1. Elevene hører ikke etter det læreren sier
2. Det er bråk og uorden
3. Læreren må vente lenge før elevene faller til ro
4. Elevene klarer ikke å arbeide godt
5. Elevene begynner ikke å arbeide før langt uti timen

Hvor ofte skjer det følgende i engelsktimene? (1=aldri, 6=i alle timer)

1. Læreren ber elevene om å forklare hva som er budskapet i en tekst
2. Læreren stiller spørsmål som utfordrer elevene til å få en bedre forståelse av en tekst
3. Læreren gir elevene nok tid til å tenke på svarene sine
4. Læreren anbefaler andre kilder til lesing/informasjon
5. Læreren oppfordrer elevene til å uttrykke sin forståelse, tanker eller meninger om en tekst
6. Læreren hjelper elevene til å knytte innholdet i en tekst til den virkelige verden
7. Læreren viser elevene hvordan innholdet i en tekst er knyttet til og bygger på deres eksisterende kunnskap

Hvor ofte skjer det følgende i engelsktimene? (1=aldri, 6=i alle timer)

1. Læreren forklarer på forhånd hva som er forventet av elevene
2. Læreren passer på at elevene konsentrerer seg mens de jobber med en oppgave
3. Læreren drøfter elevarbeid med elevene etter en oppgave er fullført
4. Læreren forklarer på forhånd hvordan arbeidet til elevene vil bli vurdert
5. Læreren sjekker at alle elevene har forstått hvordan de skal løse oppgaven
6. Læreren er i dialog med elevene om hvordan en oppgave kan forstås og løses
7. Læreren stiller spørsmål som motiverer elevene til å delta aktivt
8. Læreren gir med en gang tilbakemelding til elevene om hvordan de løste oppgaven

I hvilken grad er du uenig eller enig i de følgende påstandene om det som skjer når du arbeider i engelsktimene? (1=helt uenig, 6=helt enig)

1. Jeg forstår lærerens forklaringer
2. Lærerens forklaringer gjør det mulig for meg å løse vanskelige oppgaver
3. Lærerens gjennomgang av oppgavene nyttige
4. Jeg tenker gjennom hvordan jeg best kan tillegne meg det nye fagstoffet
5. Jeg prøver å tenke gjennom hva som er de viktigste poengene i det nye fagstoffet
6. Jeg tenker gjennom ulike måter å forstå og løse oppgavene jeg jobber med
7. Jeg tenker gjennom hvordan det nye fagstoffet kan være nyttig også utenfor skolen
Endnotes

1 For the sake of simplicity, I refer to these technologies as ‘connected technologies’ when used by young people out-of-school, and Educational Technologies (ET) when used by students in class. The term ET is used to conform to the terminology within the field of Educational Technology Research (ETR) and is not intended to imply that the use of these technologies in class is always educational. On the contrary, the current thesis will show that ET is also used by students for purposes that can be described as highly uneducational.

2 As a response to technology addiction, distraction, and cyberbullying, there is now an emerging trend to prohibit mobile phones from classrooms and schools (Selwin & Aagaard, 2021).

3 Dinsmore (2019) comments that perspectives from ETR and new media research are rarely combined. ET scholars emphasise teachers, students and ET in pedagogical contexts, while new media scholars emphasise young people’s digital practices in- and out-of-school. Dinsmore argues that ‘[t]his separation has the consequence of minimizing the power dynamics of the teacher-student relationship’ (666).

4 Lauren Resnick was a member of the steering group for the L21-project.

5 See e.g. Green, 2002, 2008, who developed an entirely new classroom pedagogy based on how popular music was created in non-formal contexts. It is important to note that the informal elements were mainly used as a pedagogical gateway into the school subject itself, thus not affecting the content per se.

6 Lee Shulman was in the steering committee of the L21-project.

7 Conversations with Michael Young in London May 2015.

8 Gert Biesta was a member of the steering group of the L21-project.

9 Conversations with Biesta in London, 19.06.2015

x This is a practical limitation due to the scope and agenda of this extended abstract. Extant research pertaining to each of the three studies reported in three published articles is not presented here.

xi Blikstad-Balas has written extensively about digital literacy in the field of ETR (see e.g., Blikstad-Balas & Davies, 2017; Blikstad-Balas, 2016; Blikstad-Balas & Hvistendahl, 2013). My selection of the study from 2012 is based on the fact that it is one of her most-cited works, and that it shaped my understanding at the beginning of my PhD project.

xii Citations in the next paragraphs about Gibson’s original formulation of affordance theory are from Chapter 8 in his book *The Ecological Approach to Visual Perception*. Page numbers are excluded since the online version (http://cs.brown.edu/courses/cs137/2017/readings/Gibson-AFF.pdf, accessed 05.03.2021) comes without page numbers.

xiii I draw on Zachariadis, Scott and Barrett’s (2010) exploration of critical realism as a theoretical foundation for mixed-methods research and their conceptualisation of demi-regularities as partial event regularities, which suggest occasional and non-universal actualisation of a mechanism over a definite region of time-space. Demi-regularities have a particularly important role in the context of discovery in which they can contribute to the creation of hypotheses about underlying mechanisms, but also in the context of analysis in which they can generate and help assess explanations. Importantly, quantitative studies can potentially reveal non-spurious and non-obvious demi-regularities.

xiv These scales were developed by professor Gavriel Salomon and professor Lars Vavik, piloted by me in two classes at two schools to check for variables that the students thought were missing, to check that the variables were understandable and considered relevant and to check for interpretation errors due to the wording of variables. Professor Gavriel Salomon subsequently implemented the necessary changes to the questionnaire. Interestingly, some of the most important variables in the study were based on student feedback, e.g. that it is hard to concentrate on school work at home and at school when one has unlimited online access to sparetime activities.

xv It is important to notice that Figure 2 on page 225 in the printed version of Article 1 is incomplete. The correct Figure 2 is included at the end of Article 1 as it is presented in Part II of this thesis.

xvi It is important to notice that Figure 4 on page 109 in the printed version of Article 2 is missing. Figure 4 is included at the end of Article 2 as it is presented in Part II of this thesis.

Part II

The Articles

\[1\] In Article 1, it is important to notice that Figure 2 on page 225 is incomplete. The correct Figure 2 is included at the end of Article 1 as it is presented in Part II of this thesis. Also note that in Article 2, Figure 4 on page 109 is missing. Figure 4 is included at the end of Article 2 as it is presented in Part II of this thesis.
Article 1
Antecedents of Students’ Self-Regulatory Strength in Technology-Rich School Environments

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Abstract. The internet activity of adolescents has increased to a considerable extent over the past few years. A key question is how students are able to regulate their study efforts in technology-rich classrooms. With the introduction of internet access in the classroom, a conflict of motivations may ensue between short-term rewards of playing games, interacting on social media or surfing the net and the long-term rewards of academic achievement. The purpose of this article is to explore the antecedents of students’ self-regulatory strength. The antecedents are students’ school motivation and school-related factors (use of internet as a learning resource at school, as well as distinct quality aspects of the teaching, teacher expectations, explanatory skills and classroom management). Regression analysis and structural equation modelling (SEM) were carried out based on 3400 student (15-17 year olds) answers to a questionnaire administered in 60 secondary schools. First, the regression analysis shows significant associations between the regressors and students’ regulatory strength. Second, the SEM analysis shows that any positive effect of the teaching on students’ self-regulation depends to a significant extent on the attitudes of the students towards the school as an institution. Third, our results show that the provision of the internet as a teaching resource induces a motivational conflict between recreational internet activity and school-related academic work. This conflict has a clear negative effect on students’ regulatory strength in academic work. The conclusion must therefore be that it is difficult to make use of the many internet affordances for school learning within schools without a critical
awareness of the potential negative side effects on students' self-regulatory strength.

**Keywords:** ICT and education; technology-rich classrooms; self-regulation; motivational conflict.

**Introduction**

The internet activity of adolescents in and out of school has increased to a considerable extent over the past few years. The use of the internet in the context of school has long fascinated educational researchers, politicians, educational bureaucrats, teachers and students. Some see the arrival of information and communication technology (ICT) in schools as part of schools' necessary adaptation and modernisation (Søby, 2013). ICT has contributed to efficiencies in many careers, so why not in school? Others regard the internet as a potential tool for strengthening learners' creative work with information sources (Willett, Robinson & Marsh, 2009). Searching for information and synthesizing information from multiple sources is an important skill in a society in which access to information increases significantly year on year (European Commission, 2013). On the basis of such reasoning, Nordic educational authorities claim that digital skills are an important competency (Finnish National Board of Education, 2014; Skolverket, 2013; Utdanningsdirektoratet, 2012). School should prepare an individual for life after schooling, so why not use ICT as a writing tool, for simulations, for the gathering of information and for communication? Students are currently expected to make academic use of the internet. However, the technology also affords the possibility to off-task behaviours in the classroom: chat, browse websites and play games.

A significant professional controversy is found in the question of what effect different varieties of ICT use in school can have on academic achievement. One argument is that the conscious use of ICT tools can contribute to more effective learning (Rutten, van Joolingen, & van der Veen, 2012). ICT can, for instance, help visualise explanations of dynamic processes, which traditional textbooks struggle to do in a similar manner (Clarke & Mayer, 2011). An example is a physical explanation of what happens inside a pump when a person uses the pump to blow air into a bicycle tire. The possibility of visualising the dynamic mechanisms involved means that educational computer programmes are better able to explain the physical processes than a textbook's step-by-step images of certain stages of the process combined with textual explanations (Mayer & Moreno, 2002). Another example is that educational computer programmes make it possible to simulate processes which otherwise are difficult to experiment with, such as simulating blood flow in the body, macroeconomic mechanisms, physical processes in zero gravity, cell division and so on. In short, it is argued that ICT can contribute to unique opportunities for learning complex
academic material in an effective manner (Smetana & Bell, 2012). Others believe that learning activities in school will offer an amputated experience if learners cannot use the information tools that actually exist in the world outside school (Greeno, 2006). An example of this is the argument that traditional school examinations without the help of external aids promote an artificial control of knowledge (Ludvigsen, 2012). Yet others propose a socio-cultural view that knowledge is built into the apparatus that we use. From this theoretical perspective, thinking is no longer regarded as something that takes place exclusively in a person’s head, but rather it occurs in the interaction between the person, the object and the tools that are employed (Säljö, 2001, p. 83).

On the basis of the above descriptions, there are scholarly arguments for the use of ICT in schools. Following this reasoning, the educational authorities in some countries (such as Norway) have put significant resources into purchasing personal computers with internet access for almost all students in upper-secondary education. Further, similar purchases of computers for many students in primary and lower secondary school are expected to occur. Norway, Sweden and Finland come top in Europe with regard to ICT access at 11th grade (European Commission, 2013; p. 12), but the intensity of ICT use in lessons by teachers is much lower in Finland compared to Sweden and Norway (European Commission, 2013, p. 56). Investments have also been made in learning platforms as communication tools between teachers and students, as administrative tools for school management and as a teaching resource (for instance, electronic textbooks and educational programmes that are incorporated in the learning platforms). A great deal of research has been carried out into how students use computers in an educational context for academic work (e.g. Smets & Mooji, 2001) and the impact on learning (Angrist & Lavy, 2002; Fried, 2008; Vavik et al., 2010), and research also indicates the darker sides of student use of computers in school (Elstad, 2006, 2008), such as tendencies to multitask and to carry out non-academic activities during lessons (Fried, 2008; Brante, 2009).

Self-regulation is a crucial component if students are to mindfully apply effort at school (Salomon, 1983). Self-regulation or self-discipline “outdoes IQ” in predicting academic performance of adolescents, and “A major reason for students falling short of their intellectual potential [is] their failure to exercise self-discipline” (Duckworth & Seligman, 2005, pp. 939, 944). Regulatory skills are important because “grades depend heavily on the ability to sustain effort and concentration despite boredom, fatigue, and innumerable distractions over the course of an academic year” (Duckworth & Seligman 2006, p. 199). Regulatory strength requires (1) “the ability to suppress prepotent responses in the service of a higher goal and ... such a choice is not automatic but rather requires conscious effort” (Duckworth & Seligman, 2005, p. 944) and/or (2) that teachers influence students’ regulatory strength by means of their teaching. The
purpose of this article is to explore the antecedents of students’ regulatory strength in technology-rich school environments.

**Theoretical framework**

Mindful engagement is crucial for achieving deep learning in academic tasks (i.e. the answers students are required to produce). Intellectual demands are inherent in students’ academic work at school: the products students are to formulate, the operations that are to be used to generate the product and the learning resources available to students in technology-filled classrooms while they are generating a product (Doyle, 2006). Students may find school boring, and at the same time, they need regulatory strength to overcome the temptation of off-task behaviours while they are doing academic tasks when they have access to the internet and games. A motivational conflict then arises, and this motivational conflict may influence the students’ regulatory strength. School motivation to learn the material in question is here regarded as a precursor of regulatory strength. Regulatory strength expresses sincerity, self-exertion, endurance of hardship and concentration. To simplify matters, it is assumed here that the student has two types of decision alternatives: either (1) to concentrate on an activity that is on the academic agenda for that lesson, with or without use of technology; (2) to engage with non-academic activities, which gives the student an immediate euphoric experience; or (3) a mix between 1 and 2. Students in technology-filled classrooms have their own techniques for switching from window to window so that the teacher does not notice that they are writing e-mails, chatting or browsing some of the time (Blikslåt-Bals, 2012). There may be periodic variations in the prevalence of non-academic activities in response to contextual factors, such as the subject matter or the quality of the teaching. To some extent, students manage to switch from academic activities, in accordance with the school programme of action, to non-academic activities, and vice versa, but multitasking takes up so much of the students’ information processing capacity that attention is diverted from the learning task on the academic agenda (Opher et al., 2009).

The non-academic activity may be conducted surreptitiously or openly. The teacher may or may not constrain students’ off-task behaviours and/or influence the students’ school motivation. This study integrates three strands of theories that have their focal points in students’ regulatory strength in academic work: (1) a theory on school motivation and self-regulation, (2) Didaktik theory and (3) a theory on affordances of ICT in technology-rich school environments.

**Theory on school motivation and self-regulation**

One antecedent mental state that causes self-regulatory strength in academic work is school motivation (Zimmerman & Schunk, 2011). Therefore, we expect
positive associations between students’ school motivation and their self-regulatory strength in academic work. This is hypothesis 1. Research on motivation gives empirical support, however, for the claim that students exhibit a decline in their intrinsic motivation for school learning as they enter and move through secondary education (Eccles, 2014; Eccles et al., 1993; Eccles & Wigfield, 2002). There is a systematic grade-related change from an orientation of intrinsic to more extrinsic motivation. These psychological shifts of orientation are associated with a general mismatch between the needs of developing students and the opportunities provided by schools. In schools, computers are primarily used as tools for writing, for collecting information and for communication, and students are expected to use the internet only for academic purposes. Yet, a motivational conflict—and thus a self-regulatory challenge—may arise with easy online access in the classroom, with students drawn to undemanding off-task behaviours while trying to engage in demanding academic work.

Our basic model of the self-regulation process is Mischel and Ayduk’s cognitive-affective processing model (2011), which relies on discounting theory (Ainslie, 2001). Discounting refers to a method of comparing immediate and delayed rewards, and it is an important attribute in our decision making in that our decisions demand that we weigh temporally distributed consequences. Practically all of us are faced with ‘choice situations’ that require us to choose between present and future rewards. In these situations, when we have a choice between rewards at different points in time, the relative value we assign to the choices is discounted in accordance with anticipated delays until they are realised. Hence, our subjective valuation of a delayed reward is inversely related to the length of the postponement (Ainslie, 2001). Extensive research on human decision making has identified this type of hyperbolic pattern and our proclivity to attach more importance to immediate rather than delayed rewards. In such cases, our behaviour can be described as dynamically inconsistent—the very modus operandi of weakness of will (Elster, 1979). The existence of competing motivations is called motivational conflict in this article.

Students may have academic ambitions and clear objectives for what they want to achieve in their education, for which consistent diligent effort at school in required. Yet, at the same time, they may be found lacking in the regulatory strength needed to work strategically in the present. The qualitative mechanisms of this paradigmatic case of self-regulatory ability can be explained by a model of hyperbolic discounting. However, we do not believe that students discount the future by a precise quantitative function. Curves I and II in Figure 1 represent the current value of reward A (mindful effort in academic work) and reward B (off-task behaviour), respectively. We assume that the student has A and B as possible future options at a given point in time, represented by t1 in Figure 1 (well ahead of the time of choice). At that particular point in time (t1),

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the student values academic work over off-task behaviour because of its contribution to the achievement of a future educational objective at time-point t3. In other words, at t1, the student prefers the greater but delayed academic reward at t3. However, as the time to the short-term reward draws close (t*), the subjective value of short-term reward B catches up and equals the subjective value of long-term reward A, which is illustrated by an intersection of curves I and II in Figure 1. Thus, between t* and the time of the short-term reward at t2, the attractions of off-task digital behaviour loom larger than those of mindful effort in academic work. In other words, between t* and t2, the current subjective value of the smaller reward is higher, and consequently, at t2 the student takes the smaller reward.

Subjective value

![Diagram showing curves I and II with time points t1, t*, t2, and t3](image)

Figure 1: The motivational conflict arises between t* and t2 when a non-academic activity (curve II) provides a quick gain and it looms larger than the academic work illustrated by curve I (figure adjusted after Ainslie, 2001).

To sum up, the current subjective value of reward A is greater than the current subjective value of reward B before the point in time t*. However, after t* and until making the decision to cash in the smaller reward of the imminent alternative B at t2, the subjective value of the delayed alternative A is smaller than B. In the absence of an effective application of self-discipline or external contextual restrictions, e.g. constraints enforced by a teacher, the realisation of alternative B can be said to provide higher utility than alternative A in the prospect of an imminent reward. A clear-cut hypothesis is not defendable because several mechanisms are possible, but we explore the associations between a motivational conflict (between leisure and school-based activities) on the one hand, and students’ self-regulatory strength in academic work on the other. This is our exploratory hypothesis 2. Further, we explore the associations

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between school motivation and motivational conflict. This is our exploratory hypothesis 3.

**Didaktik theory**

Hopmann (2007) characterises the common core of the German concept Didaktik as “restrained teaching”. A number of studies show that teaching quality impacts student achievement. These effects are quite large (Aaronson, Barrow, & Sander, 2007; Goldhaber & Hansen, 2010; Rivkin, Hanushek, & Kain, 2005; Rockoff, 2004). In this article, we limit ourselves to focusing on three different aspects of restrained teaching: teachers’ exposed expectations about student achievement (Braun, 1976; Cooper & Tom, 1984), teachers’ classroom management (Doyle, 2006; Emmer & Stough, 2001) and teachers’ instructional explanatory skills (Duffy et al., 1986; Penno et al., 2002). Students’ choices are possibly subject to constraints imposed by the teacher.

‘Classroom management’ is understood as a method of facilitating positive student behaviour and achievement. Sugai and Horner (2002) maintain that the central components of classroom management are the maximised allocation of time for instruction and the arrangement of instructional activities to optimise academic engagement and achievement. Hence, classroom management is by definition a factor that is supposed to help students attend to the academic tasks at hand, thereby increasing the amount of engaged time. It is therefore hypothesised that classroom management is associated with students’ regulatory strength (hypothesis 4). Successful classroom management and building good relationships may nurture students’ school motivation (hypothesis 5). However, opposite mechanisms are also possible.

A common feature among effective teachers is that they have high expectations on behalf of their students’ academic behaviour, learning and achievement, a phenomenon often referred to as the “Pygmalion effect” (Rosenthal & Jacobson, 1968; Rubie-Davies, Peterson, Sibley, & Rosenthal, 2014). Drawing on the theoretical framework, this increase in achievement is the result of an increase in the duration and/or quality of students’ active engagement in trying to learn specific academic content. Based on this assumption, we hypothesise that teacher expectation is associated with students’ regulatory strength (hypothesis 6) and their school motivation (hypothesis 7). Further, we expect that teachers’ instructional explanatory skills are associated with students’ regulatory strength (hypothesis 8) and their school motivation (hypothesis 9).

**Theory on affordances of ICT**

Affordances of ICT refer to the perceived and actual properties of digital resources (computers and mobile phones), primarily those functional properties

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that determine just how the thing could possibly be used in school (Salomon, 1997). Wikis, blogs and WebQuest and other web-based communication tools might have the potential to allow teachers and students to increase student engagement by enhancing the experiential type of learning (Blessinger & Wankel, 2012), depending on how the actual properties are perceived and put to use. The combination of actual and perceived utility thus determines their affordance. Similarly, the use of social media in school can have a positive impact on some students’ motivation for school work (Luckin et al., 2009). Students can be motivated by social media (Luckin et al., 2009), and online tools facilitate conversation and interaction online among youth (Kaplan & Haenlein, 2010; Selwyn, 2011; Vasbø et al., 2012), and this motivation may nurture school motivation or not. Our exploratory research question is as follows: How are affordances of ICT in school associated with school motivation (exploratory hypothesis 10), motivational conflict (exploratory hypothesis 11) and students’ regulatory strength (exploratory hypothesis 12)? Based on these hypotheses, we create this theoretical model:

![Diagram](image)

Figure 2: The hypothesised research model (hypothesis is abbreviated as H).

**Methods**

**Sample**

The empirical study that forms the basis for the analysis was completed with 60 secondary and upper secondary schools between February and March 2013. We chose schools located in, or close to, main city areas in the Nordic countries,
since city teens are most likely to have full broadband access and thus have had the opportunity to engage in the same spectrum of digital activities and develop similar digital habits in all three countries. A total of 3400 students (15-17 year olds) in general study programs voluntarily participated. None of the students who were present declined to take part in the survey.

**Instrument**

Students answered a questionnaire on different aspects of school situations and propositions about schools. The questionnaire was partly self-developed and partly adapted from internationally validated scales and surveys, such as the “Student related aspects of school climate scale”, “Approaches to learning scale” and “Disciplinary climate scale” from PISA 2009 and Tangney, Baumeister, and Boone’s (2004) “Self-control scale”. The work was done within a classical test theoretical paradigm in which psychological constructs were contextualised through a set of individual questions that were asked of the students. To assess the measurement reliability of the indicators for each of the scales, Cronbach’s alpha was used. Alpha coefficients of .70 or higher were considered to be acceptable (Nunnally et al., 1994). Three of the concepts had an alpha lower than .70. However, this can be explained by only two items being used. The students were asked to respond to questions that included a Likert scale. Seven constructs were included in the structural equation model: self-regulatory skills in academic settings (per_I), α=.62 (e.g. “I experience difficulties in concentrating (reversed)”); motivational conflict induced by ICT (con_I), α=.68 (e.g. “I lose focus on my school work when I use the PC at school”); school motivation (val_I), α=.67 (e.g. “I enjoy school learning”); teacher’s explanatory skills (tea_I), α=.84 (e.g. “Teacher explanations make it possible for me to solve difficult problems”); teacher expectation (exp_1), α=.76 (e.g. “I look up to teachers who set high academic standards”); classroom management (clm_I), α=.87 (e.g. “The students do not manage to work well”, reversed); and internet use at school (“Time spend online while at school”). ICT use was measured by the following question: “How many hours per day do you spend on the internet at school?”

**Procedure**

The students completed the paper-based survey and handed them in to their teacher, who in most cases collected the questionnaires on behalf of the project and who sent them to the research coordinator. The students were asked to respond to questions that included a 6-point Likert scale with alternative response choices: Strongly disagree (1), Disagree (2), More disagree than agree (3), More agree than disagree (4), Agree (5) and Strongly agree (6). An exemption was the last-mentioned construct (where students chose one of the following boxes: 0-1 hours, 1-2 hours, 2-3 hours, 3-4 hours, 4-5 hours, more than 5 hours).
Data analysis

A regression analysis (Table 1) confirms significant associations between the regressors and the dependent variable (regulatory strength). Confirmatory factor analysis (CFA) was used to assess the factor structure. The assessments are based on the p-value for the χ2-statistic, RMSEA (root mean square error of approximation), CFI (confirmative fit index), GFI (goodness-of-fit index) and TLI (Tucker-Lewis index). The standard criteria of p > .05, RMSEA < .05 and GFI and CFI > .95 have been used for good fit (Kline, 2005). The measurement and the structural model were estimated with IBM SPSS Amos 22. The values RMSEA = .043, GFI = .974 and CFI = .967 indicate that the structural model in Figure 3 has an acceptable fit. Structural equation modelling (SEM) was used to analyse the direct and indirect relationships between the variables. SEM allows for the analysis of latent variables with multiple indicators and multiple equations and the testing of complex causal theories with multiple pathways. Ellipses represent the latent variables, circles represent measurement errors and rectangles represent the observed measured variables. The structural model consists of terms with paths (arrows) between them. The path arrows indicate theoretical common causes and the figures (standardised regression coefficients) reflect the measured strength of the connections. The strength increases with the numerical value.

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Table 1: Results of regression analysis when students' regulatory strength was the dependent variable
Results

The structural equation model shows the pathways (the arrows) between the variables in Figure 3. The analysis shows:

• Hypothesis 1: School motivation's effect on regulatory strength is significant (p<0.01), moderately large and positive [b(val_1→per_1) = 0.30]. This means that the null hypothesis is rejected in favour of hypothesis 1 at the 1% significance level. One interpretation is that the higher level of school motivation that students report, the higher level of regulatory strength they report having.

• Hypothesis 2: School motivation's effect on motivational conflict is weak. However, the null hypothesis is rejected at the 5% level (p<0.05) because of the large number of respondents in this study. Our inference is that the effect is small and negative [b(val_1→con_1) = -0.06] and that a further exploration of the links between school motivation and motivational conflict should be an avenue of further research.

• Hypothesis 3: Motivational conflict's effect on regulatory strength is significant. The null hypothesis is rejected at the 1% level (p<0.01). The effect is very large and negative [b(con_1→per_1) = -0.65]. It is reasonable to conclude that the null hypothesis is false and that the higher motivational conflict that students report, the weaker regulatory strength they report having.
Figure 3: Structural equation modelling of exogenous variables (val_I = school motivation; con_I = motivational conflict induced by ICT; exp_I = teacher expectation; tea_I = teacher’s explanatory skills; clm_I = classroom management; ict = ICT use at school) and the endogenous variable (per_I = students’ self-regulatory strength).
Hypothesis 4: Classroom management’s effect on regulatory strength is weak but significant \((p<0.05)\) because of the large number of respondents. The effect is small and positive \([b(clm_{I} \rightarrow per_{I}) = 0.07]\). A further exploration of the links between classroom management and regulatory strength is needed.

Hypothesis 5: Classroom management’s association with school motivation is significant \((p<0.01)\) and positive \([b(clm_{I} \rightarrow val_{I}) = 0.26]\). One interpretation is that the higher classroom management that students report, the higher the school motivation score is.

Hypothesis 6: Teacher expectations’ relation to regulatory strength is not significant \((p>0.05)\). The effect is very small and negative \([b(exp_{I} \rightarrow per_{I}) = -0.03]\). A further exploration of the links between teacher expectations and students’ regulatory strength is an avenue of further research.

Hypothesis 7: Teacher expectations’ association with school motivation is significant \((p<0.01)\), large and positive \([b(exp_{I} \rightarrow val_{I}) = 0.59]\). It is reasonable to conclude that the null hypothesis is false and that the higher teacher expectations that students report, the higher the school motivation score is.

Hypothesis 8: Teacher’s explanatory skills’ effect on regulatory strength is weak but significant \((p<0.05)\). The effect is positive \([b(tea_{I} \rightarrow per_{I}) = 0.10]\). A further exploration of the links between teacher explanatory skills and students’ regulatory strength is needed.

Hypothesis 9: Teacher’s explanatory skills’ association with school motivation is significant \((p<0.01)\), large and positive \([b(tea_{I} \rightarrow val_{I}) = 0.42]\). One interpretation is that the higher that students report teacher’s explanatory skills, the higher the school motivation score is.

Hypothesis 10: School motivation’s association with ICT use in school is weak but significant \((p<0.05)\). The effect is negative \([b(val_{I} \rightarrow ict) = -0.07]\). A further exploration of the links between school motivation’s associations with ICT use in school is needed.

Hypothesis 11: ICT use in school’s effect on motivational conflict is significant \((p<0.01)\) and clearly positive \([b(ict \rightarrow con_{I}) = 0.21]\). One interpretation is that the higher level of ICT use in school that the students’ report, the more they report experiencing a motivational conflict.

Hypothesis 12: ICT use in school’s effect on regulatory strength is not significant \((p>0.05)\) and is very small and negative \([b(ict \rightarrow per_{I}) = -0.01]\). A further exploration of the links between ICT use in school and students’ regulatory strength is an avenue of further research.
Discussion and conclusion

The primary aim of this paper was to explore how time spent online in school and students’ perceptions of being trapped between two worlds—one digital and one with academic demand—were statistically associated with students’ perceptions of their ability to remain focussed and delay gratification through their regulatory strength. This choice of focus draws its legitimacy from two main assumptions: that students need to learn increasingly challenging higher-order thinking skills and develop deep knowledge and understanding at school, and that the level of mastery of these kinds of skills and knowledge relies to a high degree on students’ differential investment of sustained and conscious mental effort. Even if we assess the use of the internet in classrooms in terms of the relation to students’ regulatory strength, it does not mean that we see regulatory strength as a panacea for the problems in education. Indeed, it can be argued that regulatory strength should be regarded in curve-linear terms, in that both too little and too much can be detrimental to achievement (Ainslie, 2001). However, we justify our choice of focus on the grounds that previous qualitative research has identified focused attention among students as a crucial factor for systematic and sustainable advances in higher-order thinking skills and the development of deep knowledge (e.g. Blikstad-Balas, 2012). Acknowledging that spending time online in a classroom setting is played out against the backdrop of other salient contextual factors, we included four factors commonly held to be important for student achievement in general and student self-regulatory strength in particular. Thus, it becomes possible to quantify some of the interrelationships currently at work in classrooms. Based on the assumptions mentioned above, the choice of the theoretical framework seemed reasonable due to the similarities in the conceptualisation of learning as a product of the duration and quality of students’ active engagement with particular tasks.

The empirical findings suggest that the negative associations between students’ perceptions of a motivational conflict and their regulatory strength—a conflict partially fuelled by time spend online at school—is larger than the positive association between the three teacher-related constructs expectations, classroom management and explanatory skills and students’ regulatory strength. Given that the theoretical assumptions embedded in the structural model are indeed valid, the findings thus suggest that the positive effects of teachers’ explanatory skills and their efforts to regulate students’ classroom behaviours are to some extent undermined by students’ sense of being trapped between digital procrastination and real world demands—one dominated by instant gratification and one requiring its delay. The statistical associations between this motivational conflict and students’ regulatory strength are strong, while the
associations between teaching attributes and regulatory strength is somewhat weaker. A possible conclusion is that it is just the perennial struggle between focus and distraction taking on a digital form in 21st century Nordic classrooms. However, students have always found ways to distract themselves when faced with tedious, too easy or too demanding tasks.

There could be an element of truth in this claim, but more research is needed before we can state clear conclusions. However, it is unprecedented that students are faced with hardware and software professionally designed to capture and maintain as much of students’ attention as possible. Thus, the combination of open internet access and high student autonomy in upper secondary schools puts a premium on the successful exercise of regulatory strength, but this is increasingly hard to do even in the presence of good teaching. One might argue that it is the individual’s responsibility to pay attention and keep focus, and the teachers can only inform students about the risks and let them make their own decisions. Yet recent research indicates that the degradation of focus is not merely individual but social (Sana, Weston, & Cepeda, 2013). This means that the exercise of regulatory strength is adversely affected even if the student is just in direct view of the screen of a distracted peer. There is also a worry that it becomes gradually more acceptable to succumb to instant gratification, and that educationally meaningful tasks that are not instantly intrinsically motivating are not carried out with the investment of mental effort required to develop important higher-order thinking skills and depth-oriented knowledge (Salomon, 1983).

The empirical findings show that the current use of the internet in Nordic classrooms is positively associated with students’ perceptions of a motivational conflict. The strength of this empirical association is moderate. More research is needed to better understand these processes. If causal processes reflect this empirical association, it can be argued that the current provision of internet access in classrooms exacerbates a motivational conflict that can have serious ramifications for the necessary exercise of regulatory strength in academic work. We need also more research to better understand this link between students’ motivational conflict and their self-regulatory strength. Furthermore, if the statistical associations between regulatory strength and motivational conflict reflect causal processes, we may say that one way of reducing the mismatch situation between school content and the students’ spontaneous learning desire is for teachers to engage the student even more, to sugar-coat learning; or to make the learning task more palatable; or to concentrate more on the content of the curriculum that appeals to the students’ spontaneous learning desire (Elstad, 2006). The empirical findings might indicate that the current provision of internet access in classrooms has the potential to undermine the development of students’ higher-order thinking skills and acquisition of deep knowledge and

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understanding; thus, it is negatively associated with the subsequent fulfilment of students’ academic ambitions and in the long run is possibly detrimental to students’ sense of personal agency stemming from experiences with overcoming obstacles by sustained effort in a school setting. An attractive way of reducing the extent of non-academic activity is to lay the ground for the students themselves to behave more responsibly with respect to the obligations they have to engage in the programme activities that lead to learning in the classroom. This includes inter alia skills in exercising agency and self-regulation. This requires that the students assume responsibility when the teacher performs transfer of agency over learning from herself to the student. However, more research is needed to better understand the mechanisms of these assertions.

The empirical analysis that has been carried out in this article rests on the premise that regulatory strength is an important prerequisite for success in school by contributing to depth in the learning process. The development of higher-order thinking skills and deep disciplined knowledge is important for intellectually and future-oriented school-based learning. In other words, we assume that high effort via self-regulatory strength is a typical attribute in a results-oriented school environment. This assumption, however, is neither self-evident nor uncontroversial. It is possible to argue that a school can and should adapt to developments in youth culture by providing a space for the type of internet activity that is characteristic of contemporary youth culture (Erstad, 2014; Ito et al., 2010). The distinction between curriculum and pedagogy is important to consider when these claims are put forward. While curricula reflect what a given society regards as essential knowledge, skills and attitudes based on a complex process of compromise between a number of legitimate stakeholders, pedagogy refers, among other things, to the processes through which the state-sanctioned content is supposed to be introduced to students. And while students’ constantly changing spare-time activities and habits tend to have only a minor impact on the development of state curricula, they are crucially important for the competent teacher who uses students’ life-worlds as a gateway to the development of thinking skills, deep knowledge and understanding. It is against this background that claims regarding the digital disruption of education should be understood, since while it is uncontroversial to say that teachers could reach more students by utilising knowledge about students’ life-worlds in order to introduce the content of the curriculum, it is unsettling to a different extent to claim that the state sanctioned content of curricula should be dictated by dominant youth trends. The latter would require that we leave behind what we consider a key mission of education, namely, to provide a bridge between the knowledge, skills and attitudes developed and treasured by previous generations and the knowledge, skills and attitudes one might envisage as important in the future. We are thus debating a different type of education.
There can be a trade-off between the vertical acquisition of knowledge—which in political debate is coupled with ideas of the knowledge-based society—and a result-oriented school on the one hand and a school that embraces youth internet culture on the other. It is difficult to claim, on the basis of research, that opening up for or letting students themselves choose between off-task digital activities or academic pursuits within the school walls is without its problems. Our study provides empirical grounds to suggest that those who have strong opinions that schools should adapt to the extensive use of the internet, for instance, also need to acknowledge that such a move might have seriously adverse conative consequences, particularly for students lacking in impulse control and self-regulatory abilities. If the acquisition of higher-order thinking skills and a deep understanding of disciplinary knowledge is still a key function of education in the 21st century and if this function is at some extent contingent upon students’ regulatory strength, it is critical to find ways to reduce students’ motivational conflict and avoid increasing the tensions as the current integration of Internet in classrooms seems to contribute to.

**Limitations and needs for further research**

This section raises some concerns about the method used in this study and emphasises the need for complementary research approaches to develop a richer understanding of the links between students’ access to the internet and their self-regulation. It was not practicable for us to couple our survey data with indicators for value-added measures during the period prior to data collection. Coupling the measurements of student attitudes with performance measurements is highly demanding in research terms because this requires measurements at several different times. It is also demanding because the Nordic countries have regulations that place limitations on the practical opportunities of researchers in empirical surveys that are based on relatively substantial data material. It is, however, possible to carry out analytically oriented small-scale surveys, which can be useful in research for assessing possible causal processes. This is clearly an avenue of further research.

This study has inherent limitations which apply to more or less every equivalent study based on a cross-sectional approach. We acknowledge these limitations and argue that they can serve as a point of departure for future research. Of course, a number of factors may influence behaviour. In order to build an even stronger case for causality claims, longitudinal, experimental and quasi-experimental studies are required, plus particularly more qualitatively oriented studies of operating causal mechanisms in context. Another limitation of this study is the use of self-reported questionnaire data. The subjective component of such data is undeniable. Cross-sectional studies only present still-images of dynamically developing and interacting phenomena. Furthermore, assumptions
inherent in the SEM model might be unfounded, e.g. reversed causation may play a role, omitted variables may have influenced the overall model or variables that are not included in the model could be important. This study’s methodological approach makes it difficult to draw clear conclusions without first acknowledging the need for further validation of the findings that we regard as central. Some of the path coefficients are so small that we must urge caution. We believe, however, that our theoretical basic model is based on such a strong research foundation that we do not believe that the statistical associations highlighted in this study can be the result of coincidence or spurious connections. It should be emphasised that when we speak of teacher influence, the causal processes can go in either direction, from teacher to student or from student to teacher.

Our study, similar to other studies of student-teacher interaction, can be interpreted as an empirical support of the following statement: the student must also make an effort via regulatory strength if the teacher is to have a positive effect on the student’s learning work. In common with so much other research, our study underlines the importance of the teacher (Piopiunik, Hanushek, & Wiederhold, 2014) but also the importance of school motivation and motivational conflict. We see that there is a strong statistical association between students’ positive perceptions of a teacher and the degree to which the students value the school as an institution. When we look at the three distinct teaching quality aspects put together, we see that there are medium or large positive associations between each of the first three aspects (explanatory skills, classroom management and teacher expectations) and school motivation (path coefficients=0.42, 0.26 and 0.59, respectively). Hence, the three quality aspects of teaching seem to have a medium positive indirect association with regulatory strength via the construct school motivation. Furthermore, the construct school motivation is also slightly negatively (but significantly) related to the use of the internet in class (path coefficient=-0.07) and students’ sense of a motivational conflict (path coefficient=-0.06), thus adding to its influence on regulatory strength. This illustrates that a greater emphasis on student socialisation in the school community can also affect the same students’ self-regulation in learning. However, we need more research to understand the mechanisms involved in the processes that contribute to making students value school more strongly as an institution.

An in-depth qualitative follow-up study could be interesting to gain insight into the underlying cognitive and motivational processes. In-depth case studies with think aloud protocols, observations and interviews with students and teachers could be an interesting approach.
Digital media has attained a considerable position among youth, and it contributes to promoting trans-national cultural tendencies. The investigation reported in this article is done among 15 to 17 year-olds in Nordic countries. A further validation of this study should be done in different countries, different school contexts and different ages. This is also an avenue for further research.

Implications for practice

Despite its limitations, this study contributes to our understanding of the antecedents of students' regulatory strength. If the associations between the independent and dependent variables represent causal relationships, our findings may have implications for practice: the need for teacher professionalism and the need for meta-cognitive awareness among students in technology-rich classrooms.

Technology has become an ever-present factor in more or less every contemporary situation, while digital media has acquired a considerable significance in the lives of young people. Students bring their own, predominantly vernacular, conceptions of the internet to school, where academic literacy practices are expected. Thus, conflicting conceptions and practices are integral to the affordances offered by internet use in school. However, the salience of these conflicts will vary both on the level of the individual student, the school subject, the teacher and the classroom, the school and the wider educational and social contexts. It follows that the implications drawn from the study must be understood as informed suggestions based on this study's particular set of assumptions, the questions asked and the results obtained, and they will consequently resonate more with some particular configurations of contexts than others. However, within these limitations, the study offers valuable new insights into how students perceive of their technology-rich environment in relation to their educational endeavours, which deserve to be taken into account when policy initiatives within this area are considered. The crux of the matter is the empirically identified associations between students' sense of a motivational conflict and their self-regulation.

The need for teacher professionalism

The first question one needs to consider is the extent to which the net result of the trade-off between the cognitive benefits and conative drawbacks of internet use in the classroom is cumulatively positive based on the educational purposes one is pursuing. Since the assumption made in this paper is the need for regulatory strength on the part of the student in developing higher-order thinking skills and acquiring deep knowledge and lasting understanding, the terms of the trade-off would include the extent to which internet use improves epistemic access—in other words, how internet use is instrumentally valuable in

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terms of broadening and deepening students’ understanding of the defining conceptual frameworks and modes of thinking in different school subjects. Making this kind of professional judgment requires teachers with expert subject knowledge and knowledge of the optimal ways to provide learning opportunities which demand original, independent and joint thinking about worthwhile disciplinary content for particular groups of students, in the individual school subject and in cross-curricular work (Abramovich, 2013; Debele & Plevyak, 2012).

**The need for meta-cognitive awareness**

The second question one needs to consider is the following: Is it possible to prepare students for the task of taking on more responsibility for engaging in activities conducive to educational learning via meta-cognitive awareness? The importance of this question is evident when considering the possibility that distracted students not only lose out on the pertinent content being presented or discussed, but they might also contribute to an understanding of opting out as unproblematic. Moreover, they may provide second-hand distractions for their fellow students. In such an environment, students require both support in their pursuance of their academic ambitions and defences against powerful short-term incentives which undermine their academic efforts. These support and defence structures are not limited to the individual’s choices, but they are provided by the social and material context. In school, that context is first and foremost provided by the teacher. Metacognition includes skills in exercising agency and self-regulation, and the development of students’ strategies for action control and maintenance of intentions becomes a critical task for schools and teachers as the ability to delay gratification gains importance in open, technology-rich instructional environments.

Teachers need to develop critical awareness of the trade-offs involved between the possible cognitive benefits and conative drawbacks of internet use. This development can help teachers decide how, when, for what purposes and for whom the cumulative effects seem advantageous or not in light of the educational goals they are pursuing. More attention is needed to strategies which strengthen teachers’ pedagogical content knowledge to make them see viable compromises and alternatives. There is a need for increased emphasis on explicating both students’ academic ambitions and their relation to net activities and habits and their appreciation of school and its relation to schools’ academic mandate.
References


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Figure 2: The hypothesised research model (Hypotheses are abbreviated H).
Article 2
Learner antecedents of youth’s beliefs about agency and online learning

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PLEASE SCROLL DOWN FOR ARTICLE
ANTecedents of Youth’s beliefs about Agency and Online learning

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Abstract

Developing students’ digital skills and self-confidence in their ability to purposefully use online learning opportunities is considered important for achieving educational objectives. This study empirically explores antecedents of young people’s beliefs about agency in online learning by applying structural equation modeling to a sample of 3400 Nordic youth age 15–17. The targeted antecedents are young people’s preferences for either net-induced self-determination of learning aims, content, and processes (online culture) or institutionalized schooling as they currently experience it (school culture). We find that both factors are positively related to digital agency, but that the relationship between online culture and school culture is strongly antagonistic. Furthermore, online time in class is positively related to online culture but negatively related to school culture. We argue that formal schooling’s efforts to capitalize on students’ informal learning experiences through introducing more net-based activities in class might bolster digital agency through improved technical expertise (medium-related online skills), while simultaneously de-privilege institutionalized schooling and the acquisition of the substantial knowledge required for the development of content-related online skills. Students’ preference constructions and beliefs regarding formal and informal learning processes are particularly significant if we are to facilitate educationally desirable synergy effects and avoid troubling inconsistencies.

Keywords: student agency, informal learning, formal learning, online culture, school culture

Introduction

Digital media are ubiquitous in the lives of Nordic youth (Roth & Erstad, 2013). Increasing portions of their lives are spent consuming, producing, and interacting with or through digital media (Westlund & Bjar, 2014). Large-scale studies show that Nordic youth are among the most digitized demographic groups in the world and that they perceive themselves as having advanced digital skills (Traillon, Ainley, Schulz, Friedman, & Gebhardt, 2013). Engagement in participatory digital cultures (Jenkins, Purushotma, Weigel, Clinton, & Robison, 2009) can influence the way young people perceive learning and the role of formal schooling in their lives (see e.g. Loveless & Williamson, 2013), potentially altering how young people see the relationship between their informal online learning experiences and the purposes, processes, and content of formal education (Buckingham & Willett, 2013; Greenhow & Levin, 2015). From the perspective of education, ubiquitous connectivity offers a plethora of learning opportunities beyond the scope of formal schooling. Arguably, the degree to which young people are able and willing to take advantage of these online opportunities, that is, to exercise agency in online learning, is becoming increasingly important.

Developing students’ digital skills and self-confidence in their ability to purposefully use online learning opportunities is considered important for achieving educational
objectives. According to the Organisation for Economic Co-operation and Development (OECD):

Empowering youth to become full participants in today’s digital public space, equipping them with the codes and tools of their technology-rich world, and encouraging them to use online learning resources – all while exploring the use of digital technologies to enhance existing education processes … – are goals that justify the introduction of computer technology into classrooms. (2015, p. 186)

The OECD’s Definition and Selection of Competencies (DeSeCo) project named the ability to use tools interactively as a psychosocial prerequisite for a successful and well-functioning life (Rychen & Salganik, 2001).

National policymakers draw on the OECD’s work when drafting national curricula. As a testament to the importance attributed to developing students’ digital agency, in 2006, the Norwegian government went as far as to include digital competence in the new national curriculum as a basic skill to include in all subjects at all levels (Kunnskapsdepartementet [Department of Education], 2006). Some educational technologists saw this change as an historic event: “Never before has digital competence achieved such status in curricula, neither nationally nor internationally” (Krumsvik, 2011, p. 39). The importance of developing students’ digital agency is reflected in educational policy priorities both internationally and nationally.

However, there is no consensus on the factors that influence students’ sense of digital agency, although daily participation in informal online culture is often presented as a necessary element. With ubiquitous connectivity, students can engage in participatory digital cultures (Jenkins et al., 2009) that “offer the potential for self-directed or spontaneous learning opportunities” (Greenhow & Lewin, 2015, p. 13). It is presumed that powerful informal pedagogies operate in these everyday participatory online cultures (Loveless & Williamson, 2013), which can empower learners through “greater agency, opportunities to participate in networked communities, and access [to] a wide range of resources to support knowledge building and collaboration” (Loveless & Williamson, 2013, p. 13).

In contrast, digital practices in formal educational contexts are often presumed to exert much less influence on students’ sense of digital agency. In fact, many scholars (e.g., Buckingham & Willett, 2013) suggest that there is a widening gap between students’ out-of-school digital-life worlds and students; experiences at school, that is, that there is a “digital dissonance” in which “educators and learners [are] unable to recognize the potential benefits” (Greenhow & Lewin, 2015, p. 13). Arguably, educators tend to overlook the diversity of some learners’ digital experiences and instead “domesticate” (Salomon, 2016) the Internet and digital technologies to fit traditional, established approaches (Warschauer & Matuchnik, 2010). Internet use in formal contexts, therefore, can conflict with the development of innovative practices seen in some participatory online cultures (Green & Hannon, 2007). Still, the influence of participation in formal school culture can affect students’ sense of digital agency in unexpected ways that either complement and expand on or conflict with and compete with the influences of participation in informal digital cultures.

The purpose of this article is to explore the factors that are associated with learners’ sense of agency in online learning. We are particularly interested in how students’ preferences regarding either informal online cultures (online culture) or formal school cultures (school culture) are associated with students’ sense of agency in online learning and whether these preference constructions are primarily synergistically, independently, or antagonistically related to one another. In addition, we want to see how the provision
of time for online activities at school, that is, introducing access to online culture in school settings, is related to students’ digital agency.

It is important to explore these issues for a number of reasons. First, an enhanced understanding can inform the design of technology-rich instructional environments in which attributes of formality and informality function synergistically, not antagonistically, in relation to fostering students’ sense of digital agency. Second, understanding how the development of students’ sense of digital agency is distributed among settings and ideational preference constructions is useful for pedagogical planning and practices in the digital age. Third, the findings can indicate how the current use of online access in participating schools is associated with students’ sense of digital agency and thus provide a basis for problematizing the sometimes exaggerated claims of educational uses of digital technology (Selwin, 2016). Finally, the findings can inform the debate regarding equity of digital practices in school. The use of digital media for non-academic purposes at school (see e.g. Selwin, 2009) is not evenly distributed among students, and this use might influence some students more than others. This phenomenon deserves attention, and our findings shed light on how deeply entrenched students’ preference constructions are.

Research on influences on agency in online learning

Numerous studies on information and communications technology (ICT) in education assume that students’ sense of agency in learning is enhanced by the use of digital technologies. Even though student agency is typically not the research focus, the achievement of agency is presented as an assumed characteristic of self-directed activities, such as searching online, gaming, and new media practices in general. For example, Ito (2010) stated that “looking around online and fortuitous searching can be a self-directed activity that provides young people with a sense of agency” (p. 57); “these forms of gaming represent opportunities to experience collective action and to exercise agency and political will” (p. 220); and “new media practices are becoming the vehicle for some youth to exercise more agency in defining the terms of their own work practices” (p. 301).

Kumpulainen et al. (2009, p. 32) argued that in school contexts, technology can promote student agency when students are allowed to use the digital knowledge they acquire outside school for school purposes:

Outside the classroom, the students have better chances to display their own know-how, which would not necessarily come to its own in the classroom. Children learn things like the use of new technology considerably quicker than adults do, and it pays to make use of this situation by bringing laptops, cell phones, Internet tablets, and other easily usable gadgets into play. Children are also quick to learn and develop new ways of piggybacking technology, so the use of gadgets is an excellent way of highlighting children’s own expertise and agency.

Kumpulainen et al. (2009) argued that the fact that young people tend to be more digitally competent than their elders can be used pedagogically to strengthen student engagement in school learning, while school learning can provide much-needed direction for students’ informal online learning efforts. Similarly, Barron (2006) maintained that it is important to look within and across settings to understand which factors influence students’ digital fluency. She concludes, however, that “we have little information on synergies between participation in technologically mediated informal learning activities and more formal educational environments and the conditions that make boundary-crossing activities possible” (p. 198).
In a particularly relevant empirical study, van Deursen, van Dijk, and Peters (2011) explored the effects of gender, age, attained educational level, Internet experience, and level of Internet use on medium- and content-related Internet skills. Medium-related Internet skills refer to a basic set of skills in using Internet technology (derived from concepts such as instrumental skills, technological competence, technological literacy, and technical proficiency). Content-related Internet skills refer to a capacity to use the Internet strategically as a means of reaching particular goals, such as fulfilling information needs. By analyzing medium- and content-related Internet skills separately, the authors showed that age is negatively associated with medium-related skills but is positively associated with content-related skills. Thus, regarding content, older generations perform better than youth, whereas youth outperform older users in possessing the technical skills necessary to effectively navigate the Internet. The authors also found that educational attainment seems significant for medium- and content-related Internet skills, and they commented that this finding “contrasts somewhat with other research that claims that people learn digital skills more in practice than in formal educational settings” (van Deursen et al., 2011, p. 125). Similarly, the results revealed that Internet experience contributes only to medium-related skills, as the authors found that “content-related skills do not grow with years of Internet experience and the number of hours spent online weekly” (p. 125).

Various concepts denote the ability to navigate digital and information environments for finding, evaluating, and accepting or rejecting information—for example, digital literacy, media literacy, information literacy, digital fluency, digital competence, and digital skills, among others (Miller & Bartlett, 2012). These concepts are based on definitions that in one way or another combine technical aspects, intellectual capabilities, and substantial uses of digital technologies. Although technical expertise dominated early conceptualizations, more recent definition efforts emphasized the intellectual and substantial issues. For example, van Deursen and van Dijk (2009) noted that there is not enough empirical data to validate the structures and content of various definitions of digital competences or skills. Instead, the authors highlighted four research directions:

1. Operation of digital media
2. Uses of specific media and the formal structures on which they are built (e.g., the Internet offers hyperlinks)
3. Content provided by digital media with a focus on information search behavior
4. Personal goals and benefits for using digital media, that is, strategic skills.

Van Deursen and van Dijk (2009) commented that the strategic skills for achieving personal goals and benefits have never been measured. We maintain that the fourth dimension corresponds closely with the conceptualization of student agency in online learning we use in this paper, because agency implies the strategic self- and goal-directed utilization of digital resources for specific personal purposes. The current study thus tries in a modest way to fill the research gap identified by van Deursen and van Dijk (2009) by exploring how two different student preference constructions, online culture versus school culture, as well as the time spent online in class, contribute to students’ sense of agency in online learning. To our knowledge, no one has carried out systematic empirical research on the nature of these relationships.

Background

Before we turn to the theoretical framework, a brief comment on the role of digital media in the lives of Nordic youth is necessary, along with a brief glance at some of the main features of the educational systems in Norway, Sweden, and Finland—commonly referred to as the Nordic model of education (Blossing, Insen, & Moos, 2014).
As previously explained, digital media are ubiquitous in the lives of Nordic youth (Roth & Eristad, 2013). Increasing portions of their lives are spent consuming, producing, and interacting with or through digital media (Westlund & Bjur, 2014). Ito (2010) claimed that these tendencies are transnational and that they are associated with friendship and interest-driven genres of participation for the purpose of “hanging out,” “messing around,” or “geeking out.” Large-scale studies show that Nordic youth are among the most digitized demographic group in the world and that they perceive themselves as having advanced digital skills (Fraillon et al., 2013). Castells (2010) coined the term “networked individualism” to describe the way social relationships are organized in the age of pervasive connectivity. With their extensive access, use, and self-confidence regarding these media, Nordic youth seem to epitomize “networked individualism.” Accordingly, “networked,” “connected,” “individualized,” and “creative” are key terms used to characterize the networked generation’s emerging digital identity (Loveless & Williamson, 2013; Rose, 1996; Selwin, 2014; Tapscott, 1999). However, research indicates that procrastination also belongs among these key characterizations pertaining to Nordic youth (Elstad, Arnesen, & Christophersen, 2016). Buckingham and Willett (2013) argued that these transnational trends may contribute to a greater convergence of youth cultures. Thus, it is likely that these trends also influence how young people perceive learning and the role of formal schooling in their lives, as well as how youth perceive the relationship between their informal online learning experiences and formal education.

The present study focuses on 15- to 17-year-olds in urban areas of Norway, Sweden, and Finland. From a European perspective, these countries form an interesting enclave, as all three represent Nordic welfare societies that emphasize strong public institutions, as well as self-determination and rights for young people. In terms of educational systems, the three countries still champion ideals of social cohesion, equal opportunity, and egalitarian values, the main tenets of the so-called Nordic model of education, at least at the rhetorical level (Blossing et al., 2014). In addition, the structural features of these societies are comparable—for example, nine or ten years of universal compulsory schooling and a relatively moderate proportion of private schools.

However, there are also notable differences between schooling in Norway, Sweden, and Finland. Finnish learners have performed within the top range of school achievement among OECD countries (though now in a slight decline), while Norwegian and Swedish learners have shown mediocre performances (OECD, 2015). Some commentators attribute this difference to the high status of teachers in Finnish society (Sahlberg, 2014), which gives Finnish teachers a stronger position of authority while conducting their work (OECD, 2015), and the correspondingly low status of teachers in Swedish and Norwegian society. Another difference is the degree to which computers are used in schools: Finnish learners use computers less frequently than Swedish or Norwegian learners (European Commission, 2013). The present study examines the age range (15–17 years) at which young people in Norway, Sweden, and Finland need to make key decisions about the type of higher education that they are going to undertake. At this stage, young people are first sorted into grades or streams, in accordance with the Nordic educational model (Antikainen, 2006). In Nordic welfare communities, upper secondary education is regarded as a right (Blossing et al., 2014), while the opportunities for 15- to 17-year-olds to enter the workplace are limited.

Despite some signs of reform, the traditional school model remains an important premise for the Nordic design of the institutional arrangement we call schooling (Blossing et al., 2014). To be effective, the traditional model depends on learner socialization; that is, the learner needs to accept, or at least adhere to, the school’s values. Arguably, this socialization, in turn, legitimizes the teacher’s authority and the
tasks that the school assigns. However, this traditional school model accommodates a
continuum of differences. In Norway and Sweden, national authorities have, to a large
extent, implemented a policy of promoting learners’ acquisition of knowledge and skills
in the academic areas covered by large-scale international surveys, for instance, by
introducing national tests in these subjects (Blossing et al., 2014). Thus, these large-scale
international comparative achievement studies have influenced the structure of
traditional academic school subjects, such as mathematics and science, but also reading
literacy. To strengthen learning results, Swedish and Norwegian authorities have asked
teachers to increase the learning intensity in traditional subjects at school (Blossing et al.,
2014). Therefore, the increased learning intensity and the growing importance of
traditional subjects have widened the gap between learners’ personal fields of interest
and the content offered in schools. Some scholars (e.g., Erstad & Sefton-Green, 2013)
have entertained the hope that the use of computers could bridge young learners’
interests and school content. Finnish learners also experience this gap (Hakkakainen et
al., 2000; Hietajärvi, Tuominen-Soini, Hakkarainen, Salmela-Aro, & Lonka, 2015), even
though the Finnish educational authorities have followed a different approach than their
Norwegian and Swedish counterparts (Sahlberg, 2014).

Theoretical framework

We draw upon an analytical approach that first requires constructing a model of the
social relationships to be analyzed. The analytical model includes the elements we
believe is important. As there is no established consensus on the explanatory
frameworks or social mechanisms that account for students’ sense of agency in online
learning, our theoretical framework consists of what we consider plausible factors and
saliency relationships based on theoretical presumptions, previous research, and
professional experience. The target of analysis then becomes the structural equation
model (SEM) that we construct, not the reality that the model is intended to explain.

The model we use is shown in Figure 1, and it includes the following six constructs:

1. Time spent online at school, that is, the time students report that they spend
   online during an average school day.

2. School culture, that is, a student preference construction characterized by the
   acceptance of institutionalized schooling as students currently experience it.

3. Online culture, that is, a student preference construction characterized by an
   emphasis on self-determination in learning content, processes, and aims induced
   by online access and experience.

4. Agency in online learning, that is, students’ experiences of being able to use
   online resources in a goal-directed manner to achieve learning goals.

5. Attitudes, that is, students’ views regarding which of the two learning arenas
   (school or online) is most conducive for developing good attitudes, such as
   honesty and respect for others.

6. School associations, that is, students’ views regarding the extent to which
   students associate their schooling with engaged participation and meaningful
   content, for example.

In Figure 1, the arrows indicate expectations of relationships, while the double-
headed arrows suggest indeterminate associations.
Figure 1. Theoretical model of the antecedents of agency in online learning.

Our main line of exploration, however, concerns the targeted antecedents for agency in online learning, namely, school culture, online culture, and time online at school, as shown in Figure 2.

Figure 2. Theoretical model of primary antecedents of agency in online learning.

The relationships between attitudes and school associations and the other constructs are of secondary concern in this paper (see Figure 3). Their main function here is the extent to which the empirical associations support or contradict the main line of exploration concerning the targeted antecedents for agency in online learning. Thus, in addition to being an integral part of the overall model, the relationships between attitudes and school associations and the other constructs also are means of validation.
Figure 3. Theoretical model of secondary antecedents of agency in online learning.

We model a strictly limited part of the social reality, and the process of including or excluding factors, that is, deciding which are essential, is theoretically informed. Above, we argued that agency in online learning is an important issue for learning in the 21st century, as reflected in various international and national policy documents. When considering potential sources of influence on students’ digital agency, we draw on lessons from the learning ecology approach and connected learning; that is, we use some of the ideas developed within these frames while not fully embracing the more radical definitions of learning found in this literature. For example, connectivists (Siemens, 2004, p. 6) claimed that “[t]he pipe is more important than the content within the pipe. Our ability to learn what we need for tomorrow is more important than what we know today. (...) [L]earning is no longer an internal, individualistic activity.” What we borrow from this literature, however, is the increased focus on the interplay between contexts (informal, non-formal, and formal) and the learning trajectories for developing students’ understanding and expertise. Barron’s (2006) explication of the poly-contextual (Arnesen, Elstad, Salomon, & Vavik, 2016) trajectories of “tech wiz” kids’ learning, in particular, influences our thinking.

In a learning ecology–inspired model of the processes of and contexts for students’ digital literacy practices, Sefton-Green, Marsh, Erstad, and Flewitt’s (2016) stated that practices are shaped by social contexts at the micro-, meso-, and macro-levels, and that the specific contexts shape the meaning children themselves ascribe to their digital practices. When considering how young people develop agency in online learning, we accept the idea that contextual influences are important. Young people do not act in isolation; instead, they draw on their communities’ ways of seeing, talking, and framing experiences. Thus, participating in online culture can influence how young people see and talk about formal schooling and potentially alter how they view the interplay between their informal online learning experiences and the purposes, processes, and content they encounter at school. However, at the same time, in line with a moderate methodological individualism, we assume that these contextual influences shape learning through individual students’ interpretation of these influences, that is, that intentional states of individual actors drive individual actions that help explain social phenomena. For the purposes of our model, we assume that students’ experiences of participating in formal schooling versus informal online learning influence students’ preferences: That is, some students lean more toward self-direction and individual autonomy in choosing their learning content, processes, and aims, while others lean more toward institutionally
organized support. However, the concepts are analytically separate. Theoretically, then, we expect that the more technologically oriented online culture exerts a strong influence on students' sense of agency in online learning, while the schooling-oriented school culture is unrelated to students' digital agency.

Many schools in this study attempt to bridge the alleged gap between schooling and students' online life-worlds in different ways. The first step is often to introduce increased online access in classrooms. Theoretically, then, increased online access at school can be seen as an effort to introduce attributes of online culture into the dominant school culture, depending, of course, on the nature of the implementation. Based on this increased access, we expect that online culture at school exerts a medium influence on students’ sense of agency in online learning, that is, somewhere between the anticipated strong influence of online culture and the unrelated nature of school culture.

The model includes two other constructs, attitudes and school associations. Attitudes refer to whether students deem online culture or school culture more conducive to promoting good attributes. The higher the value for attitudes, the stronger the student believes in online learning compared to formal learning. Theoretically, then, we expect a positive relationship between attitudes and online culture and sense of agency in online learning, and we expect a negative relationship between attitudes and school culture.

The construct of school associations is intended to tap into students’ formal learning experiences. Higher values for school associations indicate more positive experiences with formal schooling. Theoretically, then, we expect that school associations are unrelated to agency in online learning but are positively related to school culture and negatively related to online culture.

One critique of the learning ecology approach suggests that it highlights balance, harmony, and coherence, while obscuring relationships of tension, conflict, and contradictions. Carrington (2013, p. 209) stated that “an ecological framing looks to find a contributory role for all components.” We address this challenge by creating a theoretical model that is based on assumptions of interplay between formal, informal, and non-formal contexts, but that is disentangled from assumptions of harmony. This opens up the possibility of discovering empirical relationships characterized by conflict, as well as by coherence.

In addition to the theoretical bases for the hypothesized relationships included in the model, we use Ito's (2010) terms for young people's engagement in online activities as an analytical lens for interpreting the empirical results. As mentioned previously, Ito (2010) distinguished between interest-driven and friendship-driven genres of online participation for the purposes of either “hanging out,” “messing around,” or “geeking out.” Friendship-driven practices refer to “dominant and mainstream practices of youth as they go about their day-to-day negotiations with friends and peers” (Ito, 2010, p. 16), and interest-driven practices are what young people “describe as the domain of the geeks, freaks, musicians, artists, and dorks – the kids who are identified as smart, different, or creative, who generally exist at the margins of teen social worlds” (Ito, 2010, p. 16). Facebook and similar social media sites are emblematic of friendship-driven practices, while interest-driven practices are more often linked to sites devoted to gaming, media production, and other specialized interests.

Methods

Sample

This empirical study used a survey administered to students at 60 secondary and upper secondary schools in Norway (20 schools), Sweden (16 schools), and Finland (24
schools) in February and March 2013. In all three countries, we chose schools located in or near urban areas, as urban youth are more likely to have full broadband access and thus, have more opportunity to engage in the full spectrum of online activity and develop similar digital habits. A total of 3400 students in general study programs participated voluntarily. The final analysis included 3045 learners, after we excluded cases with missing values. None of the learners who were present for the survey administration declined to participate.

**Instruments**

Learners answered questions about various aspects of schooling and school propositions. A classical test theoretical paradigm was followed, in which psychological constructs and items (see Table 1) were contextualized through a set of individual questions given to the learners. The learners were asked to respond to questions using a 6-point Likert-scale with alternative response choices: Strongly disagree (1), Disagree (2), More disagree than agree (3), More agree than disagree (4), Agree (5), and Strongly agree (6). The construct used for time online at school (ICT) was an exception in that it was based on the number of hours the respondents reported being online during a typical school day.

<table>
<thead>
<tr>
<th>Concepts and indicators</th>
<th>Abbreviation</th>
<th>Residual</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sense of agency in online learning</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online experiences strengthen my ability to participate in discussions</td>
<td>ag_1</td>
<td>Eag</td>
</tr>
<tr>
<td>The net helps me develop good study habits</td>
<td>v20</td>
<td>e20</td>
</tr>
<tr>
<td>My thoughts and opinions are taken seriously online</td>
<td>v21</td>
<td>e21</td>
</tr>
<tr>
<td>The net enables me to understand the world around me better</td>
<td>v22</td>
<td>e22</td>
</tr>
<tr>
<td><strong>Online culture</strong></td>
<td>net_1</td>
<td>Ene</td>
</tr>
<tr>
<td>I would prefer to learn where and whenever it suits me, rather than in school according to a common curriculum</td>
<td>v29</td>
<td>e29</td>
</tr>
<tr>
<td>School learning is of minor importance for my future life</td>
<td>v31</td>
<td>e31</td>
</tr>
<tr>
<td>Come to think of it, the Internet is now more important than school</td>
<td>v32</td>
<td>e32</td>
</tr>
<tr>
<td><strong>School associations</strong></td>
<td>pse_1</td>
<td>Eps</td>
</tr>
<tr>
<td>Meaningful content</td>
<td>v70</td>
<td>e70</td>
</tr>
<tr>
<td>Learning</td>
<td>v72</td>
<td>e72</td>
</tr>
<tr>
<td>Engaged participation</td>
<td>v73</td>
<td>e73</td>
</tr>
<tr>
<td><strong>Attitudes</strong></td>
<td>att_1</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Model constructs, indicators, and residuals.
Antecedents of Youth’s beliefs

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item no.</th>
<th>Finland</th>
<th>Sweden</th>
<th>Norway</th>
<th>Nordic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respect for others</td>
<td>v58</td>
<td>e58</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honesty</td>
<td>v59</td>
<td>e59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good behavior</td>
<td>v60</td>
<td>e60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School culture</td>
<td>val_1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I hate school (reversed)</td>
<td>v02r</td>
<td>e02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I enjoy school learning</td>
<td>v05</td>
<td>e05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time online at school</td>
<td>ict</td>
<td>Eict</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How many hours per day</td>
<td>ict</td>
<td>Eict</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analysis

The analyses were conducted using SPSS and AMOS. Cronbach’s alpha was used to assess the reliability of the indicators for each subscale. Alpha coefficients of .65 or higher are usually considered acceptable (Nunnally, 1967). In Table 2, we present the Cronbach alpha for each construct, for the total sample (Nordic) and each country. These results strengthen the case for operating with a single category for all participating Nordic students.

Table 2. The Cronbach alpha for each construct.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item no.</th>
<th>Finland</th>
<th>Sweden</th>
<th>Norway</th>
<th>Nordic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes, att_1</td>
<td>3</td>
<td>.85</td>
<td>.85</td>
<td>.85</td>
<td>.85</td>
</tr>
<tr>
<td>School culture, val_1</td>
<td>2</td>
<td>.72</td>
<td>.66</td>
<td>.71</td>
<td>.68</td>
</tr>
<tr>
<td>Online culture, net_1</td>
<td>3</td>
<td>.72</td>
<td>.70</td>
<td>.74</td>
<td>.71</td>
</tr>
<tr>
<td>School associations,</td>
<td>3</td>
<td>.73</td>
<td>.84</td>
<td>.82</td>
<td>.81</td>
</tr>
<tr>
<td>Sense of agency, ag_1</td>
<td>4</td>
<td>.67</td>
<td>.70</td>
<td>.71</td>
<td>.70</td>
</tr>
</tbody>
</table>

Confirmatory factor analysis (CFA) was used to assess the factor structure. The assessments were based on the p values (p-kji) for the chi-square statistic (kji-kvdrat), the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the goodness of fit index (GFI). The standard criteria of p < .05, RMSEA < .05 and GFI and CFI > .95 were used to determine good fit (Kline, 2005). The model’s fit indices are acceptable: RMSEA = .035, GFI = .983, and CFI = .978.

In Table 3, we present descriptive findings (mean and standard deviation (SD)) for each indicator for the total sample and for each country separately. The small variation in results between Norway, Sweden, and Finland supports our decision to refer only to Nordic learners. We comment on the descriptive results in more detail in the Results section.
Table 3. Descriptive findings for indicators used in the analysis.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Total, N = 3045</th>
<th>Finland, n = 479</th>
<th>Norway, n = 1058</th>
<th>Sweden, n = 1508</th>
</tr>
</thead>
<tbody>
<tr>
<td>v58</td>
<td>2.31 (1.18)</td>
<td>2.15 (1.07)</td>
<td>2.41 (1.27)</td>
<td>2.30 (1.15)</td>
</tr>
<tr>
<td>v59</td>
<td>2.27 (1.18)</td>
<td>2.01 (1.01)</td>
<td>2.38 (1.26)</td>
<td>2.27 (1.16)</td>
</tr>
<tr>
<td>v60</td>
<td>2.06 (1.08)</td>
<td>1.91 (1.00)</td>
<td>2.12 (1.11)</td>
<td>2.07 (1.07)</td>
</tr>
<tr>
<td>v05</td>
<td>4.04 (1.10)</td>
<td>4.09 (1.08)</td>
<td>3.85 (1.13)</td>
<td>4.15 (1.05)</td>
</tr>
<tr>
<td>v02r</td>
<td>4.48 (1.25)</td>
<td>4.33 (1.28)</td>
<td>4.58 (1.26)</td>
<td>4.45 (1.22)</td>
</tr>
<tr>
<td>v70</td>
<td>4.04 (1.13)</td>
<td>3.50 (1.11)</td>
<td>4.23 (1.10)</td>
<td>4.09 (1.09)</td>
</tr>
<tr>
<td>v72</td>
<td>4.51 (1.06)</td>
<td>4.45 (1.01)</td>
<td>4.59 (1.07)</td>
<td>4.48 (1.06)</td>
</tr>
<tr>
<td>v73</td>
<td>3.98 (1.10)</td>
<td>3.81 (1.19)</td>
<td>4.03 (1.10)</td>
<td>3.99 (1.06)</td>
</tr>
<tr>
<td>v29</td>
<td>1.96 (1.04)</td>
<td>2.18 (1.07)</td>
<td>1.81 (1.02)</td>
<td>1.99 (1.03)</td>
</tr>
<tr>
<td>v31</td>
<td>2.00 (1.13)</td>
<td>2.05 (1.12)</td>
<td>2.00 (1.19)</td>
<td>1.98 (1.08)</td>
</tr>
<tr>
<td>v32</td>
<td>2.58 (1.37)</td>
<td>2.78 (1.39)</td>
<td>2.24 (1.33)</td>
<td>2.74 (1.34)</td>
</tr>
<tr>
<td>v20</td>
<td>3.39 (1.32)</td>
<td>3.23 (1.29)</td>
<td>3.40 (1.40)</td>
<td>3.44 (1.27)</td>
</tr>
<tr>
<td>v21</td>
<td>3.04 (1.18)</td>
<td>3.13 (1.14)</td>
<td>3.01 (1.24)</td>
<td>3.03 (1.15)</td>
</tr>
<tr>
<td>v22</td>
<td>3.08 (1.19)</td>
<td>3.16 (1.16)</td>
<td>3.10 (1.22)</td>
<td>3.03 (1.18)</td>
</tr>
<tr>
<td>v27</td>
<td>4.35 (1.16)</td>
<td>4.26 (1.18)</td>
<td>4.47 (1.13)</td>
<td>4.30 (1.17)</td>
</tr>
<tr>
<td>ict</td>
<td>3.49 (1.43)</td>
<td>3.18 (1.41)</td>
<td>3.67 (1.42)</td>
<td>3.46 (1.43)</td>
</tr>
</tbody>
</table>

The empirical findings relevant to the research questions are presented in the SEM model in Figure 4. We comment on these findings in more detail in the Results section.

Figure 4. Antecedents to agency in informal online learning. The total sample is 3045. Associations between ece and eps. Abbreviations: ag_I = Sense of agency in informal online learning, net_I = Online culture (the learners' preferences inscribed in terms of free choice and self-actualisation), att_I = Attitudes induced by the Internet, val_I = School culture (valuing schools as an institution), pse_I = School associations (perceived characteristics of the school), ict = time spent online at school.

In Figure 5, we present the analyses conducted to show the extent to which the construct of online culture is associated with gender and socioeconomic status (SES; measured as the reported number of books in the home).
Antecedents of Youth's beliefs

Figure 5. The associations between online culture (net_1) and (1) gender (binary variable where girls = 0 and boys = 1) and (2) the reported number of books at home.

Figure 5 shows that the association between gender and the construct of online culture is negative ($b_{gender\rightarrow net_1} = -0.22$); in other words, boys value online culture more than girls. The figure also shows that the reported number of books in the house is not statistically significantly related to online culture. However, the extent to which the reported number of books in the home measures SES is debatable. Still, the results indicate that online culture is not associated with a particular SES group but is more strongly associated with boys than with girls. The fit indices in Figure 5 are acceptable: RMSEA = .041, GFI = .997, and CFI = .990.

Results

Our primary research objective was to determine how the students’ preference constructions about learning, school culture and online culture, are related to students’ sense of agency in informal online learning. We also wanted to see how schools’ current efforts to bridge the alleged gap between young people’s digital-life worlds and students’ formal education by providing time online at school is associated with students’ sense of digital agency.

Figure 4 shows that the relationship between online culture and digital agency is large and positive ($b_{pre_c\rightarrow ag} = .49$). This result aligns with our theoretically based expectations. It indicates that the more students harbor online cultural learning preferences, the more the sense of agency the students experience in informal online learning. Figure 4 also shows a medium-large and positive ($b_{sca\rightarrow ag} = .27$) relationship between school culture and digital agency. This result is not in line with our theoretical expectations, as it indicates that the more students identify with formal schooling, the stronger their sense of agency in informal online learning. Regarding the relationship between the two preference constructions, Figure 4 shows a large and negative path coefficient ($b_{pre_c\rightarrow ag}$).
This means that even though both contribute to explaining students’ sense of digital agency, the internal relationship is statistically significantly negative; that is, the more students identify with online culture, the less they identify with school culture. In other words, the two constructs are neither synergistically nor independently related but are strongly antagonistically related. The fact that the constructs simultaneously contribute positively to a sense of digital agency indicates that their contribution is due to mediating factors not included in the model, for example, technical expertise in the case of online culture and substantial expertise in the case of school culture.

In terms of schools’ efforts to include online culture in the dominant school culture by providing time online at school, Figure 4 shows time online at school has a medium and positive relationship with students’ digital agency ($b_{\text{p[f]} \text{c}[\text{eq}]} = .23$). This result is in line with our theoretical expectations, and it suggests that the more students spend time online at school, the more the sense of agency they experience in informal online learning. The relationship with school culture, however, is medium and negative ($b_{\text{p[f]} \text{c}[\text{eq}]} = -.21$). The result suggests that the more time students spend online at school, the less they appreciate their schooling. This result seems to suggest that providing more time online does not necessarily have a positive motivational impact on formal educational practices. Instead, Figure 4 shows a small but positive relationship with online culture ($b_{\text{p[f]} \text{c}[\text{eq}]} = .10$), that is, a preference for self-determination in learning aims, processes, and content.

Our secondary research objective was to see how students’ experiences in developing good attitudes either online or at school are associated with the other constructs. This objective aims to understand how students’ views of school characteristics (e.g., engaged participation) are related to the other constructs. These empirical results are shown in Figure 4.

A higher score for the attitudes construct indicates a stronger belief in the efficacy of online learning in promoting good attitudes, whereas a lower score indicates a stronger belief in the efficacy of formal schooling in promoting good attitudes. Figure 4 shows a medium-large and positive association between attitudes (abbreviated att) and time online at school ($b_{\text{p[f]} \text{c}[\text{eq}]} = .22$), online culture ($b_{\text{p[f]} \text{c}[\text{eq}]} = .19$), and agency in online learning ($b_{\text{p[f]} \text{c}[\text{eq}]} = .23$). In other words, the more students experience that their online activities promote good attitudes, the more they spend time online at school, (2) the more they prefer self-determination in learning content, processes, and goals, and (3) the stronger the students’ sense of agency in online learning. Furthermore, Figure 4 shows a medium-to-large and negative relationship between attitudes and school associations ($b_{\text{p[f]} \text{c}[\text{eq}]} = -.15$) and school culture ($b_{\text{p[f]} \text{c}[\text{eq}]} = -.41$). That is, the more students think that online activities promote the development of good attitudes, the less students have positive associations with formal schooling, and more specifically, the less students appreciate their formal schooling.

Because higher scores for school associations suggest that the students associate formal schooling with positive qualities, such as engaged participation and learning a lot, the large and positive relationship ($b_{\text{p[f]} \text{c}[\text{eq}]} = .58$) with school culture is in line with our theoretical expectations. The medium-large and positive relationship between school associations and agency in informal online learning ($b_{\text{p[f]} \text{c}[\text{eq}]} = .17$) and the medium and negative relationship between school associations and online culture ($b_{\text{p[f]} \text{c}[\text{eq}]} = -.21$) were anticipated based on our theoretical assumptions. There seems to be a strong link between liking formal schooling and associating schooling with positive attributes, such as learning a lot and engaged participation. The link between school associations and agency in online learning is weaker but still positive. Again, we see that the more students associate something good with formal schooling, the less they embrace online culture.
Overall, the results for the secondary relationships seem to corroborate the results for the primary relationships. That is, both preference constructions contribute to students’ sense of agency in informal online learning, and the preference constructions are markedly antagonistically related.

Discussion and conclusion

This study primarily aimed to explore antecedents of students’ sense of agency in online learning activities. The three main antecedents we targeted were school culture, online culture, and time spent online at school. The importance of exploring these constructs’ contributions rests in the antecedents’ centrality to students’ lives, not only in terms of the large amount of time students spend interacting in these arenas but also due to the constructs’ role as all-encompassing frames of reference in terms of students’ meaning-making processes. Understanding students’ preference constructions and beliefs regarding formal and informal learning processes is particularly significant if we are to enable and facilitate educationally desirable synergy effects and avoid troubling inconsistencies and mutually reinforcing contradictions. If we want to revitalize institutionalized schooling, unintended devitalizing effects might occur if our strategy is to introduce into the dominant school culture a competing online culture characterized by an emphasis on self-determination in learning content, processes, and aims. We argue that formal schooling’s efforts to capitalize on students’ informal learning experiences through introducing more net-based activities in class might bolster digital agency through improved technical expertise (medium-related online skills). However, this activity may simultaneously de-privilege institutionalized schooling and the acquisition of substantial knowledge that arguably is required for the development of content-related online skills.

First, we found that all three main antecedents are positively related to students’ sense of agency in online learning. For online culture and time spent online at school, the results are in line with our expectations based on previous research and theoretical assumptions. It makes sense that a preference for self-determination in learning aims, processes, and content that Internet access opens up would go hand in hand with a sense of digital agency, that is, feeling confident that one is able to utilize the online space for learning purposes. In fact, one might argue that it takes a lot of confidence to prefer independent online learning to the relative safety of attending institutionalized schooling. As for the other finding (that an increase in time spent online at school is positively associated with agency), it might seem that the effort to introduce digital technology in schools has succeeded in terms of students’ confidence in using digital technology for learning purposes. However, this interpretation relies on the premise that the relationship is causal; that is, increases in time spent online cause the effect of a heightened sense of digital agency. If, instead, this is an instance of reverse causality, that is, students with a higher sense of agency in online learning spend more time online at school when offered the opportunity, then an increase in the availability of digital learning opportunities does not increase students’ sense of agency; it only increases the time spent online by the most agentic students. We will look more closely at this possibility after discussing the other findings.

The third positive relationship concerns school culture and agency in online learning. Based on previous research and theory, we anticipated the two factors would be unrelated. We did not expect that an appreciation of formal schooling and school learning would align with students’ sense of agency in informal online learning to such a degree, that is, a medium-sized path coefficient ($\beta_{\text{school}} = .27$). Still, the finding makes sense when we consider that agency in online learning is not only about medium-related
skills (i.e., the ability to adequately navigate online learning spaces) but also about content-related skills related to substantive issues. If we propose that a sense of online confidence is influenced by medium- and content-related skills, then the impact of the knowledge acquisition and the understanding developed within the frames of formal schooling might increase students' online agency. If this is a matter of reversed causality, then a higher sense of online agency indicates a greater appreciation for schooling. This does not seem to be an equally convincing explanation, because, as far as we can see, there is no obvious candidate for a process through which digital agency would affect appreciation for schooling. Given that the causal direction is as hypothesized (i.e., from appreciation for schooling to online agency), we have reason to doubt the connectivist claim that in the digital age, knowledge is not an individual possession but an individual's access to a network. The claim that the pipe is more important than the content of the pipe rests on the assumption that previous knowledge is not involved in the process of accessing new knowledge, that is, that it is possible to know what to look for without depending on previous knowledge. The study results suggest that appreciation for school learning goes hand in hand with a sense of digital agency, and we maintain that this can be reasonably accounted for by an increase in content-related Internet skills. This does not mean that we subscribe to a narrow individualist view of knowledge, but that through formal schooling, students receive access to a type of specialized and abstract discourse that is conducive for competent participation in a range of situations, including online arenas.

In addition to exploring the relationships between the three constructs and agency in online learning, we set out to understand how the two preference constructions of school culture and online culture relate to each other. Given that we found that both constructs are positively related to agency in online learning, we would expect that the associations between them would be only slightly negative. However, we found a very large and negative association between the two constructs. It was so large that they can be described as mutually contradictory and distinct categories. As we discussed above, there is a possibility that technical aspects of Internet skills mediate the relationship between online culture and digital agency, while substantive online skills mediate the relationship between school culture and digital agency. The plausibility of this inference is strengthened by the large size of the internal relationship between online and school culture. The negative relationship means that the more a student subscribes to online culture, the less he or she appreciates formal schooling and school learning as he or she currently experiences it. This impression of a conflict is strengthened and corroborated by the empirical findings pertaining to the secondary constructs of attitudes and school associations, for example, by showing a negative relationship between school associations and online culture ($b_{[aa]} = -.21$) but a large and positive relationship between school associations and school culture ($b_{[ac]} = .58$).

The extent to which this conflict is present in the student community and within individual students' frames of reference is an empirical issue. The dynamics of such a conflict are a subject for future research. This study is not longitudinal and does not address the temporal dynamics of the conflict apparent in these results, and we are careful not to draw strong conclusions based on a single study. However, if our finding is an empirical expression of the developing dynamics of a mutually reinforcing contradiction within individual students' frames of reference regarding meaning-making, learning, and educational processes, this is something that educational authorities must take seriously. From this perspective, our finding that the time spent online at school is positively related to online culture ($b_{[oe]} = .10$) and negatively related to school culture ($b_{[oc]} = -.21$) might suggest that schools' current efforts to increase the relevance of formal schooling by providing increased online access is misplaced. In other words, this
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effort by schools might have the unforeseen and politically undesirable side effect of undermining rather than enhancing students’ appreciation for school and school learning. If the aim is to revitalize institutionalized schooling, then unintended devitalizing effects might occur if the strategy involves the introduction into the dominant school culture of a competing online culture characterized by an emphasis on self-determination in learning content, processes, and aims. Understanding students’ preference constructions and beliefs regarding formal and informal learning processes is particularly significant if we are to enable and facilitate educationally desirable synergy effects and avoid troubling inconsistencies and mutually reinforcing contradictions. We argue that formal schooling’s efforts to capitalize on students’ informal learning experiences through introducing more net-based activities in class might bolster digital agency through improved technical expertise (medium-related online skills). However, it may simultaneously serve to de-privilege institutionalized schooling and limit students’ access to a specialized and abstract discourse that is conducive for competent participation in and strategic use of online arenas (content-related online skills).

The limitations of this cross-sectional, questionnaire-based, “snapshot” research contribution are well documented. We acknowledge these limitations and argue that they can serve as points of departure for future research. First, conceptual studies are required to improve construct validity and as a basis for more comprehensive SEMs, including pertinent moderating and mediating variables. Second, we need longitudinal, experimental, and case studies to improve causal inferences (internal validity) by determining not just whether the relationships are causal but how and why causal chains and constellations produce the identified effects. Third, improvements in external validity are called for by conducting comparative research on randomized groups enabling statistical generalization, and carrying out similar research at different locations, people and contexts. Fourth, we need qualitative studies that aim for analytical generalization based on theorization of operating causal mechanisms in context.

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1 Finally, we conducted an analysis to check whether there is an empirical connection between sense of agency in online learning and learners’ grades in Mathematics and in English as a Foreign Language (EFL) but found no empirical connection. The correlation coefficient between sense of agency in online learning and self-reported Mathematics grades was -0.012, and between sense of agency in online learning and self-reported EFL grades -0.001.
Figure 4. Antecedents to agency in informal online learning. The total sample is 3045. Associations between ene and eps. Abbreviations: ag_I = Sense of agency in informal online learning, net_I = Online culture (the 'learners' preferences inscribed in terms of free choice and self-actualisation), att_I = Attitudes induced by the Internet, val_I = School culture (valuing schools as an institution), pse_I = School associations (perceived characteristics of the school), ict = time spent online at school.

Nordic

Standardized estimates
kji-kvdrat = 425.109  df = 91  p-kji = .000
rmsea = .035  gfi = .983  cfi = .978
Article 3
Exploring students' explanations for off-task practices in an innovative learning environment (ILE) using a typology of agency as theoretical framework

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Exploring students’ explanations for off-task practices in an innovative learning environment (ILE) using a typology of agency as theoretical framework

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ABSTRACT
Learner agency is a key factor in success with technology-infused Innovative Learning Environments (ILEs). Focussing on informal practices unrelated to the learning agenda (off-task practices) and considered undesirable by students (school-net-conflict), this paper explores how students who experience a school-net-conflict explain their off-task practices using four conceptions of agency as a theoretical framework. An analysis of interview data from focus groups with a purposive sample of Norwegian secondary students suggests the dominance of sovereign conceptions of agency, i.e., off-task practices understood as individual self-regulation failures. Other common explanations included a) a drive-like ‘pull’ of social media (material conception), b) peers’ off-task practices as triggers (relational conception), and c) adjustment to a grade- and test-oriented incentive regime (ecological conception). Findings also suggest a disconnect between students’ explanations (situational nuance/detail) and attributions of ‘blame’ (dispositional default). Implications, limitations and further research are also considered.

KEYWORDS
Agency; learning Infrastructure; procrastination; innovative Learning Environments; technology-Rich Environments; student Explanations

Introduction

Over the last decade, Innovative Learning Environments (ILEs) have been designed to encourage learner engagement with connected, digital technologies (ICTs) in order to provide new opportunities for knowledge production and sharing through innovative work practices (Immns, Cleveland, and Fisher 2016; Istance and Kools 2013; OECD 2013). ICTs can provide easy access to a range of contexts beyond the confines of the classroom and can strengthen relevant student experiences by interconnecting content from various arenas in a symbiotic manner (Royle, Stager, and Traxler 2014). Moreover, the agility of mobile devices opens opportunities for increased participation on the part of students in deciding what, how and where they learn, given a refined understanding of what quality work looks like and where they are in a curriculum progression (Charteris and Smardon 2018, 52). Such a partial ‘erosion of the normal zone of order’ (Mulcahy 2016, 85) leaves the distinctions between informal and formal learning environments increasingly blurred. Through access to connected mobile...
technologies students can, and do, move between practices of formal schooling and informal friendship or interest-driven practices (Blikstad-Balas 2012), such as hanging out, messing around and seeking out (Ito 2010). This overlap of practices serves to heighten awareness of the inherent interconnectedness between life in- and out-of-school (Barron 2006), and to heighten awareness of the distinctive modes of participation associated with various practices in- and out-of-school (Resnick 1987). Therefore, students’ abilities and opportunities to navigate purposefully and intentionally within and between practices becomes an important consideration, and learner agency re-emerges as a key factor for success with ILE initiatives.

The fact that many students struggle with their off-task practices in ILEs, calls for increased research efforts (Ott 2017, 46). The OECD initiated ILE project (OECD 2013) stresses the need for ILEs to be formative and thus able to use information about the learning taking place to inform further development and direction. Research into different aspects of ILEs is therefore considered crucial for generating knowledge about how well the ILEs are working and for suggesting potential solutions to emergent problems (Istance and Kools 2013, 54). A first step can be to gain insight into how students explain off-task practices that they deem problematic for achieving their school ambitions (school–net-conflict).

In the following, we focus on the explanations themselves in order to draw inferences about the repertoire of discursive heuristics used by the students to explain how and why they go off-task. Kahneman (2013, 98) defines a heuristic as a ‘simple procedure that helps find adequate, though often imperfect, answers to difficult questions’ and stresses that such heuristics are not consciously chosen but are a result of the ‘imprecise control we have over targeting our responses to questions’ (98). Drawing on Bernstein (1999, 159–160), the set of strategies possessed by any one student is dependent upon the total sets of strategies of the community as a whole, i.e., Bernstein distinguishes between the individual’s ‘repertoire’ and the community’s ‘reservoir’. In this article, we are primarily concerned with the culturally available ‘reservoir’ of discursive heuristics used by students to increase coherence and decrease ambiguity in their explanations. The theoretical framework narrows our inquiry to students’ reasoning about agentic forces that account for their off-task practices. In line with the aim of in-depth, rich descriptions of students’ explanations, we conducted a qualitative case study based on eleven students attending the same Norwegian upper secondary school.

The article begins with a brief background of pertinent aspects of the Norwegian educational context. In the theoretical framework, we consider the role of learner agency and present a four-factor typology of conceptions of agency (Charteris and Smardon 2018). Next, we present the methods used in our qualitative case study, before presenting and discussing the findings. Limitations and further research are considered, before we end with concluding remarks.

**Pertinent aspects of the Norwegian educational context**

In Norwegian schools, the real push towards integrating ‘new technologies’ as part of the learning infrastructure in schools and classrooms started in the early 2000s, and gained momentum in 2006 with the formulation of a new national curriculum (Department of Education and Research 2006) applicable to grades 1–13. The longstanding work by the OECD in relation to the key competences framework (Rychen and Salganik 2003) inspired
the inclusion of digital competence as one of the five key competences to be included in all subjects at all levels. Norwegian authorities formally recognised that the development of students' digital competence was as important as speaking, reading and writing for all learning practices. In the upcoming national curriculum that will come into force in 2020, digital competence is still considered an important competence (see, e.g., the new Core Curriculum at Regjeringen 2019). However, the new curriculum shows that there has been a similar shift of emphasis in Norway as in the OECD from approaches criticised for implicit 'technological determinism' to approaches focussing on the design of entire learning environments with ICTs as part of the infrastructure for learning.

The school selected for our case study is located in a county known for heavy investments in ICTs, for translating national initiatives into ambitious regional plans and strategies for utilising the potential of digitalisation, and involving schools and teachers in creating learning environments conducive to the integration of digital technologies. The country's objective is that

all students and staff [should] use digital tools and resources in all subjects (...). [R]esource individuals in the educational use of ICT should work actively to develop student and staff ICT skills (...), demands are made and follow-up provided in respect of professional development for individual members of staff. The school is to have an oversight over digital tools, resources, and learning materials in all subjects and should have a set minimum standards for the use of digital tools, resources and materials in all subjects (Elstad 2016).

In the early 2000s, many schools in this area removed blackboards, re-configured classroom spaces, e.g., by replacing individual desks with tables more amenable for group and project work, and promoted a student-centred schooling based on ideas derived from American progressive pedagogy. The encyclopaedic-centred schooling in the grammar-school tradition was left behind. Local authorities thus promoted an understanding of the relationship between teachers and students in line with a strong version of distributed power in classroom relationships. However, the growing importance of the international testing regime for national priorities gradually rolled back measures designed to level power discrepancies between teachers and students, and brought a re-orientation towards learning outcomes (Elstad 2016). At the same time, ideas about autonomous learning, learning to learn and student responsibility for their own learning have had a renaissance (Regjeringen 2019). 'To learn to learn' and 'self-regulation' are specified as areas of particular importance in the upcoming curriculum. Overall, progressive ideas linked to the use of educational technology and the educational focus on accountability are embedded side by side, i.e., there is an 'amalgamation' of educational progressivism and result orientation in the Norwegian educational context (Elstad 2016).

Theoretical framework

Charteris and Smardon (2018, 62) show that there are references in the education literature to new generation learning environments and the cognitive and affective capacities of the individual student, e.g., student motivation, student engagement, student autonomy, student-centred learning, and self-regulated learners. They point out, however, that there are fewer references to the fields of relational agency, where there is co-regulation (...); ecological agency, as the action that takes place in temporal and
relational contexts (...) or the agency of materiality occurring in the non-static arrangements of classroom assemblages (...)’ (60). They recommend that research considers approaches to agency in ILEs that acknowledge and engage with both sovereign, relational, ecological and new material forms of agency and how they influence learning.

In this article, we focus on how students who experience a school–net-conflict explain their off-task practices. A typology of agency developed by Charteris and Smardon (2018) is used as a theoretical framework to analyse the nature of the discursive heuristics students mobilise in their explanations. The typology spans sovereign, relational, ecological and new material conceptions of agency. These conceptions are integral to theoretical traditions that differ in terms of the ontological and epistemological assumptions they operate from. It is beyond the scope of this article to explicate the intricacies of these differences, but in general, the conceptions range along a continuum from humanist to posthumanist ontologies, and realist to relativist epistemologies (Charteris and Smardon 2018, 55).

OECD writers stress the importance of learner agency and ‘voice’, arguing that ‘as the learning becomes more personalised, the active role of the learners becomes more evident’ (Istance 2015). However, agency is theorised in different ways, and these differences have implications for schooling contexts. A dominant tradition in the literature about education gives primacy to individualised cognitive conceptions of agency that are associated with so-called ‘self-theories’ such as self-efficacy (Bandura 1982), self-regulation (Schunk and Zimmerman 2007) and self-determination (Deci and Ryan 2012). Presumptions of individual choice and human autonomy and intrinsic motivation for learning are common for these theoretical traditions. Agency is associated with the development of a ‘growth mindset’ or ‘learning orientation’ thus attributing substantial understanding and academic success to one’s own efforts and self-regulatory and metacognitive strategies (Dweck 2012). This conception of agency is evident in the ILE literature where ‘student agency as sovereign ownership of learning is heavily promoted’ (Charteris and Smardon 2018, 55). The favoured notion of agency is ‘exclusively about empowered learners having opportunities to exercise choice and make decisions in the classroom’ (Charteris and Smardon 2018, 55). However, Charteris and Smardon (2018) criticise this notion for conveying a relatively simplistic conception of the relational, ecological and material conditions for agency.

Relational conceptions of agency draw on sociocultural theories, and thus emphasise that agency is situated in a particular relationa, structural and discursive context. Therefore, relational agency is a product of interactions and dialogue between people in social environments, and involves a capability to work with peers to ‘strengthen purposeful responses to complex problems’ (Edwards, 2011). This depends on the ability to engage with and integrate others’ perspectives into your own understanding, that is, relational agency is located in the dynamic between extrinsic and intrinsic elements. The outcome is distributed and relational expertise (Edwards 2005, 2010, 2011). While relational agency emphasises the relational and situational conditions for agency, ecological conceptions expand the notion to include the temporal dimension.

The most common definition of ecological agency draws on Emirbayer and Mische (1998) who conceptualise agency as a temporally embedded process of social engagement informed by the past, oriented towards the future combined with a ‘practical-evaluative’ capacity to contextualise past habits and future projects within the
contingencies of the present. Hence, an ecological conception of agency is situated and dynamic because it is embedded in ‘temporal-relational contexts-for-action’. Agency is thus not something you possess (or not), but something that you can achieve in situated action. In ecological terms, agency varies from context to context based on conditions of possibility and constraint, and the way the agent mobilises beliefs, values, reasoning and preferences in relation to particular situations.

While sovereign, relational and ecological conceptions of agency privilege the human actor, new material conceptions emphasise the agency of objects in learning environment assemblages (Buchanan 2015). While ecological conceptions of agency contribute with a more nuanced perspective regarding the contribution of the temporal dimension, new material conceptions fill a gap by providing new ways to understand how objects and structures, the spatial dimension, contribute to making things happen. Understanding how ‘matter matters’ (Barad 2007) enables a consideration of how humans and objects are entangled in assemblages (Jackson and Mazzei 2016). Agency is thus understood as a spatially distributed practice that includes the larger material arrangements (Barad 2007, 379). Agency understood materially is thus ‘generated through a range of elements within schooling assemblages. It is co-produced in relations between objects, between humans and objects, and between humans’ (Charteris and Smardon 2018, 56).

Originally, Charteris and Smardon (2018) developed the typology for analysing principals, teachers and teacher educators’ perspectives of agency. However, they called for further research into learners’ perspectives to supplement their typology. We attempt to meet their call by using their typology to analyse students’ explanations of their off-task practices in class.

The case study

The focus of the study reported in this article was how students who experience a school–net-conflict explain their off-task practices. We sought to include students who invested in their own schooling and thus had incentives to want to conform to the existing grammar of schooling, but at the same time engaged in off-task practices that they found problematic. The way these students experienced and explained the interrelationship between their school ambitions and net-practices via an investigation of their views of problematic off-task practices provides valuable insights into the available cultural ‘reservoir’ of discursive heuristics of agentic forces at play in educational settings. By using different conceptualisations of agency to analyse their explanations for off-task practices, we seek to gain a deeper understanding of how broader discourses and ideas about agency influence students’ thinking.

Based on a large-scale quantitative study conducted in 60 secondary schools with 3400 students in the Nordic countries (Arnesen, Elstad, and Christoffersen, 2017a, 2017b; Arnesen, Elstad, and Christoffersen 2016), we narrowed down our focus in order to find the right type of informants for our case study. First, based on answers to statements about students’ views about the relationship between school and Internet-activities, we carried out a Principal Component Analysis (PCA) identifying three main patterns that made sense theoretically. We termed the three: ‘school-culture dominance’, ‘net-culture dominance’ and ‘school–net-conflict’. Based on the results from the PCA, we created a school–net-conflict index and used it to compare school–net-conflict mean values
among students in Finland (N = 1389), Sweden (N = 802) and Norway (N = 1209), and found that Finnish students experienced significantly less conflict than their Nordic neighbours did. We then compared the 60 schools in our sample using the same index. Among the 21 schools with the highest school-net-conflict values there were no Finnish schools, only Norwegian and Swedish ones. The schools with the highest scores were a couple of Norwegian upper secondary schools from a county that has been a pioneer in terms of providing students with individual laptops and encouraging schools to make use of students’ digital devices in education. We then contacted one of the high-conflict schools known as an ICT pilot school that actively tried to turn classrooms into technology-infused learning environments. We conducted a simple survey (N = 109) using variables from the school-net-conflict index to identify high-conflict students who fit our pre-set requirement of high off-task practices and high conflict-experience. We also consulted our gateway teacher at the school before we ended up with 11 students who fit the bill.

The 11 students were 16–18 years old, attended this medium-sized (ca. 600 students) upper secondary school in a medium-sized Norwegian town (ca. 50000 people) and in a mid-income neighbourhood. They attended general studies programmes, but two of them were in a competitive International Baccalaureate (IB) track. The 11 students came from across the attainment spectrum; seven were first graders (aged 16 years), two second graders (aged 17 years) and two third graders (aged 18 years).

We carried out semi-structured focus groups with four groups of two students and one group with three students. Each focus group lasted from 30 to 45 minutes and was recorded and transcribed. We then analysed the transcriptions in two cycles (content analysis: trigger and enabling conditions, and theoretical analysis: four conceptions of agency) using Hyper Research.

Findings

**Sovereign agency**

Sovereign agency is a conceptualisation of the autonomous individual who engages in self-regulated learning. We translated this conceptualisation into an analytical frame for the interpretation of the 11 students’ explanations for their off-task practices. The findings reveal a clear tendency for students to utilise this sovereign conception of agency to account for procrastination involving ICTs. They mobilised this discursive heuristic more often than the other three conceptualisations both explicitly and implicitly. All 11 students used some variation of the theme ‘self-regulation failure’ to explain why they engaged in off-task practices in class. While some of the explanations rested exclusively on this theme, most combined it with some of the other three discursive heuristics. ‘I get easily distracted’ was the most common explanation for the students’ problematic off-task practices. The students interpreted this proneness to distraction as a relatively stable, innate personality trait. We considered sovereign agency as the dominant discursive heuristic not just because of the frequency of occurrences, but because the students tended to evaluate other contextual and situational factors in class in terms of how they influenced their proneness to distraction. In the first illustrative example below, a first-year
student reflects on whether he prefers strict or kind teachers, while in the second example his classmate reflects on what is required to raise the quality of learning at their school.

I get easily distracted, ok, so if the strict teachers are really strict, then I feel that I had done better for myself as well, while the kind teachers only let me sit on Facebook, ok, so I don’t feel like I learn anything. So right now I want strict teachers, I do not want such kind teachers (Ben 16).

The first thing they should do was to restrict access to Internet pages, only leaving Google and ItsLearning open. I know that it sounds boring, but then you can actually pay attention. And to use handwriting, in notebooks, one for each subject, science, social science, maths and so on. You can bring your Mac and all that, but you can only use it for finding information, not for note taking. The book is the main syllabus in a way, because now a lot of what we learn is actually online and that is in fact very distracting. (Berit 16).

Their point of departure is that they were easily distracted, and the rest of their interpretation followed up on that common theme. With the presence of what they saw as digital distractions such as Facebook, Ben preferred strict teachers to combat his innate tendencies towards distraction, rather than kind teachers who let him waste his time. Berit would raise standards by barring student access to most Internet pages, going back to taking notes by hand in notebooks and using analogue textbooks. While they acknowledged that contextual factors play a role in their off-task practices, the main gist of the problem as they saw it was their difficulty with exercising self-control in the face of distractions – their innate personality traits. By using sovereign agency as a main frame of reference, their reflections were primarily about how to avoid letting their personality traits ruin their education and future prospects.

Relational agency

Edwards (2011, 34) describes relational agency as a capacity to work with peers to ‘strengthen purposeful responses to complex problems’. Relational agency is characterised by a dynamic interaction between engaging with others’ interpretations and the integration of these into your own decision-making. It involves finding common solutions to situations together with peers by recognising their motives and capacities. Relational agency involves interpreting, negotiating and reconciling social information with one’s own interpretation leading to relational expertise (Edwards 2005; 2010; 2011).

The findings with regard to the use of relational agency as a discursive heuristic show that students used it frequently, and often in conjunction with sovereign conceptions. Five relational elements occurred in explanations for off-task practices in all focus groups, a) peers’ activities, b) the strictness of the teacher, c) teachers’ pedagogical practices, d) students’ perception of the subject matter, and e) official rules and de facto norms. As instances of relational agency failure, the five elements helped thwart purposeful responses to problematic off-task practices. The students’ reasoning was mainly characterised by descriptions of how these elements affected their innate lack of self-regulation.

Each focus group mentioned peers’ off-task activities as triggers for their own off-task activities. Three focus groups compared peer influence with the spread of an infectious disease. The scenario presented was one where, at first, one or two students at the front of class went off-
task; then, some of the nearby students went off-task, and before long as many as 50% of the class were not paying attention to the teacher or the task at hand. However, the same focus groups also commented that peers also influenced them to stop procrastinating; it felt awkward to be the only one engaged in off-task practices.

The role of different teachers varied depending primarily on how strict they were. As illustrated in the example above, strict teachers implemented the official regulations against off-task practices in class and held the students to account for breaches. The two focus groups that had Thomas as social science teacher agreed that he was strict and that he managed to keep off-task practices under control. The students appreciated the way he helped them stay on-task, and explained that they learned more and got better grades in his subject. At the other end of the continuum was the female science teacher. She was highly appreciated for her kindness and caring personality, but the students saw her as too lenient with regard to off-task practices. She did not enforce the school regulations and did not hold the students accountable for breaches of the rules. Consequently, the students said her approach released their underlying, innate lack of self-control and caused them to procrastinate.

All 11 students commented directly or indirectly on the influence of the teachers’ activities on their off-task practices. Unsurprisingly, they agreed that highly engaged, expert teachers largely managed to keep the students focussed. However, even these teachers had to make sure that transitions went smoothly, that the tasks did not become repetitive and boring, too easy or too difficult, and that the students did not have the opportunity to do the work at home alone. Each focus group mentioned these as potential triggers for the constantly lurking lack of self-control in the face of easily accessible online temptations. Project work was the only concrete type of pedagogical organisation mentioned as a good way to keep the students focussed. By holding the students accountable for each other and creating situations where the group depended on each member’s contributions, the teacher could help to keep problematic off-task practices at bay.

With regard to the subject matter, the students seemed to agree that it was easier to remain on-task in subjects you appreciated. More surprisingly, in two focus groups, they maintained that it was easier to remain on-task in difficult subjects such as mathematics and physics. They explained that in order to cope in these subjects you had no choice but to stay focussed. Because the subjects are complex they needed the teachers’ explanations, examples and explications to understand and get the grades they wanted. According to the students, this was not the case in several other, ‘easier’, subjects such as History or English. Of course, if the subjects became overwhelming and you fell behind, the odds were that you would give up and then off-task practices would flourish.

According to the official rules and regulations of school, the students were not allowed to engage in off-task practices in class. The students in the most passive focus group were clearly worried about saying too much during the interview despite our sincere assurances that everything they said would be anonymized and untraceable. It emerged from the conversations in each of the five focus groups that the influence of the official rules on the students’ off-task practices depended on the teachers’ enforcement and accountability processes vis-à-vis the students. However, most of their teachers only enforced them half-heartedly, that is, they either looked the other way or gave them a stern look. This practice did not convince the students to stay on-task in class, but rather to keep their
off-task activities partly hidden from the direct view of the teacher. Interestingly, the students in all five focus groups agreed that the de facto norms regarding off-task practices in class were in direct opposition to the official rules and regulations. As the illustrative example below shows, the students themselves would not react negatively if a peer spent class time watching films, especially if the student in question got good grades anyways. David and Doug, two third-year boys, comment on a girl who frequently watched films in class.

There is one in class who always watches films, and then I start to wonder, ‘What is she doing?’ (David 18)
But she gets excellent results though (Doug 18)
Yes, that is true (David 18)
Excellent results? (Interviewer)
Yes, she does really well (Doug 18)
and watches movies in class? (Interviewer)
Yes. She’s allowed (Doug 18)
She’s allowed. She gets 6 [highest grade] anyways (David 18)

Ecological agency

As mentioned in the theoretical framework, the most common definition of ecological agency is a temporally embedded process of social engagement informed by the past, oriented towards the future and combined with a ‘practical-evaluative’ capacity to contextualise past habits and future projects within the contingencies of the present. Thus, ecological agency is a process embedded in ‘temporal-relational contexts-for-action’ (Priestley, Biesta, and Robinson 2013, 18). It follows that agency in ecological terms is not something you can possess, but rather something you can achieve in situated action, i.e., in temporally located relations between actors and the environment through which they act (Priestly et al. 2013, 40).

Used analytically to account for students’ reasoning regarding their off-task practices, the ecological conceptualisation of agency has a wide reach and thus encompasses most of the findings already presented above. However, it supplements the previous two by helping to identify, and adding a focus on, the importance of the students’ past and their orientation towards the future. In four of the five focus groups, the students used experiences at lower secondary school as a baseline for comparison and interpretation of their current off-task practices. In all groups, the future prospect of getting good grades and thus the importance of tests seemed to play a major role in how they evaluated current contingencies and acted in the present. A final theme that was discussed in four of five focus groups was the students’ time orientation, especially the idea that you have plenty of time to do the work in the future (‘slack’).

A recurring theme with reference to the influence of past experiences involved how the lower secondary school system operated in terms of online access, the use of pen and paper for notetaking, the use of physical books and the level of teacher management and control in class. The first-year students talked about these practices in positive terms, and longed for a similar kind of order and discipline in upper secondary school. They claimed that they were able to focus and got better grades in lower secondary in comparison with the lack of focus
and falling grades at upper secondary school. These students were willing to introduce a similar system at upper secondary in order to avoid unnecessary loss of focus.

In terms of the students’ orientation to the future, attaining good grades and the associated importance of tests was a dominant theme among all informants. The students did not see the need to stay on-task in class if it did not affect their grades. This attitude towards investing effort in class infused students’ explanations with a sense of instrumental rationality. If grades are the only objectives for your activities in class, and you repeatedly see that what you do in class does not have any bearing on those grades, you have an incentive to do what you please in class.

It is worth noticing that the students did not mobilise the sovereign conception of agency in their explanations here. Two important alternative frames of reference were mobilised instead. First, the students referred the way they experienced the institutional structure of incentives for studying hard at school. Getting good grades was the most important consideration, because grades opened up opportunities for higher education, the job market and ‘a good life’. For the students, the stakes were high and they felt that teachers set grades based exclusively on test results. Consequently, the students believed that the tests in subjects that end up in their final grade records from upper secondary were crucially important. This affected their priorities and had consequences for how they studied, just as the following illustrative example shows.

How often do you study hard and really try to understand the subject matter? (interviewer)
The most important tests (Berit 16)
Does it happen right before the tests? (interviewer)
Yes (Berit 16)
and you actually do it? (interviewer)
Yes (Berit 16)
Yeeeess ... (Ben 16)
At least in the final subjects (Berit 16)
Like in science, ok, which is a final subject and the most important subject this year, I think (Ben 16)
(...) as long as I get good grades in the final subjects, it is fine, those grades stick with you
So, this is the only thing that makes you really study the subject matter, then? (interviewer)
Yes, because we will not have those subject any more (Berit 16)

Even in their final year at upper secondary, students study at least 10 subjects each with their respective tests and final grades. The students said that they had to be strategic about their effort and do not want to waste energy on lessons that did not affect their grades.

The second alternative frame of reference mobilised by students was an instrumental and performative oriented conception of education that overshadowed a more substantive and mastery-oriented conception. An illustrative example is the way the students considered off-task practices acceptable as long as the student involved got good grades (see the example above). However, the students themselves seem to sense that this way of regarding education was inadequate. Three of the students in the sample normally got the highest grades but still recognised that their off-task practices were problematic. They seemed to have picked up a competing frame of reference about ‘doing your best’ as part of their socialisation at school or at home, and this frame seemed to affect them and produce their sense of school-net-conflict. Still, the two
alternative frames of reference, the incentive regime and the instrumental understanding of education, provided the students with rational explanatory frames for problematic off-task practices.

There were two more future-oriented ecological conceptions of agency at work in the students’ explanations for their off-task practices. From three of five focus group discussions, one could infer two types of orientation to the future availability of time that students implicitly used as frames for explaining their off-task practices. The first is known in the literature as ‘hyperbolic time discounting’, that is, the subjective value attributed to a future reward is relative to the distance in time, i.e., the closer in time, the higher the subjective value. Overall, the students in the sample saw doing well on important tests and getting good grades as important goals. The students considered these goals as more important than goals related to their net-practices. One would, therefore, expect that the students' current actions in class would reflect these priorities, thus reducing net-induced off-task practices to a minimum. However, in the students’ explanations, it was evident that they felt the value of net-induced immediate gratification surpasses diligent schoolwork if the important test was far in the future and the online gratification was available here and now. The term ‘discounting’ refers to a tendency to choose a ‘smaller-sooner’ reward over a ‘larger-later’ reward, while the term ‘hyperbolic’ refers to situations in which there is an exponential increase in value as the availability of a reward draws closer in time. In other words, the prospect of immediate gratification from off-task practices overshadowed any long-term and more valued gratification of reaching their school objectives, i.e., the subjective value of off-task practices increased exponentially just before they became available and surpassed the value of the studying.

The second frame of reference for the students' off-task practices was linked to the idea of 'slack', that is, the perception that there is unlimited time in the future, but not enough time in the present (Zimbardo and Boyd 2014). Repeatedly, the students said they postponed important schoolwork until they got home, and then failed to do it because the time available at home was also limited. Strangely, and of particular relevance when we address the ecological conception of agency, the students did not seem to learn from numerous negative experiences with delaying work this way as the following example illustrates.

So, when teachers share their presentations online it is less effective? (interviewer)

Yes, I think so, because no one will view them at home, at least not routinely. The easiest is to get all the information you need in class, get it all written down, gone through it (...). Do tasks at home or homework, then you don't do it. The day after you ask everyone Have you done the task? Send it to me on Facebook (laughs) (Annie, 17)

(...). Is it like that for the boys in class as well? (interviewer)

(laughs) That has happened quite often. So I usually [think] "no, I don't need to work this lesson because I will do it at home" and when I come home I just sit there on Facebook and when I look at the clock, yes, suddenly it is ten, eleven or twelve, and the next day I just write to a friend 'have you done the homework?’ just send it to me, okay, so I just send it to the teacher. That has happened too many times, all too many times (Anders 17).
That we do homework online or on PC makes it too easy to cheat, in a way, I have not done my homework once (...). We have homework in English due Wednesday, I think, I remember that I wrote it down on the PC, kind of (...). I know I will not do it, and I will sit there on Wednesday before class and ask the girl behind me if she can send it to me. But I want to do it, but I know that I will not have the time or something will come up that prevents me from doing it (Annie 17).

The example illustrates how temporal considerations enter into students’ explanations for problematic off-task practices. The perception of availability of time in the future is attributed importance, as well as an inability to learn from past negative experiences. Thus, a lack of ecological agency is present in their explanations of off-task practices.

**New material agency**

While sovereign, relational and ecological conceptions of agency emphasise the human actors, in new material conceptualisations of agency the human actors are de-centred. Instead, human actors and objects co-produce each other and the resulting relationships have agentic potential. Agency is thus an emergent co-produced phenomenon that can be seen in schools as a relational dynamic between students, teachers and non-human phenomena (Charteris and Smardon 2018). For the purposes of this study, we restrict our focus to the co-constitutive relationship between students and their digital online technologies.

For our informants, the relationship with digital online technologies formed the dominant frame of interpretation for off-task practices alongside sovereign agency presented above. Every one of the 11 students mentioned this relationship as a major reason for their off-task practices. Here, it is important to keep in mind that the students have unrestricted online access in-class. By emphasising their relationship to digital technology and online media, the students shifted the locus of what they saw as the agential, causal core of their practices. Instead of looking outward to elements in their instructional environment that ‘push’ them into distraction by way of their innate lack of self-control, they now looked into the nature of the material distractions themselves and identified operating agentic forces that ‘pull’ them into distraction by way of the applications and web pages’ persuasive design. The students’ interpretation was that ‘matter matters’ (Barad 2003). A common theme among the interpretations presented by the students was a pre-reflective, habitual, embodied and non-utilitarian urge to check what was going on online even if they knew nothing interesting was likely to have happened since they last checked. The students reported having social media applications open all the time in class regularly checking their Messenger, Facebook notifications or Snap. The following exchange between two friends, Doug and David, can serve as an illustrative example. We asked them why they used Facebook in class.

- I wonder myself. It is just that I am so stupid that I have my mobile there and then it blinks and then I check to find it is nothing. It blinks when a group conversation is ongoing. (David 18)
- Yes, it blinks because I have chat on Facebook. So my thinking in class goes like this ‘OK, what’s happening on the chat now?’ and then I just have to see. And if they write, I answer and then I just put the phone away. (Doug 18)
- Yes, you must, of course, check what they write. Chat is the most common activity, I think. (David 18).
In the next illustrative exchange, we asked two first-year students, Erica and Eli, if they had access to technology in class. They confirmed that they had constant access to their smartphones and their Mac, and continued:

It is OK with the access that we have, but it can easily make you do other things. And I wish that I managed to only write what I was supposed to write, but it ends up with me, suddenly, OK, I will fix my CV or check Facebook or check for mail, and "did I get the job I applied for?", sort of, you do so much else than what you are supposed to do. (Erica 16)

You are just a click away from Facebook and it is pretty tempting to just go on Facebook and check if something new has happened and such. (Eli 16)

But it is in fact quite idiotic because nothing really happens on Facebook, but it you just feel that you have to click on it, I don't know what it is. (Erica 16)

Temptations you cannot resist, sort of. (Eli 16) (…)

Facebook is the most important distraction, but it should not really have been that, because I don't get it, I don't know how to explain it, but I have to check, even if I don't do anything in particular there. (…). But it is not just Facebook, suddenly I get the urge to visit Nelly.com to check out the sale they have on and see what kind of dresses I shall wear in the next party, sort of. (Erica 16)

The examples show that the students mobilised a way of thinking in which the access and nature of the online distractions in and of themselves often acted as sufficient conditions for their off-task practices in class.

**Discussion**

ILEs are designed to optimise the relational dynamics in learning spaces by acknowledging the contribution of both human (e.g., teachers and students) and non-human (e.g., classroom design and technologies) entities, their interconnectedness and embeddedness in larger infrastructural arrangements (Istance and Kools 2013; OECD 2013). Learner agency is critical for succeeding at creating a relational dynamics that stimulate new knowledge practices in classroom spaces within the infrastructure for learning (Charters and Smardon 2018, 52). Off-task practices in class can point to areas in need of improvement, especially if the students at the centre of the exploration are school-oriented and want to do well at school. The weakening of horizontal borders carries both great promise and substantial risk. Opening up for educationally beneficial horizontal connections via the most multipurpose infrastructure known to humanity—the Internet—invariably has unintended side effects. Our 11 students experienced their own off-task practices as problematic since they wanted to do well at school (school-net-conflict). They did not feel able to do what was required for achieving their academic objectives, i.e., they experienced some kind of failure of agency. Their understanding of this failure of agency is important since a narrative constructed around individual responsibility and failure can contribute to the gradual loss of initiative/motivation.

Social-cognitive oriented research shows that students can enter vicious circles of procrastination, where perceived self-regulation failure contributes to lack of faith in regulatory self-efficacy, which in turn increases procrastination (Wäschle et al. 2014).
Another similar strand of research indicates that the consequences of procrastination for future possibilities are less severe for ‘active’ than ‘passive’ procrastinators (Chu and Choi 2005). This means that those students who feel that they actively choose to go off-task fare better in their future lives than students who feel that they do not make an active choice, as in the case of the students who say they drift off-task, pulled in by alluring, online distractions. The explanations provided by our informants did indeed draw on this kind of sovereign conception of agency; they blamed their own self-regulatory inadequacy for their experience of school–net-conflict. This was the dominant perspective used by the students to judge their performance, and they thereby seemed to align with the dominant OECD ideology used by (neo-) liberal policy makers in their visions for ILEs and education in general (see, e.g., Davies and Bansel 2007; McPherson and Saltmarsh 2016; Miller 2015).

The OECD position regarding ILEs and agency offers a striking paradox. On the one hand, the OECD promotes a more holistic understanding of learning environments and the role of new technologies emphasising the quality of relational dynamics as crucial for innovation in learning (Istance and Kools 2013). On the other hand, the OECD is also a fierce promoter of the narrative of the self-responsibilised individual learner disconnected from the relational dynamics of the same learning infrastructures. The sovereign self is the protagonist of this narrative, a self-sufficient individual who is in a position to choose, reject or accept the way the structural and agential dynamics influence or co-produce the sovereign agent. In other words, the sovereign agent is in a position to exclusively act in ILEs, and does not have to act through, by way and as part of the infrastructure for learning. The relational, temporal or material elements do not ‘push back’, but respond in an entirely unproblematic and predictable fashion.

By including four types of conceptualisation of agency for our theoretical analysis, we have demonstrated how students can turn to a deeper contextual understanding to account for their actions. They use relational conceptions to account for how off-task practices are social and become de facto norms in the absence of teachers who implement rules and hold students to account. Ecological conceptions were used in their explanations as temporal baselines for comparison and interpretation, but also as agential frames that could account for off-task practices in their own right, such as temporal time discounting and a time orientation characterised by ‘slack’. New material conceptualisations of agency were used in students’ explanations in relation to how the design of new technologies and online media have the power to pull students into distraction. However, if we combine the findings using all four conceptions of agency, it might support the claim that the agential potential found in the students’ explanations lay in constantly changing relationships between objects, humans and structures. It is therefore paradoxical that the students keep blaming their innate lack of self-control for their off-task practices while at the same time their own explanations point to a highly nuanced, contextual and relational understanding. The sovereign discursive heuristic has practical consequences. The students blamed themselves for their off-task practices, and some of the teachers left it to the students to keep on-task in class. This ‘un-sociological’, and ‘de-politicised’ understanding of learning environments is problematic since it obscures pertinent structural elements and risks misattributing problematic off-task practices solely to innate individual characteristics. Unfortunately, relational, ecological and new material conditions for agency are less understood, are rarely explicitly mentioned in policy
documents, receive less attention in popular media and are less intuitively accessible in cultural contexts dominated by the rhetoric of individualism. However, the OECD initiated ILE project draws explicitly on a holistic relational understanding of learning environments and the role of ICTs in them. Therefore, the OECD’s vision of responsibilised, individual life-long learners is a paradox. In fact, the very idea of redesigning ‘innovation hostile’ learning environments to create conditions conducive for sovereign learner agency is an oxymoron. The agency attributed to changing the relational constellations confirms a fundamental relational understanding of learning environments as infrastructures for learning. Individual students and teachers do not just act in these environments, but are integral parts of the infrastructure themselves and thus act through and by means of the same environments.

In terms of potential solutions to the 11 students problematic relationships to their off-task practices, each of the four conceptions of agency can play a role as they complement each other. Sovereign conceptions point towards cognitively oriented measures, such as developing meta-cognition, learning strategies and goal setting, and implementation strategies. Relational conceptions contribute with measures designed to strengthen the relational expertise and dynamics in class and thereby reaching collective solutions to and norms for problematic off-task practices. Ecological conceptions offer measures that integrate students’ orientations to the future and thus, e.g., redirect the main direction of the schools’ incentive regime from grades and tests, towards mastery, meaning making and interest generation. New material conceptions could contribute with measures that take seriously the attraction of popular applications and internet sites understood in conjunction with school-oriented practices, and thus strategically use or limit online access for predefined educational purposes.

Concluding remarks

The discursive heuristics mobilised by school–net-conflict students to account for their off-task practices are important considerations when designing technology-infused learning environments. The findings show that students have detailed, nuanced and context-sensitive understandings of the forces enabling their problematic procrastination, yet at the same time turn to the default discursive heuristic of an innate lack of self-control when explicitly explaining the failure of agency. The students seemed to take the role of ‘the intuitive psychologist’ (Ross 1977) displaying a ‘general tendency to overestimate the importance of personal or dispositional factors relative to environmental influences (…). [The intuitive psychologist] too readily infers broad personal dispositions and expects consistency in behaviour or outcomes across widely disparate situations and contexts’ (184).

In sociological terms, the ‘repertoire’ of discursive heuristics pertaining to agential forces making things happen in the learning environment is closely knit to the idea of the responsibilised individual on a perpetual quest for the self-sufficient sovereign self. The lack of alternative, culturally resonating, discursive heuristics more attuned to the relational, ecological and new material aspects of learning environments make students’ fundamental attribution failure predictable, if not inevitable. From the perspective of these school–net-conflict students, then, most off-task instances were an expression of individual self-regulation failure despite highly unfavourable contextual conditions.
Experiencing self-regulation failures repeatedly can have implications for students' sense of self-efficacy and self-worth. In addition, without access to a cultural 'reservoir' of discursive frames emphasising the potential of relational, ecological and new material ways of viewing the world, students might not 'see' and therefore not seek or enter into helpful and productive relational interactions. It is therefore timely to expand the range of a culturally salient 'reservoir' of discursive heuristics from which a more nuanced individual 'repertoire' can emerge to encompass ideas about the inherent relationality of the human condition (Arendt 1958) or the importance of both agentic capacity and agentic spaces in shaping agency (Biesta and Tedder 2016). Within new generation spaces there can be a range of interpretations of agency. The main contribution of this paper has been to shed light on a disconnect between how students understand the nature of their off-task practices and how they attribute 'blame'. In the process, they reduce contextual nuance and detail and increase the importance of dispositional attributes until the lack of self-control is the gravitational centre around which all other factors revolve.

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