



**Master of Information Systems – Digital Business
Systems/Management and Innovation**

**Online Learning in Higher Education During A Global
Pandemic: An Explorative Study On Norwegian Students**

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A report submitted in partial fulfillment of the requirement for the degree of Master of
Information Systems

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Abstract

Through an exploratory study we aimed to address challenging factors related to learning during the Coronavirus pandemic. We have investigated and identified procrastination, self-regulation, and exam anxiety as important factors associated with learning success. Since the educational sector has shifted radically towards online learning, we have additionally examined previous literature related to learning analytics, learning during disasters, and online learning. To address our research objective, we initially applied a survey to map out procrastinators and non-procrastinators to include for our semi-structured interviews with students. We additionally conducted a small sample of interviews with teachers, and one teaching technology manager, to acquire their perspective on the current situation. While prior studies under Covid-19 found that online learning has been perceived positive by students, our findings revealed challenges related to engagement in online lectures, and thus, suggesting that engagement is not properly facilitated through the current learning management systems. This paucity of engagement is further argued to reduce the students' overall learning outcome in terms of both practical knowledge and informal understanding of subjects. However, it does not reflect on the grades as the evaluation system has become more lenient. Our findings further revealed significant differences amid procrastinators and non-procrastinators when investigating the students' study behavior and habits, and we see that procrastinators in higher degree encounter challenges related to motivation, allocating time to study, and structure, as opposed to non-procrastinators. Nevertheless, our findings reveal that the teachers are not able to sufficiently follow-up students-at-risk themselves because of time constraints and limited resources, and a lack of an appropriate framework is hindering the university to adequately adopt learning analytics.

Keywords: Online Learning, Covid-19, Learning Analytics, Procrastination, Self-regulation, Test Anxiety

Acknowledgements

We would like to express our deepest gratitude to our supervisor Lester Allan Lasrado, despite the Covid restrictions our supervisor has been providing us with excellent guidance and support throughout this Master Project. We would also like to thank each other for being great team members and lift each other's spirit during these special circumstances. Additionally, we would like to thank all our family and friends for supporting us through this final period as students. Lastly, we would like to thank all the participants for taking the time to participate in our project and for provide us with valuable insight into their experience during this pandemic.

I certify that the work presented in the thesis is my own unless referenced

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Date: 21.05.2021

Total number of words: 18101

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1 Introduction

The coronavirus pandemic is an unprecedented event for society and has also significantly affected the education community. Firstly, education has shifted massively towards online learning, which meant a quick transformation of the curriculum and learning styles (Ratten, 2020; Kang & Zhang, 2020). Second, preventive measures like quarantine and social distancing have meant isolation for individuals and families, which results in problems related to student well-being (Andrén and Pettersson, 2020), productivity, procrastination, and academic anxiety (Jia et al., 2020). While previous studies have investigated the impact of online and distance learning on students (Patterson 2018; Winters et al., 2008), and education during a crisis (Dabner, 2012), the field of research addressing the combination of these two contexts is deficient. The research on the impacts of the current crisis on students is still emerging, and the timeframe of which this phenomenon can be explored is unknown. Although past studies can result in useful prescriptions from educators to handle the current situation, it is important to emphasize the uniqueness of this pandemic, which have forced the students into a form of isolated online learning. Hence, our aim of this study will be to explore the impact of the current situation from an Online Learning perspective. This is an important subject to address, not only to be prepared should it happen again, but because we don't know for how long this pandemic will last. It is also assumed that the online learning setup has come to stay and will to a much greater extent be applied in education after this pandemic. Therefore, it is urgent to explore and develop this new way of learning and teaching.

Drawing upon previous literature related to Online and Distance Learning, research has found that the degree of procrastination may be amplified in a digital learning setup, as students tend to procrastinate more when they are not expected a particular behaviour (Elvers et al., 2003). Studies further imply that the demands on self-regulation are higher in distance education settings than in traditional university settings (Klingsieck, 2012), and that self-regulation (Rasheed et al., 2020), effort regulation, and motivation tend to lack for online students (Rakes & Dunn, 2010). It is also argued that academic procrastinators are less inclined to self-regulate, which will have a negative effect on performance in online courses (Elvers et al., 2003; Tuckman 2005). Several types of research methods related to learning analytics have also emerged along with the digital learning setup, giving instructors and researchers access to student activity and interactions with digital learning tools (E.g., Akram et al., 2019; Kang & Zhang, 2020; Paul Ruiz et al., 2015). Results

highlight the relation between time-related indicators and procrastination (Akram et al., 2019), thus indicating that the time until starting an activity on a digital platform can be adequate to procrastination related indicators (Paul Ruiz et al., 2015). Academic anxiety is also stated to be a possible impact of this pandemic (Jia et al., 2020), and previous research has reported that academic anxiety may negatively affect the students' motivation and concentration (Nsor-Ambala, 2020; Trifoni and Shahini, 2011), and thus causing some students to perform worse than their ability would otherwise allow (Zeidner 2007). However, test anxiety may also be a consequence of a lack of preparation for the test (Trifoni and Shahini, 2011), poor study skills (Culler & Holahan, 1980), and procrastinating behaviour (Siemens and Long, 2011; Yerdelen et al., 2016).

1.1 Objective and Research Question

Exploring these concepts and themes derived from Online and Distance Learning literature and associated fields of research (e.g., education and social and psychological studies), will provide us with substantial knowledge to address our research objective. Past studies related to procrastination (Choi and Moran, 2009; Rakes and Dunn, 2010; Van Eerde, 2003), academic anxiety (Chapell et al., 2005; Culler and Holahan, 1980; Zeidner 2007), self-regulation (Zimmerman and Schunk, 2011), learning analytics (Daud et al., 2017), and student engagement (Lawrence et al., 2019; Van Oldenbeek et al., 2019) can subsequently result in useful prescriptions for educators to handle the current situation. Consequently, we address the following research questions:

RQ1: Has the shift to online learning impacted some students differently as compared to others?

RQ2: What are the main challenges related to online lectures?

This dissertation will investigate RQ1 from a student perspective and RQ2 from both student perspective and teacher perspective, and thus, we intend to explore concepts such as procrastination, self-regulation, test anxiety, and learning analytics within an online learning context to set the scope of this study. We will also be looking at previous studies on education during a crisis and more recent studies from the Corona Pandemic, to acquire more knowledge on important aspects of the current context in which our study is being carried out.

The reason we have chosen the mentioned concepts is that procrastination (Goda et al., 2015; Paul Ruiz et al., 2015; Van Eerde, 2003), self-regulation (Heikkilä and Lonka, 2006; Zimmerman, 2002), and test anxiety (Zeidner, 2007) are all predictors of academic performance according to

the literature. The literature further states that in an Online and Distance Learning setting, people tend to procrastinate more (Elvers et al., 2003), and the necessity of self-regulatory skills increases (Klingsieck, 2012). Students have also reported higher academic anxiety due to the pandemic (Jia et al., 2020), and test anxiety can be a cause of procrastinating behaviour (Yerdelen et al., 2016). Learning analytics will be addressed to explore its capability to identify procrastinating behaviour (Akram et al., 2019; Paul Ruiz et al., 2015) to initiate and help students at risk, which is more feasible now as the majority of lectures are being carried out online. Although this study will mainly emphasize the students' perspective, we want to explore the teachers' perspective on online learning because their adaptability to teaching online may directly impact the students' online experience.

1.2 Method and Approach

To address our research questions, we will apply both quantitative and qualitative methods. Initially, we will conduct an online survey on master students to map out procrastination (Tuckman, 1991), active procrastination (Choi and Moran, 2009), test anxiety and self-regulation (Pintrich and Groot, 1990). For this study, we will only apply the passive procrastination data derived from Tuckman's (1991) questionnaire, to achieve a purposeful sample of students to take part in semi-structured interviews. This is because we want to look at differences between procrastinators and non-procrastinators, to see whether they are impacted differently by the online learning format caused by this pandemic. We have chosen to view our data through the lens of procrastination because we find it to be the most versatile concept amongst the included concepts. This is because procrastination is a predictor of poor performance, procrastinating behaviour is characterized by poor self-regulatory skills (Van Eerde, 2003; Wolters et al., 2017), and procrastinating behaviour may also lead to test anxiety (Yerdelen et al., 2016). Additionally, procrastinating behaviour is one of the main parameters to be measured using learning analytic tools (Akram et al., 2019; Paul Ruiz et al., 2015). Lastly, we would like to investigate the notion that procrastinating behaviour may be amplified in an online learning setting (Elvers et al., 2003), and try to understand why.

With the sample selection derived from the survey, we can carefully select participants to achieve a representable variety of procrastinators and non-procrastinators to include for our semi-structured interviews. The semi-structured interviews will constitute the main data collection to address our

research questions, where we will ask questions related to all our included concepts and formulated within the Online learning context, as will be elaborated in the method section.

Lastly, we will conduct a small sample of semi-structured interviews with teachers to view their perspective on this disruptive shift to an online learning setup. This is to get some nuance to the results, and hopefully be able to support some of our findings. Additionally, the teachers will directly influence the students' learning experience, and hence, we want to explore the dynamic between students and teachers to find out how it has impacted the students during this pandemic.

1.3 Delimitation

The field we are studying is extensive, and because of the exploratory approach we had to this study, there are quite a few concepts, themes, perspectives, and data that we could not include in this paper. First of all, this study will not separate between impacts caused by online learning and the pandemic. We are looking at them as one common phenomenon, which means we do not depict between what is a cause of the pandemic and what is a cause of online learning. This is important to mention because some of our results may not apply in a regular online learning setting without the pandemic. Furthermore, we will not include the social impact and how this might influence the students' studies and behaviours.

2 Theoretical Background

We initially created an overview of the important concepts and definitions to make the literature review more comprehensible for the reader, as shown in Table 1. In the literature review, we will start by presenting theory related to learning during disasters and online learning to establish the context of our study. This is followed by a review of our other concepts, including learning analytics, academic procrastination, self-regulation, and test anxiety.

Table 1: Overview of definitions of concepts

Concepts	Definitions	Author of study
Passive procrastination	Procrastination is defined as a person who needlessly delays tasks one intends to do. Characterized from a behavioral aspect as the act of delaying work, and from a psychological aspect as the habit of telling themselves bad excuses to justify an act of needlessly delay work.	Klingsieck (2012) Steel (2007), Dewitte and Schouwenburg (2002), Choi and Moran (2009), Tuckman (1991).
Active procrastination	Active procrastinators prefer to do work under pressure, thus making a deliberate decision to postpone. ‘A parallel definition of this concept is active delay, which in an educational context is described as a student who intentionally delays work because they expect learning to occur quickly and that such students may procrastinate to spur themselves to efficient action.	Chu and Choi (2005), Choi and Moran (2009), Corkin et al. (2011), Hensley (2014), McElroy and Lubich (2013)
Self-regulation	Self-regulation within the learning context refers to self-generated thoughts, feelings, and behaviors that are planned and systematically adapted to affect one’s learning, motivation, and goals. The Hallmarks of self-regulation are choice and control, meaning that people must experience a	Schunk and Ertmer (2000), Zimmerman (2000), Zimmerman and Schunk (2011), Weinstein et al. (2011), Deci et al. (1996).

	sense of unpressured willingness to engage in the action for it to be considered fully self-regulated.	
Test anxiety	Test anxiety refers to the subjective experience of intense psychological, cognitive, or behavioral symptoms of anxiety before or during test-taking situations that interferes with test performance.	Chapell et al. (2005) Culler and Holahan (1980), Much and Broder (1999), Zeidner (2007), Trifoni and Shahini, (2011).
Learning analytics	“The measurement, collection, analysis and reporting of data about the learner and their contexts, for purpose of understanding and optimizing learning and the environments in which it occurs (Siemens & Long 2011, p.34).	Siemens and Long (2011).
	Gathering extensive data and storing data about how students perform, learning processes and interaction, through diverse forms of the educational learning management system.	Ifenthaler (2017), Pardo et al. (2016), Viberg et al. (2018).
Online Learning	Online learning can be defined as teaching and learning mediated through the internet by the use of extensive platforms, which offers the learner to learn from anywhere, to any time, at the student’s own convenience.	Gonzalez et al. (2020), Rapanta et al. (2020), Rasheed et al. (2020).

2.2 Education During crises and Online Learning

Viewing from the context of natural disasters and crises, online teaching has become a robust solution in limiting infection risk. In early 2020 the World Health Organisation declared the current corona situation as a global health emergency. Thus, the swift shift to online learning served as a viable solution for combating covid-19 related disruptions to education (Adnan & Anwar, 2020; Aucejo et al., 2020; Fjørtoft 2020). According to UNESCO, schools and higher education institutions in 185 countries, constituting over 89.4% of enrolled students worldwide, were affected

(Marinoni et al., 2020). Similarly, the UIA global survey reported that 59 % of higher educational (HE) activities on campuses were fully stopped and institutions were closed, whereas 30 % of institutions were partially opened with major disruptions (Marinoni et al., 2020).

From previous catastrophic disasters, it was learnt that e-learning quickly became a crucial resolution during these difficult times. Take for instance the case of Canterbury, New Zealand, which quickly adapted to a web-based environment and social media platform that became a prominent source of support for learners (Dabner, 2012). However, the sudden change to online learning is reported to be both beneficial and challenging for educational institutions and students (Ayebi-Arthur, 2017; Husky et al., 2020; Marinoni et al., 2020). As social distancing and isolation have become new norms, studies concerning Covid-19 and HE have reported that a shift to online learning has been well accepted, and a causative explanation for this may be that a large majority of students today belong to the millennial or post-millennial generations, who are considered the generations of social media savvy, with the use of social media as their main source of communication (Khalil et al., 2020; Rogowska et al., 2020). Other quantitative studies during Covid-19 found that students find online learning to be a good option in the pandemic context, where only 3.8% preferred face-to-face classes and 5.6% reported that online studies were not useful out of 83.5 % of respondents (Schlenz et al., 2020).

2.2.1 Online Learning

Although the shift towards blended-learning and e-learning is more widespread today, and the benefits are substantial, the completion rate is often substantially low (Patterson 2018). Studies within online learning and blended learning have reported that students often face challenges with self-regulation which involves procrastination, online help-seeking, lack of self-regulation skills, poor time management, and improper utilisation of online peer strategy (Bol and Garner, 2011; Rasheed et al., 2020; Winters et al., 2008; Yilmaz, 2017). Additionally, student isolation has been a concern as it includes student feeling isolated, disinterested, and experiencing issues with synchronous online communication (Rasheed et al., 2020; Winters et al., 2008). More recent studies explored the impact of online learning concerning educational content understanding (Alassaf and Szalay, 2020; Khalil et al., 2020), and found students to be positive about online learning, as it is suitable for most subjects, thus, students felt that they comprehend the content in less time as opposed to campus learning (Alassaf and Szalay, 2020; Khalil et al., 2020). Whereas other studies,

conducted with cross-sectional and extended technology acceptance model in e-learning, indicated that students mainly had a medium feeling towards online learning and found it to improve their productivity and their self-efficacy; likewise found ICT tools to be largely intuitive (Khalil et al., 2020; Rizun and Strzelecki, 2020; Schlenz et al., 2020). Similarly, in terms of performance, a study conducted at the University of Madrid pre-covid-19 (classroom-based), and after (online classes), observed that students performed significantly better during covid-19 quarantine. The findings suggest that the new learning method was the case for a significant increase in student performance (Gonzalez et al., 2020). However, many students felt that they were not well equipped for practical courses such as i.e., dentistry and medicine (Khalil et al., 2020; Schlenz et al., 2020). Nonetheless, the transition to online learning for teachers has been varying in existing literature (Fjørtoft, 2020; Rapanta et al., 2020; Schlenz et al., 2020), and found the shift to online learning being time-constraining and claimed that using digital tools necessitates more preparations and better classroom management (Fjørtoft 2020; Schlenz et al., 2020).

2.3 Learning Analytics

Learning Analytics (LA) is still an evolving area in higher education (HE) and has gained a predominant amount of attention to combat challenges that higher education encounters, such as addressing student retention, curriculum standards, measuring teaching quality, students learning behaviour, and student engagement (Herodotou et al., 2019; Ma et al., 2015; Martin and Ndoye, 2016). The use of extensive integration of technology into higher education (HE) sharpens the teaching and learning practices (Ifenthaler, 2017). LA seeks to improve and amplify the quality of blended-learning and online learning by gathering extensive data and storing data about how students perform, learning processes, and interactions through diverse forms of educational learning management systems (Ifenthaler, 2017; Ifenthaler et al., 2014; Pardo et al., 2016; Viberg et al., 2018). Using complex numbers and algorithms derived from learners' digital footprints (Ifenthaler, 2017; Pardo et al., 2016). Hence, allowing stakeholders to gain summative, real-time, and predictive data to help understand and enhancing the students' learning experience (Avella et al., 2016; Gašević et al., 2016; Ifenthaler, 2017). In recent years, many institutions have adapted to learning analytics, as educational institutions are now experiencing increased pressure to account for what and how students are learning. Thus, the strain is more significant as more institutions are shifting towards blended and online learning. Likewise, as universities are receiving massive

cohorts, traditional learning techniques poses serious challenges to the scalability of dialogue-based solutions (Pardo et al., 2019; Van Der Kleij and Adie, 2020). Some examples of universities that have successfully employed LA are Perdu University, which implemented course signals to provide meaningful feedback based on a predictive model (Arnold and Pistilli, 2012), the University of Maryland Baltimore County, which adopted blackboard LCMS to track students and predict its student performance (Dietz-Uhler and Hurn, 2013), and Marist College, who used early intervention based on a predictive model to provide students with earlier feedback, allowing students to act on issues before it is too late (Sclater et al., 2016)

Similarly, as the field is evolving, a number of case studies have been established concentrating on the implementation of LA in HE from a student concentric view (Arnold and Pistilli, 2012; Corrin and De Barba, 2015; Dietz-Uhler and Hurn, 2013; Heller and Bry, 2019; Jivet et al., 2020; Pardo et al., 2016). Research states that traces of students in online platforms (spending in online materials, discussion in forums) are significant in predicting student performance, identify at-risk students, and increase engagement (Akçapınar et al., 2019; Herodotou et al., 2019; Martin and Ndoye, 2016). The findings suggest students with Course Signal (CS) in a course retained at a rate significant to their peers who had no CS, and students that had two or more course signals had a higher rate than those who had only one or no CS (Arnold and Pistilli, 2012). Similarly, emphasis on meaningful feedback has been identified as one of the significant factors for influencing students' performance; the evidence comes from a meta-analysis conducted by Hattie (2009). Previous research offers abundant suggestion concerning the effective delivery of feedback (Dawson et al., 2019; Huisman et al., 2019; Van Der Kleij and Adie, 2020). However, students experience that the feedback was not fulfilling the role as it should (Ferguson, 2011), and studies within LA claim that meaningful feedback can be provided with LA tools (Gašević et al., 2016; Jivet et al., 2020; Pardo et al., 2019). (Pardo et al., (2020) suggest combining both traditional (human instructor) and automated (algorithm) provisions of feedback to have a positive association with student's satisfaction. Thus, there is the possibility of discovering how technology can challenge human intelligence to yield personalised feedback for a large cohort (Pardo et al., 2019).

2.3.1 Challenges of Learning Analytics

Even though learning analytic tools are highly beneficial for higher education, there is considerably little focus on higher education stakeholders in existing literature (Ferguson et al., 2016; Hilliger

et al., 2020), and challenges related to strategic planning and policy (Tsai and Gasevic, 2017). Literature within LA in Europe predominantly focused on the supply side such as the development of tools, prototypes and data (Arroway et al., 2015; Ferguson et al., 2016). Studies conducted in Latin American universities suggest there is a need for greater emphasis on engaging stakeholders by a dialogical approach of increasing awareness of the existence of LA services (Hilliger et al., 2020). Similarly, existing literature identified numerous challenges HE encounters (Macfadyen and Dawson, 2012; Tsai and Gasevic, 2017). Such as, lack of leadership capabilities to drive the implementation of learning analytics and faculty culture resistance seems to be major concerns (Arroway et al., 2015; Macfadyen and Dawson, 2012; Tsai and Gasevic, 2017). Existing studies revealed that there is a broad tension amid entrepreneurial and operational agendas when introducing LA to higher education, such as funding skills, expertise and workload allocation of employees, institutional culture (Macfadyen and Dawson, 2012; Tsai et al., 2019), and a lack of pedagogical grounding approaches to eliminate learning hurdles (Macfadyen and Dawson, 2012; Tsai and Gasevic, 2017). Thus, scholars suggest there is a need for an open environment and conceptual change, distribute expertise and collaboration which can support learners at all aspects of the learning journey (Macfadyen and Dawson, 2012). Educators are often seen to be more concerned about the adoption of learning analytics rather than improving the way people learn and how teaching is given (Macfadyen and Dawson, 2012). Similarly, Insufficient training opportunities has been identified as a challenge, and in terms of teacher it is often experienced that teachers are being more reluctance to use LA due to heavy workload, lack of digital skills and data literacy (Herodotou et al., 2019; Rodríguez-Triana et al., 2018). Rienties et al. (2018). Likewise, a study conducted with the use of technology acceptance (TAM) in a multi-embedded study on 95 teachers, discovered that though the training was provided, teachers found interpretation of data and the use of LA dashboards to be difficult, whereas 86% needed additional training and follow-up support. In this TAM study, it was identified variations in how teachers perceive LA dashboards, which indicated that participants with high technology acceptance were positive about training, whereas those with a lower technology acceptance were less satisfied (Rienties et al., 2018). Even though LA dashboards allow the user to gain more detailed information, users often doubt the accuracy, and hence, it is not perceived as useful (Rienties et al., 2018; Schwendimann et al., 2016), which is an open challenge when utilising learning analytics. In 2016, Europe's General Data Protection Regulation (GDPR) came into force and changed the LA field (Ferguson et al., 2016).

While institutions have common regulations regarding the use of data, the uncertainty and different views regarding ethical issues have made it challenging to develop learning analytics frameworks (Tsai et al., 2019). In this connection, LA has raised concern among student trust and scope of surveillance (Slade et al., 2019; Sun et al., 2019). Likewise, students are often willing to exchange personal data for perceived benefit, however, are doubtful by the risk and drawback of collecting educational data due to the possibility of introducing biases (Verbert et al., 2020).

2.4 Academic Procrastination

Procrastination is an increasing concern within the educational sector and addressing this issue has become a continuously growing field of interest for researchers. Previous studies have found that low self-efficacy, disorganisation, low intrinsic motivation, poor effort regulation, and time management are all strong characteristics of academic procrastination (Howel & Watson, 2007; Rakes & Dunn, 2010; Steel, 2007; Van Eerde, 2003; Wolters et al., 2017), and thus, argue that academic procrastination is a reliable predictor of poor academic performance (Goda et al., 2015; Paul Ruiz et al., 2015; Van Eerde, 2003). The literature further provides methods to measure and identify academic procrastinators e.g., through surveys (Choi & Moran, 2009; Tuckman, 1991), or by tracking students' learning activities (Akram et al., 2019; McElroy and Lubich, 2013; Paul Ruiz et al., 2015). While these methods are more of a quantitative character, Dewitte and Schouwenburg (2002) conducted a qualitative case study on procrastinators to acquire a deeper understanding of why procrastinators postpone work. However, it seems to be a lack of studies addressing academic procrastination from a more individual and socio-psychological perspective, and more research of qualitative character is required (Paul Ruiz et al., 2015; Van Eerde, 2003; Van Eerde & Klingsieck, 2018).

Van Eerde (2003) and Van Eerde and Klingsieck (2018) have both conducted a meta-analysis of literature within the field of academic procrastination, of which they identified a possible lack of moderating effects or moderating variables, considered when studying procrastination (Van Eerde & Klingsieck, 2018). Moderators are defined as variables that affect the relations between an independent- and a dependent variable (King, 2013), which in this setting may refer to the individual students' ability to perform a task or whether a job requires accuracy and punctuality versus good solutions and creativity (Van Eerde, 2003). Choi and Moran (2009) elaborate further on Van Eerde (2003) 's moderator theory and speculate that most professional workers dealing with

tight deadlines and unpredictability may benefit from flexible time management behaviours such as active procrastination. In contrast, in relatively routine and predictable task situations, non-procrastination would likely be a better task strategy (Choi and Moran, 2009). According to Chu and Choi (2005), not all procrastination behaviours are harmful or lead to negative consequences. Active procrastinators are positive and prefer to do work under pressure, thus making a deliberate decision to procrastinate (Chu & Choi, 2005; Choi & Moran, 2009). In addition, Hensley's (2014) study found that only passive procrastination is a significant predictor of grades, which indicates that active procrastination behaviour might not lead to poor performance; instead, they may perform the same as non-procrastinators but with different learning strategies and time management approaches (Wolters et al., 2017). It appears that active procrastination is commonly described as a learning behaviour related to delaying work, which might be more clearly understood as an adaptive form of delay; as opposed to traditional procrastination (Corkin et al., 2011). Hensley (2014) describes active delay as students who intentionally delay work because they expect learning to occur quickly and that such students may procrastinate to spur themselves to efficient action. Considering these findings on procrastination and active delay, it is argued that studying delay rather than procrastination might yield an incomplete picture since it does not consider the psychological aspects of procrastination (McElroy and Lubich, 2013).

Research states that feedback plays a fundamental role in assisting students with self-regulated learning and to reduce academic procrastination (Evers et al., 2003; Kang & Zhang, 2020; Paul Ruiz et al., 2015). The findings further suggest that cognitive behavioural interventions reduced procrastination more strongly than the other types (Van Eerde & Klingsieck, 2018). Procrastination is proved to be related to less use of cognitive and metacognitive strategies (Howel and Watson, 2007; Wolters et al., 2017), and the use (or lack of use) of learning strategies plays an important role in the dynamics of procrastination (Klingsieck, 2012), which supports cognitive behavioural therapy as a strong intervention type. However, deeper studies of educational aspects such as learning styles are required (Paul Ruiz et al., 2015).

2.5 Test Anxiety

Test anxiety is frequently cited among the pivotal factors at play in determining a wide array of unfavorable outcomes for students, including poor academic performance (Chapell et al., 2005; Culler & Holahan, 1980; Musch & Broder, 1999; Zeidner, 2007). Some of the factors that cause

test anxiety are related to exam type (Nsor-Ambala, 2020), fear of negative evaluation, bad experiences in previous tests, time limitation, and pressure (Trifoni and Shahini, 2011). Students have reported that test anxiety negatively affects their motivation and concentration and decreases knowledge retention during the exam (Nsor-Ambala, 2020; Trifoni and Shahini, 2011), thus causing some students to perform worse than their ability or achievement would otherwise allow (Zeidner, 2007). However, test anxiety may also be a consequence of a lack of preparation for the test (Trifoni and Shahini, 2011), poor study skills (Culler & Holahan, 1980), and procrastinating behaviour (Yerdelen et al., 2016).

The literature has also considered the notion that females are more anxious than males and investigated how this gender difference may impact their ability to perform on a test. Findings imply that female students report higher levels of test anxiety (Cassady & Johnson, 2002; Chapell et al., 2005; Núñez-Peña et al., 2016; Stöber, 2004; Trifoni and Shahini, 2011). Although female students have reported a higher level of test anxiety than their male peers, there were no observed gender differences in academic performance (Cassady & Johnson, 2002; Núñez-Peña et al., 2016). One study even reported that female students had significantly higher GPAs (Grade Point Average) than male students (Chapell et al., 2005). Stöber (2004) found that female students coping with high test anxiety worry reported less avoidance coping and more task-orientation and preparation. Female students are more afraid of failing in a test situation and will accordingly prepare more than male students (Núñez-Peña et al., 2016; Trifoni and Shahini, 2011), which shows that worrying is considered to be a kind of problem-solving strategy perceived to foster motivation and stimulate preparatory and analytical thinking (Stöber, 2004).

In terms of online examinations, Stowell & Bennett (2010) reported that Students who normally experience high levels of test anxiety in the classroom had reduced test anxiety when taking online exams, while the reverse was true for those low in classroom anxiety. Additionally, the relation between test anxiety and exam performance was weaker in an online setting than in the classroom (Stowell & Bennett, 2010).

2.6 Self-regulation

Self-regulation within the learning context refers to self-generated thoughts, feelings, and behaviours that are planned and systematically adapted to affect one's learning, motivation, and goals (Schunk & Ertmer, 2000; Zimmerman, 2000; Zimmerman & Schunk, 2011). Self-regulation

is argued to be an important function of education, but also within other areas like music and sport (Zimmerman & Schunk, 2011), to develop lifelong learning skills (Zimmerman, 2002). However, the number of students entering higher education without being properly prepared to benefit from their studies is increasing (Weinstein et al., 2011). In general, educational programs have been developed to help students with basic study skills like reading and writing, but learners must also be strategic and self-regulated so they can take more responsibility for their learning processes, thoughts, and behaviours (Weinstein et al., 2011). Students may self-regulate different dimensions of learning, including their motives for learning, the methods they employ, the performance outcomes they strive for, and the social and environmental resources they use. Thus, self-regulation has both qualitative and quantitative aspects because it involves which processes students use, how frequently they use them, and how well they employ them (Schunk & Ertmer, 2000).

According to Zimmerman (2002), some of the component skills for self-regulation include goal orientation, adopting proper strategies for attaining the goals, progress- and performance orientation, efficiently time management, self-evaluation of methods, and attributing causation to results. Hence, the student's level of learning and study success has been found to vary based on the presence or absence of these key self-regulatory processes (Heikkilä and Lonka, 2006; Zimmerman, 2002). A more recent study by Iwamoto et al., (2017) suggests that the current generation of students have high self-confidence, which reduces their level of academic anxiety and motivation to self-regulate. Because of their confidence in the existing ability and the belief that they would come to understand the course content when a high-stake assignment nears, self-regulation skills are not a priority during their academic preparations (Iwamoto et al., 2017).

The hallmarks of self-regulation are choice and control (Schunk & Ertmer, 2000), meaning that people must experience a sense of unpressured willingness to engage in the action for it to be considered fully self-regulated (Deci, Ryan & Williams, 1996). Students have little opportunity for self-regulation when teachers dictate what students do, when and where they do it, and how they accomplish it (Schunk & Ertmer, 2000). On the contrary, online and distance learning provides students with a high degree of freedom, hence giving the students control over where, when, and how to study (Hong & Jung, 2011; Peterson & Roseth, 2016). Since distance online learning is characterized by autonomy, students' ability to self-regulate their learning becomes a critical factor for deep and meaningful learning (Barak et al., 2016; Barnard et al., 2009; Hussein-Farraj et al., 2012). Students with weak general self-regulated learning skills and poor calibration skills might

be particularly at risk in distance education courses that are largely autonomous or self-directed in nature (Bol & Garner, 2011; Inan et al., 2017). Furthermore, it is reported that online students indicated metacognitive skills, such as planning, controlling, and evaluation skills, as essential for meaningful distance learning; while on-campus students asserted a lack of self-discipline and limited communication skills as barriers to distance learning (Barak et al., 2016). Cho and Shen (2013) state that students' achievements are mediated by three types of regulation—effort regulation, metacognitive regulation, and interaction regulation. Educators are therefore advised to offer students strategies for increasing their self-regulation in distance education environments (Sun & Rueda, 2012).

2.7 Conceptual model

Based on acquired knowledge from our literature review, we have made a conceptual model for our research objective, as demonstrated in *Figure 1*.

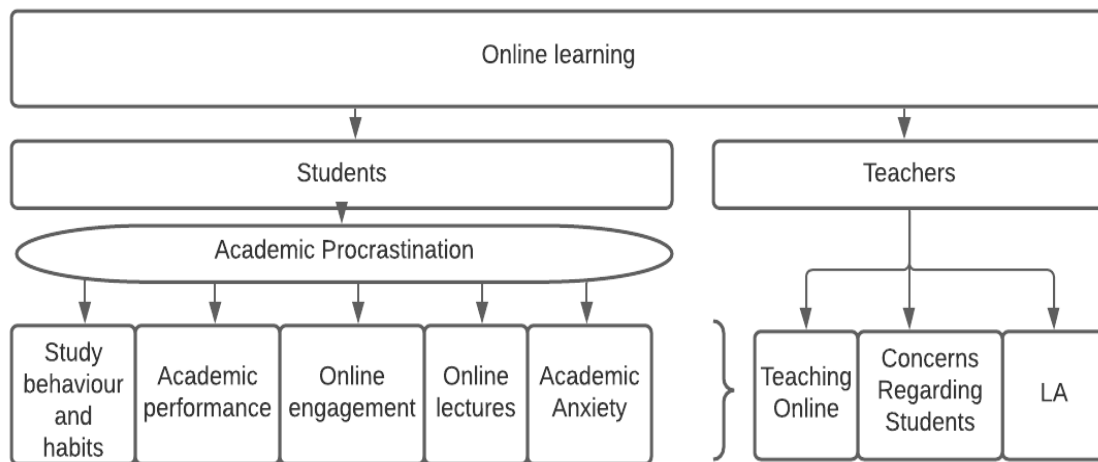


Figure 1: Conceptual Model

Starting from the top, you can see that our research will be conducted from an Online Learning perspective, and further examine the students with an applied procrastination lens. On the bottom left, we have created five main themes (Study behavior and habit, Academic performance, Online engagement, Online lectures, and Academic anxiety) which will be explored to address our research questions. On the right side of *Figure 1*, we have created three main themes (Teaching online, Concerns regarding students, and Learning Analytics) which have been constructed to

address RQ2 from a teacher perspective. The fundamental knowledge behind this conceptual model is anchored in previous theory where, for instance, *Study behavior and habits* have derived from procrastination- and self-regulation theory. We have also adjusted some themes consecutively and accordingly with our results derived from the data collection phase. This is because we have chosen an exploratory approach to this study with the respect to the unique circumstances in which the study has been carried out, and thus, demanding us to be more adaptive in terms of how the study will turn out. Hence, the main themes we selected for this model are based on their perceived importance related to our research objectives but also based upon what our interview participants emphasized as important.

3 Research Methods

To gain a comprehensive understanding of the state-of-art, we critically studied each topic in the literature review. We initially started with looking into the Basket of eight to find relevant papers within the domain of procrastination, self-regulation, test anxiety, learning analytics and online learning. Similarly, we conducted search processes using certain keywords on Google Scholar. Additionally, papers related to higher education themes during Covid were explicitly found by searches in Google Scholar. In the process of finding the right papers, we used various keywords such as: Online learning during a pandemic, teaching during Covid, Higher education during Covid, Procrastination in online learning, Self-regulation in higher education, Test anxiety in higher education, and their combinations were used. In process of evaluating which papers to use we initially used papers classified as level 1 and level 2 by the Norwegian Centre of Research Data (NSD) search engine. Subsequently, we used the forward and backward method (Özdamar and Ulusoy, 1996), to explore sources referenced in the articles to gain a greater understanding of the development of topics.

This dissertation employs quantitative and qualitative research methods, predominantly focusing on the qualitative data collection aspect. Such a method provides meaningful data as it allows us to capture the complexity of users, moreover, allows us to grasp a deeper understanding of the user needs in a specific context (Vaughn and Turner, 2016). Similarly, contributes to the creation of new solutions, which contributes to research (Vaughn and Turner, 2016). As described in the introduction, we initially conducted a survey with the intent of attaining a purposive sampling of our data for the dissertation. Due to the current pandemic, the data collections for this dissertation have been conducted digitally, using platforms such as Zoom for interview and Qualtrics for the survey.

The following methods section will involve, method 1 survey and cluster, method 2 involves student's interviews, supplementary teachers and TTC manager interviews and lastly, ethical protocol, reliability, and validity.

3.1 Method 1: Survey and Cluster

we conducted an online questionnaire on Master Students to map out procrastination (Tuckman, 1991), active procrastination (Choi and Moran, 2009), test anxiety and self-regulation (Pintrich and

Groot, 1990). For this research, we only applied the passive procrastination data derived from Tuckman's (1991) questionnaire. This is because we wanted to look at differences between procrastinators and non-procrastinators, to see whether they are impacted differently by the online learning format during this pandemic.

3.1.1 Research Design

The Tuckman Procrastination Scale (TPS) was originally developed to measure academic procrastination which included 16 items scale and has been employed in multiple studies (E.g., Chu and Choi, 2005; Hensley, 2014; Tuckman, 2002; Tuckman, 2007). In this study, however, we employ 13 of the 16 questions using an 8-point scale. We started with 16 items but reduced it after the first test run. There are two main reasons for this (1) these 16 questions were part of a larger survey and after the first test run, a need was felt to reduce the number of questions. Therefore, some (three) of the questions were dropped, including (Q4) *I keep putting off improving my work habits*, (Q8) *I am a time waster now, but I cannot seem to do anything about it*, and (Q14) *Putting something off until tomorrow is not the way I do it*. (2) The scale was changed to an 8-point scale i.e. Never (1) to Always (8) as compared to prior papers wherein a 4-point or 5-point scale were employed. While Always (8) was seen as negative and Never (1) was seen as positive, some of the questions were the opposite of the rest. These questions had to be re-coded, and includes Q5, Q9, and Q10, according to Table 2 which displays the order of questions after the reduction of questions.

3.1.2 Data collection

The invitation for participating in the survey was sent to students from two study programs i.e., 19 students from Bachelor of Data Science and 120 students from Master of Information Systems using canvas (LMS). Overall, 50 (40%) opened or started the survey and 25 (18%) completed the surveys, with a gender ratio of 52% (Male) and 48% (Female). In this survey, the gender ratio is close to equal between female and male. Hence, we obtained balance sized sub-groups.

3.1.3 Factor analysis and Cluster analysis to identify procrastinator types

The Tuckman Procrastination Scale (TPS) measured academic procrastination using the 16 items scale on a single factor with loadings of 0.4 and reliability (Cronbach's α) of 0.86 (Tuckman 1991).

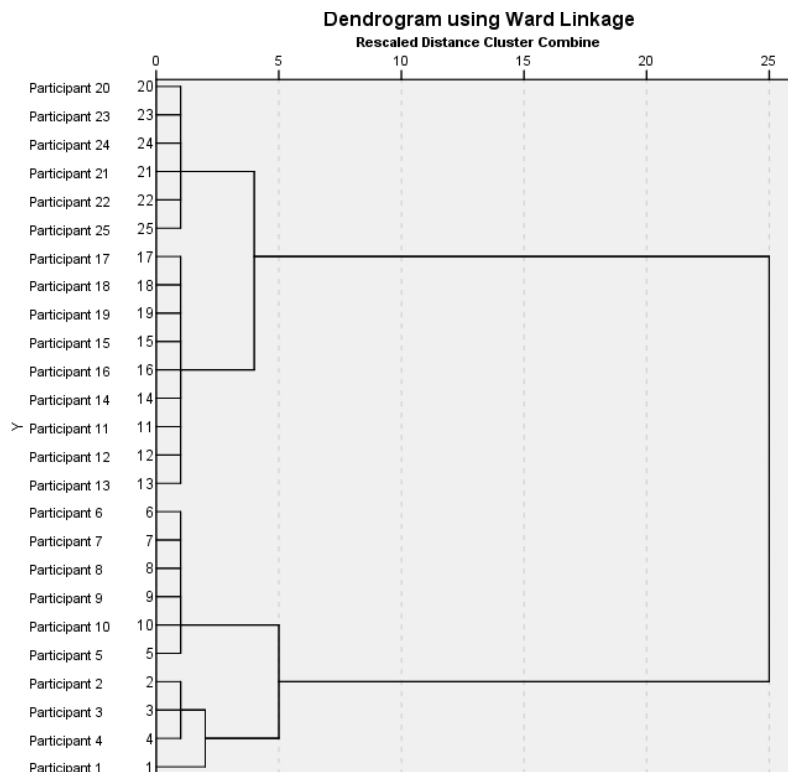
This has been validated by more recent studies (Tuckman 2002; Tuckman 2007) wherein the single factor has been well established and employed along with reliability (Cronbach's α) of 0.92 and 0.89 respectively. In this study, we first employ exploratory factor analysis (EFA) to (1) verify the one-factor scale and (2) to extract factor scores to classify the participants. For the factor analysis, we employed steps prescribed by (Hair et al., 1998) and his subsequent books (Fifth edition). As an extraction method, principal components analysis (PCA) was employed. In line with best practices employed in other papers, e.g. (Leimeister and Krcmar 2009, Özer et al., 2013), we look at the extent of common variance among the variables, KMO and Bartlett's Test of Sphericity. First, we employ the factor analysis using SPSS and load all items on one factor which results in 58.48% of the variance loading on the first factor (Table 2). We then drop Q3_5 and Q3_9 due to low or double-item factor loadings, thus having one factor that explains 67.23% of the variance with a high KMO (0.849) and Bartlett's test is highly significant ($p < .001$).

Table 2: Overview of the factors, reliability, and other related numbers

Item	Mean	SD	Loadings	Cronbach's α	Question (Never [1]-Always [8])
Q3_1	3.60	2.236	.934	0.949	I needlessly delay finishing jobs, even when they are important.
Q3_2	3.08	2.253	.867		When I have a deadline, I wait till the last minute.
Q3_3	3.52	2.104	.889		I delay making tough decisions.
Q3_4	3.12	1.856	.782		I manage to find an excuse for not doing something.
Q3_5	4.16	1.650	.196		I put the necessary time into even boring tasks, like studying.
Q3_6	3.32	1.676	.814		I am an incurable time waster.
Q3_7	2.96	1.925	.880		When something is too tough to tackle, I believe in postponing it.
Q3_8	3.12	1.965	.925		I promise myself to do something and then drag my feet.
Q3_9	3.08	1.656	.437		Whenever I make a plan of action, I follow it.
Q3_10	3.60	1.803	.582		I finish important jobs with time to spare
Q3_11	4.40	2.021	.581		I get stuck in neutral even though I know how Important it is to get started.
Q3_12	3.36	1.997	.829		I postpone starting on things I don't like to do
Q3_13	3.32	2.174	.832		Even though I hate myself if I don't get started, it doesn't get me going.

Next, cluster analysis was carried out using the factor scores. The hierarchical clustering was conducted using the Ward algorithm. For determining the number of clusters, visual measures (i.e., dendrogram) and TPS scores were used, resulting in a 4-cluster solution as shown in Table 3.

Table 3: Clustering and Dendrogram using Wards Linkage



Cluster 1 entails students that are classified as procrastinators

Cluster 2 entails students that are classified as somewhat procrastinators

Cluster 3 entails students that are classified as somewhat non-procrastinators

Cluster 4 entails students that are classified as non-procrastinator

The clusters constitute our main finding from this method, as we will select participants from each of the four clusters to take part in our semi-structured interviews, presented in the next section.

3.2 Method 2: Semi-structured Interviews with Students

The study focused on semi-structured interviews to follow a predetermined and standardized set of questions (Longhurst, 2003; Newcomer et al., 2015) derived from our comprehensive literature review. Similarly, we focused on that the interviews were more directed towards the participants

rather than the set questions. In that manner, we could ensure flexibility on the issues which were addressed by each participant (Longhurst, 2003). The benefit of such an approach allows room for more informal and open-ended interviews, which allowed us to gain more of an independent response out of every question that was asked to the participants (Newcomer et al., 2015). Nevertheless, this approach is a lengthy process, labor intensive, and requires the interviewers to be sympathetic, approachable, and knowledgeable about the relevant issues (Newcomer et al., 2015). The process of preparing for interviews required a substantial amount of time as education during a global pandemic is a sparse field of research. Because of the pandemic, we had to be flexible when scheduling interviews with the participants due to clashes with online seminars, work, or the need for quiet space for the participants to conduct the interviews. The nature of semi-structured interviews allowed us to gain a substantial amount of data, however, it demanded analyzing a large sum of data and many hours of transcribing (Newcomer et al., 2015). We have included the transcriptions of interviews in Appendix F.

3.2.1 Crafting Interview Guide

As discussed above, a substantial amount of time and effort went into the process of designing an interview guide. The interview crafting process required us to have an in-depth understanding of existing concepts (Section 2.0) and how they connect (Figure 1 – Conceptual Model). In the process of crafting the interview guide, we confronted challenges related to the design as the nature of the themes are very much overlaying. Hence, each question was carefully designed with great consideration of the different themes. The questions were designed to draw information that is descriptive of their experience, thoughts, and emotions. In order to obtain genuine and open answers, we initially initiated small talks to make each participant comfortable (Newcomer et al., 2015). See Appendix D to view our interview guide for the students.

3.2.2 Participant selection and sample size

To gain a greater understanding and contribute to a better understanding of the state-of-art, we had the intent of purposive sampling. Such an approach is a deliberate choice as we researchers can decide what needs to be identified and places us to find participants that are willing to provide the information by virtue of knowledge experience (Etikan et al., 2016). Based on the questionnaire conducted in early autumn 2020, 19 participants agreed to be interviewed. However, 13 students participated in the interview with a response rate of 68 %. Based on the interviews, two candidates

were eliminated due to time constraints and theoretical saturation. We purposefully interviewed candidates from each cluster identified in method 1. In that manner, we conducted more of a heterogeneous sampling approach, from non-procrastinator, somewhat-procrastinator, somewhat non-procrastinator, and non-procrastinators. Since our sampling pool was small, this approach is useful to cover all spectrums (Etikan et al., 2016)

Table 4: Overview of gender and full-time and part-time students

Participants	P2	P3	P5	P9	P10	P11	P12	P18	P22	P24	P25
Gender (F/M)	F	M	F	M	F	M	M	M	M	F	F
Full-time-/Part-time student (F/P)	F	F	P	F	P	F	F	F	F	F	F

3.2.3 Steps of conducting interviews

The process of conducting interviews was deliberately spread across three rounds due to the nature of our explorative approach. In the first round of interviews, we realized that the design of the guide was too broad and had too many open questions. Hence, it was difficult to obtain answers related to important topics such as LA and Academic Performance. In the second round, we made an alteration in our interview guide based on our experience with the first round of interviews. However, experienced similar issues with questions being broad, and hence, more of a structured approach was taken by making the questions more direct with room for flexibility. In the third round, we evaluated and compared our interview data and discovered common themes that were raised in round 1 and 2, hence, more themes were added, and other themes were dropped as we did not feel that they suited our research scope. In the third round, all alteration was made based on the second round. In this step, most topics were covered in an effective manner, hence, we gained a theoretical saturation after the third round. Due to the fact we deliberately conducted our interviews in three rounds, some topics were missing on the first few interviews, and hence, some codes were left blank in appendix B.

3.2.4 Coding

To analyze and sort the interview data, we used a thematical approach, which allowed us to analyze data in a systematic manner. To build the systematic approach, we used the Braun and Clark (2006) five phases approach.

- Firstly, we familiarized ourselves with each interview by listening to recordings and writing the transcripts manually on Microsoft word, and additionally, we took notes from every interview.
- In phase two, we generated the initial codes manually on Microsoft word, by labelling the data in a semantic approach to identify the surface of our codes. This allowed us to not look at anything beyond what the participants said.
- In the third phase, all codes were transferred to Microsoft excel and all data were compared and discussed in a systematic manner. Since we established the main themes in the conceptual model (Figure 1), it allowed us to allocate some codes to each theme. Additionally, new themes were constructed based on the codes generated by phase two.
- In the fourth phase, we critically evaluated all the codes and main themes. In this phase, codes were shortened and removed from the analysis. The remaining codes were merged and labelled as sub-themes.
- In phase five, main themes were renamed and adjusted according to the sub-themes derived by our data. These final main themes were the ones we displayed in the conceptual model (Figure 1), to make it easier for the reader to follow our objectives. All sub-themes were crafted to have a singular focus with correlation with other main themes to gain a coherent whole story about all data.

3.3 Method 3: Semi-structured Interviews with Teachers

After conducting interviews and coding student data, we proceeded by conducting supplementary interviews with the teachers at Kristiania University College, which would allow us to strengthen and validate the challenges that have been raised by the students. Similarly, to gain an understanding of how teachers perceived the shift to online teaching, the interviews were conducted in a semi-structured approach to allow open and independent answers (Newcomer et al., 2015). In

the process of finding teachers for our supplementary data gathering, we got the opportunity to have a spontaneous meeting with the TTC (Teaching Technology Centre) manager at KUC and used the opportunity to find more about the tools that KUC use to capturing student activity and touch upon KUC's general use of LA tools and regulations around LA and GDPR.

3.3.1 Crafting the Interview Guide

The teacher interviews and our meeting with the TTC manager were crafted based on existing literature from section 1, and with the challenges that were raised by the students. In order to craft the best possible interview guide, we viewed and analyzed the preliminary findings from students to address the gaps and experiences raised by students. Additionally, we addressed several questions regarding communication channels that were derived from student interviews. You can view our interview guide for the teachers in Appendix E. As mentioned above, we impulsively conducted a meeting with the TTC manager at KUC, hence, we did not have any pre-established questions, however, conducted the interview based on existing knowledge and reflections from both students- and teacher interviews.

3.3.2 Sample size

To find relevant participants for the teacher interviews, we received assistance from our associated professor/supervisor to contact the relevant participants for this study. The study had four teachers and one TTC manager from Kristiania University College.

3.3.3 Coding

Based on prior experience with coding student interview data, we used the same approach by Braun and Clarke (2006), to familiarize us with data by listening to recordings, taking notes under and after interviews, and transcribing manually on Microsoft word. The coding process was conducted together by both of us authors, and in this process, we knew what we were looking for based on prior experience with students. Hence, the process of coding, cleaning, and structuring data was less time constraining. Additionally, a similar process was conducted as in 3.2.4, where codes were translated into sub-themes in phase four and main themes were formed based on the sub-themes derived by our data.

3.4 Reliability, validity, and ethical protocols

3.4.1 Reliability

Reliability involves the scope to which information is consistent and accurately represented across population under a study, and if the result of a study can be replicated under a similar methodology (Leung, 2015; Tongco, 2007). There are three types of reliability when considering a qualitative approach, and these methods are homogeneity (internal consistency), meaning the extent to measurements being consistent and remain the same, which can be assessed through item-to-total correlation, split half-reliability and Cronbach's alfa (Golafshani, 2003; Heale and Twycross, 2015). Secondly, the measurement is stable and consistent over time by use of an instrument with recurrent testing, which is used with instruments such as test-retest- and alternate-form reliability testing (Golafshani, 2003; Heale and Twycross, 2015). Lastly, equivalence is conducted through inter-rater reliability views at how agreement level is among two or more researchers (Heale and Twycross, 2015). In this dissertation, we focused on purposeful sampling (Tongco, 2007), firstly, by mapping participants, and secondly, by derived concepts from section 1. Such an approach can be argued to be measured reliable as our dissertation focuses on selecting information-rich cases which allow us to produce in-depth understanding rather than empirical generalizations (Suri, 2011). Nevertheless, such an approach requires being aware of outcome bias, confirmatory bias, and methodology bias (Suri, 2011). In this dissertation, we have been focusing on constant data comparison by gathering all participants in one matrix (see appendix B and C), and comprehensive data use by investigating variables and themes to hinder errors in judgment of data and avoid biases. Moreover, we focused on establishing research that can be replicated by other researchers by following the same research approach.

3.4.2 Validity

The validity of a qualitative study reflects on whether a study is true or certain (Guion et al., 2011). In other words, if the findings are accurately mirroring the situation, and that the research is validated by evidence. Triangulation is a method where a finding of a qualitative study is validated by analyzing a study from multiple perspectives (Guion et al., 2011; Thurmond, 2001). In this study, we have adopted methodological triangularity by conducting questionnaires on Master students, and the survey was conducted in early autumn 2020. Based on the survey, we identified procrastinators, somewhat procrastinators, somewhat not procrastinators and non-procrastinators.

In late December 2020, we conducted our first round of interviews, while the second and third round was conducted between January-February 2021. To verify the issues raised by the students we conducted supplementary interviews with teachers which were conducted in late February and early March 2021. Such an approach allows us to create a more innovative and unique way of understanding a phenomenon, which allows us to picture a clearer and genuine understanding of this research area (Guion et al., 2011).

3.4.3 Ethical Protocol

To comply with the requirements of research ethics, the research was conducted in accordance with NSD (Norsk senter for forskningsdata). The consent of all participants in the survey was obtained in the digital survey. Similarly, all teachers were informed about ethical guidelines our dissertations adhere to in e-mail, additionally, consent was obtained verbally when the interviews were conducted. For confidentiality purposes, all participants were anonymized and replaced with a nickname. Additionally, all personal data and interview recordings of the participants were stored in Kristiania University College Database, and storing time was from October 2020 till March 31, 2021.

4 Results & Analysis

The objective of this study was to investigate the impact of online learning during the pandemic on students, and hence, we aimed to address two research questions:

RQ1: *Has the shift to online learning impacted some students differently as compared to others?*

RQ2: *What are the main challenges related to online lectures?*

This section has been structured based on the two research questions, and further distinguished separate sections for student findings and teacher findings. Firstly, we will present the main findings from the student interviews, with the applied procrastination clusters, to address RQ1. This is naturally followed by the findings from the student interviews related to address RQ2, which additionally will include a separate section presenting our findings from the teacher interviews related to address RQ2. Lastly, we will briefly present our findings related to learning analytics, from both the students'- and the teachers' perspective, which will be used in the discussion section to discuss solutions to the established concerns regarding online learning. The findings from the student interviews and the teacher interviews have been coded and analyzed to create a matrix of all the main quotes, sorted by participants, themes, codes, and the procrastination clusters (only students). You can view our matrix for the students in Appendix B, and Appendix C for the teachers.

4.1 Findings from Student Interviews

Through our student interviews, we aimed to address five main themes in the context of online learning during this pandemic. During the coding phase of our data samples, we looked for challenges with online learning within the established main themes and generated the following sub-themes, as shown in Table 5.

Table 5: *Definitions of Sub-themes (Students)*

Study Behavior and Habit	Definition
Distraction	<i>The extent to which the student gets distracted during online studies</i>
Motivation	<i>Overall motivation to study</i>
Time to study	<i>Whether the students feel they got more time to study due to Online learning, and to what extent they take advantage of it.</i>

Structure	<i>To what extent the student structure his/her everyday study.</i>
Academic Performance	Definition
Academic satisfaction	<i>How satisfied the student is with his/her own performance so far</i>
Learning outcome	<i>Do you get the same academic knowledge as you would have in a traditional study environment</i>
Academic Anxiety	Definition
Test Anxiety	<i>To what degree the student is worried about his/her academic performance</i>
Online Engagement	Definition
Student participation	<i>To what extent the student actively participates in class and in lectures</i>
Engagement in lectures	<i>To what extent the student experience two-sided engagement during lectures</i>
Camera	<i>The use of the camera during online lectures</i>
Online lectures	Definition
Live lectures	<i>How the student experience live online lectures.</i>
Recorded lectures	<i>How the student experience recorded and pre-recorded lectures.</i>
Teachers' ability	<i>How the student experience the teachers' ability to teach online</i>
Communication with teachers	<i>What the students think of the communication with, and support from, their teachers</i>
Study environment	<i>How the student feels about his/her study surroundings</i>

While these sub-themes represent codes where we identified challenges, the below matrix (Table 6) displays the frequency of stated challenges for each sub-theme, sorted by participants (identified by their respective participant number) and procrastination clusters. This is simply explained by: $X = \text{stated challenge within the respective sub-theme}$. The matrix gives a thematic overview of our findings, which displays which sub-themes have the most related challenges, and further helps us identify significant gaps between procrastinators and non-procrastinators.

Table 6: Thematic matrix of findings

Main Themes	Sub-themes	Procrastinators		Somewhat procrastinators			Somewhat non-procrastinators			Non-procrastinators		
		2	3	5	9	10	11	12	18	22	24	25
Study behaviour and habit	Distraction	X		X		X	X	X			X	
	Motivation	X	X	X	X	X	X	X				
	Time to study	X	X									
	Structure	X	X				X					
Academic performance	Academic satisfaction	X			X							
	Learning outcome	X			X	X	X	X	X			
Academic Anxiety	Test anxiety	X			X							
Online engagement	Student participation	X	X		X		X				X	X
	Engagement in lectures	X		X	X	X	X	X	X		X	
	Camera	X	X			X		X	X		X	X
Online lectures	Live lectures	X	X				X				X	
	Recorded lectures		X		X	X		X		X		X
	Teacher's ability	X		X	X							X
	Communication with teachers	X			X	X						
	Study environment	X				X	X	X	X			

4.1.1 Procrastination Clusters

When we looked for differences between the clusters, we mainly focused on the two “extremes” (procrastinators and non-procrastinators) and used the two middle clusters to explain variations. We searched for sub-themes with crosses on all procrastinators or one procrastinator plus all somewhat-procrastinators. At the same time, the non-procrastinators must have zero crosses or one non-procrastinator plus zero crosses from somewhat non-procrastinators in order to conclude a significant difference. Based on this approach, we concluded the following sub-themes to demonstrate a difference between procrastinators and non-procrastinators, as shown in Table 7:

Table 7: Main Differences Between Procrastinators and Non-procrastinators

Sub-themes	Procrastination type	Description	Example
Motivation	Procrastinators	Are having issues staying motivated.	<i>“I have not motivation, and that causes me to procrastinate a lot. I was thinking of just dropping out of my studies and just start again after the pandemic (...)”</i> – Participant 2
	Non-procrastinators	Their motivation remains apparently unaffected.	<i>“My motivation remains the same. I mean, it’s not changed at all”</i> – Participant 24
Time to Study	Procrastinators	Not able to take advantage of the extra time to study. They even report spending less time on their studies.	<i>“Yes, because I like... after the lecture, I usually stay and start working, but now it kind a becomes like... When there’s a lecture, I just want to relax afterwards. If I would have been on campus, I wouldn’t just walk home straight away”</i> – Participant 2
	Non-procrastinators	Feel that they got more time and are spending that time on their studies.	<i>“The activity related to school has probably increased compared to what it was before. I’ve always spent enough time to study, but I might spend more time now”</i> – Participant 25
Structure	Procrastinators	Report issues with structuring their everyday study.	<i>“My circadian rhythm does not exist, so there’s a lot last-minute (...) I don’t have much of a structure in that sense. Like, those days when I don’t have work, I just let the days pass by for a bit”</i> – Participant 2
	Non-procrastinators	Have good structure, and even that it might be easier to structure your studies.	<i>“The more you get into it, the more structured one gets. You eventually spend more time to study. But the more you’ve gotten into the studies, you realize that these routines are quite important.”</i> – Participant 18

The sub-themes displayed in Table 7 have only derived from study behavior and habits, which overall concluded that the main differences between procrastinators and non-procrastinators can be found within this main theme. Although we were surprised to not identify any significant differences within the other main themes, we do see a correlation in that the procrastinators to some extent experienced challenges within all the sub-themes, while the non-procrastinators challenges mainly have been identified within online engagement and to some extent online lectures. We could further see that the non-procrastination cluster, in general, is a lot less impacted by online learning during this pandemic than the other clusters. On the other hand, the procrastinator cluster has a lot more similarities with the middle clusters, which limits the opportunity to conclude any significant difference between them.

Lastly, we see that challenges related to academic satisfaction were only reported by two participants, of which both were classified as a procrastinator and somewhat procrastinator. We could also see that the same participants who were not satisfied with their grades, also experienced issues with test anxiety. In this sample, however, we did not have enough participants to argue any significant difference between the clusters.

4.1.2 Main Challenges with Online Learning - Students

The second objective of our study was to address the following research question: (RQ2) *What are the main challenges related to online learning?* While the thematic matrix (Table 6) displays sub-themes that have all been identified as challenges by the students, we wanted to draw out the most emphasized challenges. To do this, we calculated the % of participants who had reported challenges for each sub-theme, to identify the main challenges (Table 8).

Table 8: Main Challenges with Online Learning – Numerical Representation (Students)

Main themes	Sub-themes	% of participants reporting issues
Study behaviour and habit	Distraction	63,63 %
	Motivation	63,63 %
	Time to study	18,18 %
	Structure	27 %
Academic performance	Academic satisfaction	18,18 %
	Learning Outcome	54,54 %
Academic Anxiety	Test anxiety	18,18 %
Online engagement	Student participation	54,54 %
	Engagement in lectures	72,72 %
	Camera	63,63 %

Online lectures	Live lectures	36,36 %
	Recorded lectures	54,54 %
	Teachers' ability	36,36 %
	Communication with teachers	27 %
	Study environment	36,36 %

Consequently, we extracted all sub-themes above 50%, as have been highlighted in Table 8, and created a table of main challenges, explained with extracted quotations to argue our findings (Table 9).

Table 9: Main Challenges with Online Learning – Textual Representation (Students)

Sub-themes	Description	Example
Distraction	Students get more easily distracted in online learning	<i>"I get distracted all over the place (...) I'm studying and then I just go watch some TV (...) The opportunity to go do something else than studying is something that... it is harmful, really."</i> – Participant 24
Motivation	Students are experiencing a decrease in their motivation to learn.	<i>"I am still motivated to complete, but it takes a lot more now to stay motivated to actually wanting to learn the subject"</i> – Participant 10
Learning Outcome	Students do not perceive to get the same learning outcome from online lectures.	<i>"Absolutely not. (...) Data science is a very practical subject, and having to sit at home with a practical subject and work alone, is a lot more difficult"</i> – Participant 11
Student Participation	Students are less active, or not active at all, as compared to physical classes.	<i>"Before I started here, I participated quite actively in class very often. But now I haven't participated anything."</i> – Participant 3
Engagement in Lectures	Students are poorly engaged in online lectures.	<i>"It's simply just boring to hear a teacher talk for 3 hours, on a PowerPoint he shares on the screen. (...) even though the subject may be ever so interesting"</i> – Participant 9
Camera	Students do not use their camera during online lectures, especially in larger assemblies.	<i>"70 people have their cameras switched off and that makes it less tempting to have my camera on. But when we are like 20 people in class, I usually use my camera."</i> – Participant 12
Recorded lectures	Students are struggling to keep	<i>"With recorded sessions you can let it play in the background, but I experience that it just remains in the</i>

focus during recorded lectures.	<i>background while something more important is happening another place”- Participant 9</i>
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5.2 Findings from Teacher Interviews

In this section, we will present the findings from our teacher interviews. The objective of these interviews was to address the already established sub-themes derived from the student interviews, to explore them from a teacher’s point of view. Through an analysis of the data, we extracted the sub-themes where we acquired enough relevant data related to our research question and categorized them into two main themes: Teaching Online and Concerns Regarding Students. In Table 10, we have included a list of the sub-themes with definitions that we used during the coding phase.

Table 10: Definitions of Sub-themes (Teachers)

Teaching online	Definition
Camera	<i>The teachers’ thoughts on the students’ use of camera</i>
Engagement in lectures	<i>How well do the teachers try to create engagement in class</i>
Conducting online lectures	<i>What are the teachers’ general thoughts on conducting lectures digitally</i>
Pre-recorded	<i>What the teachers’ thoughts on making pre-recorded lectures</i>
Concerns regarding students	Definition
Learning outcome	<i>Do the teachers feel that they are able to create the same learning outcome for the students</i>
Relationship with students	<i>How the teachers experience their relationship with the students</i>
Student performance	<i>What are the teachers’ thoughts on the students’ grades during this pandemic</i>

4.2.1 Main Challenges with Online Learning – Teachers

Similar to the presentation of student findings, we created a table of main challenges, explained with extracted quotations to argue our findings (Table 11). However, we did not have enough teacher participants to emphasize the most impacted sub-themes, and hence, we included all.

Table 11: Main Challenges with Online Learning (Teachers)

Main themes	Sub-themes	Description	Example
Teaching Online	Camera	The Teachers do not get any physical response., which makes it harder for them to interact.	<i>“I’m talking to dark grey boxes with a white name in it. I don’t see face expression I don’t really know anything. Usually, I look at both body and face if they understand what I’m talking about (...) But now I have zero control over how well I hit.” – Teacher 3</i>
	Engagement in Lectures	Teachers feel online lectures need to be more entertaining but find it hard to facilitate that through a screen.	<i>“You can’t mention their names, call them out, so you have to think of it like you would have planned a Netflix.” – Teacher 1.</i> <i>“Keeping focus is very tough when it’s digital. (...) it will be very monotonous to lecture digitally. It’s generally poorer teaching.” – Teacher 3</i>
	Conducting Online Lectures	The teachers need to be more straight to the point because of a shorter attention span in online lectures, and it is easier for participants to leave.	<i>“Back when lectures were physical, I think the people speaking were a bit privileged in that they could say whatever they wanted, they could take as long as they wanted, because people didn’t just stand up and leave. Now, when it’s digital, you have to think all time that the person watching can just leave, just exit that window and not watch you if you are boring.” – Teacher 1</i>
	Pre-recorded	Teachers prefer live because they do not get any contact with the students through pre-recorded, and they also perceive it as more time consuming.	<i>“I prefer having it live because I emphasize contacts, even if I feel bad contact with students live, there is zero contact if I record in advance. At least I’ll get questions live.” – Teacher 3</i> <i>“(…) I have made a few pre-recorded, but then I got pretty caught up in making it good, and then it takes a lot of time.” – Teacher 4</i>

Concerns Regarding Students	Learning Outcome	Teachers are concerned with the students' learning outcome in terms of an informal understanding. This could be because they can't talk too much "off-topic" and tell stories, or because a certain course demands more interaction and discussion.	<p><i>"When it comes to the pure learning outcome, I don't think you would be able to educate people as well, and by educate, I mean more... Things are more comprehensive when it comes to providing people with more informal understanding. The things you get through me having comments or having small sporadic stories from practice etc."</i> – Teacher 1.</p> <p><i>"It has been problematic, definitely. Because many of the lectures I give is workshop-based, so it's supposed to be, for instance, corporation (...)"</i> – Teacher 2</p>
	Relation with Students	The teachers don't feel that they have the same relationship with their students, which is further argued to negatively impact the overall learning experience,	<i>"I also think that it's an important part of the learning experience to share the experience. (...) It has been always great motivation, and also a very important part of our education, to get to know you all together, just meet you in the hallways, drop by the classroom, chat with you, you know, on different occasions."</i> – Teacher 2
	Student Performance	According to the teachers, the students' performance in terms of grades have not decreased. This is assumed to be because of easier exam formats and evaluations, but also that the students might have more time to study.	<p><i>"Poorer, but there are two sides of it. They learn less, they perform worse. But then we have made it easier for them in the exam, and hence, the exam grades are at least as good or maybe better."</i> – Teacher 3</p> <p><i>"It doesn't seem like the results are any worse (...) In general, people might have more time, but I don't know if people are actually making use of that time to study."</i> – Teacher 4</p>

The challenges within the above sub-themes are reflecting the sub-themes and challenges derived from the student interviews. What we observed as the most cited challenge, by both students and teachers, are challenges related to online engagement. Our meeting with the TTC Manager provided us with some useful implications to consider, which probably has an impact on the engagement in online lectures. He explains that the management faculty leaders decided to record

live lectures to make them available for students with socially critical professions, and because of GDPR, they could not make the use of camera and microphone mandatory:

“There were some socially critical professions, so recordings were necessary, and with the recordings they had to tell the students that this is being recorded and you don't have to use your camera or microphone (...) We didn't have all the contracts, telling students had signed up for "it's okay to be recorded". Everything in that GDPR sector was new, and we didn't have the time and that's the case for the rest of the sector too, that they didn't have time, or it would be very hard to get the jurisdiction in place. But everyone went through with it, because we have to, according to the university law, to give them similar learning outcome. We want all our teaching to be student-protective, and it's very hard to establish because: On one side we want them to record everything, on the other side we want the students to be protected and those demands don't match.” – TTC Manager

4.3 Learning Analytics

Within this main theme we analysed data from both student interviews and teacher interviews related to learning analytics. We will start by presenting an overview of definitions for the sub-themes used to code the data from the interviews with students and teachers, as displayed in Table 12.

Table 12: Definitions for LA Sub-themes (Teachers and Students)

Learning Analytics (Teachers)	Definition
LA in Teaching	<i>To what extent the teachers apply learning analytics</i>
LA Data	<i>What type of data they are looking at.</i>
Student Follow-up	<i>Do they apply this knowledge to follow-up students.</i>
Learning analytics (Students)	
LA (positive/negative)	<i>The students' thoughts related to the use of learning analytics in education.</i>
LA University Access	<i>The students' thoughts related to the university having access to personal activity data.</i>

Similar to the previous presentations of findings, we display a summarized table of main findings and quotations in Table 13 below.

Table 13: Main findings from LA (Teachers and Students)

	Sub-themes	Description	Example
Students	LA (Positive/Negative)	The students were mainly positive to the use of Learning Analytics. However, one of the students expressed worry related to the data being over-interpreted or used wrong.	<p><i>"I think it could be interesting to view information and observe relations around what we are doing, and further if that reflects our results. If there are any relations."</i> – Participant 11</p> <p><i>"The only thing I'm worried about is an overinterpretation of the data. Clearly, if you use a tool to explain my study activity, and I've been active at another place (...) In other words, this doesn't necessarily cover everything."</i> – Participant 9</p>
	University Access	The answers were mainly positive, indicating that it should not be a problem for the students if the data are being used right.	<i>"I think that too is a good thing, as long as all evaluations are anonymous it shouldn't really matter in terms of grades. (...) you wouldn't get a better evaluation if you are more active than others."</i> – Participant 12
Teachers	LA in Teaching	2 teachers had never used learning analytics, which might be because of time constraints and a lack of encouragement,	<p><i>"There's no encouragement to apply it, no. Hence, it's more for those who are especially interested."</i> – Teacher 4</p> <p><i>"(...) it was very clear that it would benefit us a lot. But obviously we did not get around to actually getting into it before we had our class."</i> – Teacher 1</p>
	LA Data	2 teachers had some experience with it, and mainly looked at logins and login-duration in canvas.	<i>"I especially view how often the students have logged in, who have logged in and for how long, and then I drill down to view what they have been looking at, and what not. I haven't gone more in depth (...)"</i> – Teacher 4
	Student Follow-up	The teachers admit to not be good enough at follow-ups. They have tried, and are trying, despite that they do not really have enough time at hand to do it sufficiently.	<p><i>"I'm very bad at following up. I feel bitter because I'm very busy with creating good teaching (...)." – Teacher 3</i></p> <p><i>"I have tried to contact those who are in the danger zone (...) but I don't feel that I have been good enough to follow-up, because there's just so many things happening."</i> – Teacher 4</p>

The overall interpretation of these data tells us that the students are mainly positive to the use of learning analytics, and they would give consent to let the university access their data as long as they are being well informed. In terms of the teachers, although we only had 4 participants, did not seem to apply learning analytics as much. The teachers further reported to not have enough capacity to follow-up students at risk themselves.

Speaking to the manager of The Teaching Technology Centre at KUC, however, provided us with knowledge about practices and experiences with the use of learning analytics at the university. He explains that learning analytics is hard to apply in practice because of the students' contracts and concerns with potentially breaking laws regarding GDPR:

“We would like to use learning analytics much more, like the nudging and teachers being able to see what students are doing and so on. But that's also something that wasn't established, and it wasn't in the students' contracts. We know that there has been some use of, for instance, the log-in data in Canvas, to see which ones are not active.” – TTC Manager

“I also know that some institutions have not been using Canvas data at all, like Høyskolen i Østfold. We have all the data, we can use Tableau, and we can use Power BI, but it's a minefield. We don't want to break laws regarding GDPR” – TTC Manager

He further explains that they were working a lot on making a good framework for learning analytics before the pandemic, but they have not really got the time to continue their work due to the disruptive shift to online learning. Although he tells us that there are several accessible data points from which the teachers can pull out data, e.g., Zoom and Canvas.

“This is something we've been working much on, and we were very interested in before the Covid (...) but suddenly there was just to get online teaching to work. (...) They have access to data, but whether they are using it or not, has not been a focus during covid. We've been teaching teachers to use Canvas and Zoom effectively” – TTC Manager

Lastly, he informed us that they still need to work on a proper framework to push data, instead of pulling, which will make it easier for the teachers to access important data about their students without having to pull it themselves:

“But we haven't made a framework that makes it... you have to pull it out, it's not push, and that's what we've been looking at, but we want more push of data, just telling that these three students: “contact them, because they haven't been active in the latest two weeks”, for instance, or having more dashboards showing with colours and giving nudges to the teachers on what to act on.” – TTC Manager

5.0 Discussion

5.1 Differences between procrastinators and non-procrastinators

As part of our research objective, we aimed to address RQ1: *Has the shift to online learning impacted some students differently as compared to others?* By comparing our data across the procrastination clusters, we were able to observe differences in how procrastinators and non-procrastinators have been impacted by online learning during this pandemic. According to our findings, there are significant differences found amid procrastinators and non-procrastinators when investigating the students' study behavior and habits. In the summary of main differences (Table 7) and the thematic matrix of our findings (Table 6), we see that procrastinators in higher degree encounter challenges related to motivation, allocating time to study, and structuring his/her day, as opposed to non-procrastinators.

Viewing these findings, we see that motivation has the most significant difference among procrastinators and non-procrastinators out of four clusters. We see three of the clusters scoring high on the loss of motivation to be an issue in online learning during this pandemic. In common, we see the students mention generally the shift to online has been the main contribution to the loss of motivation, and the fact it takes much more effort now to structure their every day (see appendix B). The lack of motivation also seems to be one of the reasons why procrastinators are struggling to self-regulate their studies. According to the definition of self-regulation, it is something that happens of free will, meaning that one makes a deliberate decision to do something without feeling that they must. In such cases, these actions are argued to be driven by e.g., motivation (Schunk & Ertmer, 2000; Zimmerman, 2000; Zimmerman and Schunk, 2011).

Following motivation, prior studies agree that motivation is a significant factor in how students perform academically (Van Eerde, 2003; Zeidner, 2007; Zimmerman, 2000), and how students' structure and allocate time to study are correlated. Especially during Covid-19, when the students have been forced into the online format, our findings reveal that students with procrastinating characteristics are significantly more prone to postponing their tasks and not taking advantage of the extra time. Contrary, the non-procrastinators perceive the extra time as valuable to invest in their study and perform better. The discrepancy can be explained by students with low structuring ability tend to struggle more when the study is shifted to online, as to how time should be spent is up to the students themselves. Our findings indicate that the first cluster (procrastinators) experience

challenges with structuring, whereas the rest of the clusters experienced it as an advantage by having online learning, as it allows them to structure their everyday according to their premises. Additionally, the students in the mid-range between procrastination- and non-procrastination, mentioned their struggle of having good structure at the beginning of the pandemic, but have now become more aware of the importance of maintaining good structural habits in online learning format. Non-procrastinators argue that structuring their studies have become easier because there is not much else to do. On the other end, the procrastinators indicate that poor structure is a cause of change in the study environment, meaning that they usually rely on feeling the pressure to show up on campus in order to work efficiently with their studies and are struggling to initiate self-study from home because there are other more attempting options (See appendix B). Existing literature points at important components including goal orientation, adopting proper strategies for attaining the goals, progress- and performance orientation, efficiently time management, and self-evaluation of methods (Heikkilä and Lonka, 2006; Zimmerman, 2002), to succeed in an online learning environment. However, in physical classes, students have little self-regulation as teachers in high degree determine what students do, when, and where they do it, and how they accomplish it (Schunk & Ertmer, 2000). Similarly, having online learning requires students to build their metacognitive skills, such as planning, controlling, and evaluation skills, which are key factors to succeed in online learning (Barak et al., 2016). This might be the reason why structure is a challenge for the first cluster of procrastinators, as a result of the shift from conventional classroom education to online learning. Interestingly, there is no significant difference between procrastinators and non-procrastinators within academic satisfaction, even though our findings conclude motivation to be a challenge for the majority of students. However, two students, classified as a procrastinator and somewhat procrastinator, reported challenges with both test anxiety and academic satisfaction. This indicates that there is a correlation between the two sub-themes, which can be supported by Trifoni and Shahini (2011) who argue test anxiety to be a cause of e.g., bad experiences in previous tests. Our findings further indicate that test anxiety could potentially occur more frequently among procrastinators, which is in line with previous literature (Yerdelen et al., 2016).

The interesting findings from the teacher interviews give us an insight into why students seem to perform the same or better. According to teacher 3 and 4, the students generally perform the same or worse, however, it does not reflect on the grades as the evaluation system has become more

lenient, even though more self-study time is available for students to prepare themselves. Interestingly, a study by Gonzalez et al. (2020) conducted at the university in Madrid, contradicts our findings and observed that students did perform better due to the shift to online learning. One casual explanation for that could be that our study was conducted on Norwegian students, and secondly, the study was conducted on Information technology students at KUC. This is in line with what Khalil et al. (2020) and Schlenz et al. (2020) discovered, stating that students experienced that they were not fully equipped for hands-on subjects in online learning.

5.2 Main challenges with online learning during the pandemic

Prior studies conducted under Covid found that the impact of online learning has been perceived positive by students (Alassaf & Szalay 2020; Khalil et al., 2020), they comprehended the learning material well, and found it to improve their productivity and self-efficiency (Khalil et al., 2020; Rizun & Strzelecki 2020; Schlenz et al.,2020). Nonetheless, our findings contradict the existing literature and found challenges related to the engagement between students and teachers in online lectures, which constitute our main answer to RQ2: *What are the main challenges related to online lectures?* In our findings, we found similarities in the sub-themes related to online engagement from both the students and the teachers (Camera, Engagement in lectures, recorded lectures, and student participation) that have been raised as challenges, which reflects on the students' perceived learning outcome and the teachers experience with educating the students.

In terms of camera, findings indicate that the majority of students tend to have the camera switched off due to their peers having it off. Similarly, classroom size has a major influence on camera being switched off, and one student even mentioned that when it is 70 people in the seminar, it makes it less tempting to have the camera on. On the other side, findings suggest that teachers are mentally exhausted by so many students having their camera switched off, as a part of the educational learning is to interact with students, read facial expressions, and comprehend if the students get to benefit from the lectures. Teacher 3 even expressed that he/she feels that they have zero control over how learning content is comprehended by the students. Interestingly, students also raise challenges with class engagement. Students commonly reported classes to be A-4, with only teachers talking while the students are just listening. Similarly, other students report that they miss physical classes where they can get direct answers to questions that they might have, which might be a cause of their cameras being switched off, as mentioned by the teachers. In contrary to students

raising issues with classes being boring, derogatory, and one-sided, our findings suggest that there is a great challenge for the teachers as they rely on students having the camera on to get the desired learning outcome. The teachers report that creating online content and providing live lectures are challenging as most students have a shorter attention span when it comes to online lectures, which builds on existing literature by Fjørtoft (2020), who argues teaching online to be more time constraining and requires better classroom management. One explanation for the lack of engagement in class can be correlated to the sub-theme *Distraction*, where our findings indicate that most of the students within all four clusters are struggling with distractions. Commonly mentioned issues include working from home and a need for change in the study environment, which is also a commonly raised issue in prior literature related to isolated student environment, disinterest, and challenge with synchronous online communication (Rasheed et al., 2020; Winters et al., 2008) One of our participants even mentioned that he/she feels that studying from home is challenging as he/she gets distracted all over the place. Similarly, having the opportunity to go and do something else than studying, is something that can be harmful to students' self-efficacy and productivity, which implies student's self-regulatory skills in a home environment. When it comes to live- and recorded lectures, we discovered that most of the students prefer live lecture as the students feel that they must show up, whereas other students feel they get less distracted by attending live lectures. Correspondingly, most of the challenges are related to recorded lectures, as students mainly struggle with keeping their focus during recorded lectures. Similarly, having recorded lectures means there is greater scope for students to procrastinate more as the recording provides them with the flexibility to watch it whenever it is convenient for them. Furthermore, teachers have similar preferences as the students, and prefer live lectures rather than pre-recorded. Even though the contact is limited in live lectures, at least they have the opportunity to get questions and create some sort of engagement rather than no contact at all.

Based on existing literature and our findings from Online Engagement and the sub-theme *motivation*, it is not surprising to discover that learning outcome is perceived to be a major challenge in online learning. Several students reported that they are still motivated to complete, however, they are less motivated to actually wanting to learn the subjects. Findings indicate that both teachers and students experience the learning outcome to be poor. According to Khalil et al. (2020) and Schlenz et al. (2020), students experienced that they were not fully equipped for hands-on subjects, which goes in line with our findings were e.g., one student reported that it is hard to

obtain the same learning outcome as in physical classes as some subjects are more practical and requires working with other students. In other spectrum, teachers experience that they are not able to interact as much or tell sporadic stories because students have a shorter attention span, and the nature of online lecture does not allow as much collaborative hands-on work and reflections as physical classes. This is stated to limit the student's learning outcome in terms of practical knowledge and informal understanding of subjects, and thus, decreasing the benefit from participating in lectures (see Table 11).

Building on sporadic talks, our findings indicate that teachers are more aware of what is being said in online lectures as they are recorded to be a long-lasting product. This leads to an interesting discussion in terms of GDPR regarding the students' use of the camera and microphone. One teacher specifically mentioned that he/she understands that students have their camera off because it is recorded, however, experience talking to black screens (See Appendix C). Similarly, prior studies within LA indicate that students often are willing to exchange personal data for perceived benefit, however, are doubtful by the risk and drawback of collecting educational data due to the possibility of introducing biases (Verbert et al., 2020), which is in line with our findings. This leads to an interesting discussion around GDPR and the root of engagement challenges. TTC manager of KUC further provided us with useful implications to consider, such as jurisdictions around GDPR. Additionally, prior literature within LA touches upon topics regarding the use of data, uncertainty, and different views regarding ethical issues (Tsai et al., 2019). This has made it harder for institutions to gather student data as institutions such as KUC want to focus on student privacy and allow students to choose whether they want to use the camera and microphone during recorded lectures.

5.3 Student follow-ups and use of Learning Analytics

In terms of student follow-ups, our findings suggest that teachers are not as good at following up students, although some teachers are trying their best. However, due to time constraints and limited resources, they cannot provide the students with the necessary support that is required when shifting to online learning. Prior studies put emphasis on the importance of retaining good support for students and how students are learning, especially in an online learning context, as such learning platforms can pose serious challenges to the scalability of dialogue-based solutions (Pardo et al., 2019; Van Der Kleij & Adie 2020). Hence, more universities are now shifting towards adopting

Learning Analytics to combat such challenges (Herodotou et al., 2019; Martin & Ndoye 2016; Ma et al., 2015). Our finding suggests that LA tools are widely available in universities, however, there is limited use of them in Norwegian educational systems. For instance, our meeting with the TTC Manager of KUC confirmed that the benefit of such tools would allow students to notify their progress, however, there is a lack of an appropriate framework that hinders the university to adequately adopt LA. This is because there are jurisdictions and GDPR concerns around adopting LA, which is a common challenge amongst universities in Europe (Ferguson et al., 2016; Tsai et al., 2019). Similarly, from teachers' perspective, our findings suggest that there is little encouragement to use built-in Canvas data, Tableau and Power BI to monitor student's activity and capture the procrastinators. Our findings indicate there is a need for universities to change their institutional culture and to encourage the use of LA (Macfadyen and Dawson, 2012; Tsai et al., 2019), similarly, the adoption of such tools would allow amplifying the learning experience, address students learning behavior, student engagement (Herodotou et al., 2019; Martin & Ndoye, 2016; Ma et al., 2015), and capture students that are more vulnerable during online learning.

6 Conclusion

Looking at how the shift to online learning has impacted some students differently than others (RQ1), our findings related to the procrastination clusters revealed significant differences within study behaviour and habits. More specifically, we see that procrastinators in higher degree encounter challenges related to motivation, allocating time to study, and structure, as opposed to non-procrastinators. Since both structure and allocation of time to study are tightly related to self-regulation, we conclude that procrastinators are struggling to self-regulate their studies in an online learning setting. The lack of motivation amongst the procrastinators further supports our finding, since a self-regulated action is an act of free will and argued to be driven by e.g., motivation, and thus, a lack of motivation may reduce the ability to self-regulate. Although prior literature can tell us that low self-regulation is a common characteristic of procrastinators, our findings argue that the procrastinators' ability to self-regulate has decreased during the pandemic, and thus, confirming the notion that procrastinating behaviour may be amplified in an online learning setting, as stated by Elvers et al., (2003).

Through our study, we further aimed to identify the main challenges related to online lectures (RQ2). While prior studies on learning during Covid-19 have found the impact of online learning to be perceived positively by students, our findings contradict this existing literature and revealed challenges related to online engagement. In this study, both students and teachers reported challenges related to the use of the camera, engagement in lectures, distractions, recorded- and pre-recorded lectures and participation in class. While the ability to facilitate engagement in lectures is limited due to GDPR, other factors like the online format itself appear limiting in terms of creating good engagement, and thus, imposing the educational sector to re-think the way of conducting lectures and their use of the current learning management systems. We further argue that poor online engagement may affect the students' learning outcome, which has been stated to be a common concern across all participants. This is also reflected by the students' change in motivation, where several participants reported that they are less motivated to actually wanting to learn the subjects. In terms of online engagement, the teachers perceive the students to have a shorter attention span and are trying to keep the lectures more straight-to-point, while the students perceive the lectures as boring and crammed. This is resulting in a lack of discussions, reflections, sporadic stories from practice, and collaborative work, which we argue to reduce the students'

overall learning outcome in terms of practical knowledge and the informal understanding of subjects.

Lastly, we investigated the practice of learning analytics, which have been argued by prior studies to e.g., address and improve the students' learning behavior and engagement. In our study, the findings suggest that the teachers are not able to sufficiently follow-up students-at-risk themselves because of time constraints and limited resources. Our findings further state that there is little encouragement to use built-in Canvas data, Tableau, and Power BI to monitor student's activity, which is argued to be because of jurisdictions and GDPR concerns related to adapting LA, which is a common challenge amongst universities in Europe. Hence, a lack of an appropriate framework is hindering KUC to adequately implement learning analytics, which has been difficult to prioritize due to the disruptive shift to online learning.

6.1 Limitations

This dissertation acknowledges the limitations, and there are a few limitations associated with this research. First, the sample size of this research may not generalize the findings to the population and could increase the number of participants of student- and teacher interviews. Additionally, the study could reconsider the profiles of the teachers as this research consisted of four teacher interviews, and three of the teachers were teaching at bachelor level. Hence, the findings from this study may not accurately reflect the experience of our participants, who are master students. Similarly, in the process of data collections, we got the opportunity to meet the TTC Manager, but adding an extra group with LA and the learning management team would strengthen this study. Similarly, in the process of collecting data we got the opportunity to meet the TTC Manager but having access to the participants' activity data would have given this study a lot more depth in terms of understanding the students' learning patterns.

In terms of the methods employed, there are some limitations. Firstly, we were aware of the drawbacks of purposive sampling of student's data, and thus, this research may include errors in judgment with the sampling techniques. The interviews enabled us to get a snapshot of the student's situation, but conducting the interviews twice over time would have strengthened the data collection and given us a more accurate picture of the situation of each participant. In terms of coding the interviews, the coding process was conducted together due to time constraints and the amount of data, hence, the reliability was not tested and may lack internal consistency. Lastly, conducting an

explorative study with both a survey and semi-structured interviews is time-constraining, hence, we suggest the study should be conducted in a longitudinal manner.

In terms of gaining a better holistic picture of how the current pandemic has impacted students, this dissertation could have included the social impact of the situation. We initially investigated the social aspect, which would help us explain more of our findings. Furthermore, we investigated the use of LMS from both students- and teachers in our interviews, which could potentially allow us to investigate further into how and where to make improvements in terms of engagement in lecture, and detect which platforms are more successful than others. However, due to time constraints and a large amount of data, it was not possible for us to include all factors that would allow us to get a deeper understanding of how the pandemic has impacted students in an online learning format. In terms of measuring Academic performance our research investigated whether the students were satisfied with their grades. However, having insight into the students' grades could potentially allow this dissertation to gain a more accurate picture of their academic performance, since grades are considered the most precise approach to measure academic performance. Similarly, it would allow us to understand learning patterns and correlations between the grades and our sub-themes.

6.2 Suggestions for Future Work

From this dissertation, there are several implications that can be deduced. Firstly, our dissertation found there is a great need for educational institutions to understand how the shift to online learning has impacted the students. Our findings indicate that there is a need for universities to reconsider their teaching practices by understanding the students' learning behavior, and additionally detect students at risk by early intervention strategies with the use of LA tools.

In terms of engagement in class, our findings indicate that there is a major lack of class engagement and participation in online lectures. Consequently, we suggest universities consider more interactive teaching methods and learning management systems that encourage more engagement between students and teachers. For instance, reducing the online classroom size to encourage more dialogues with the students, which can potentially contribute to improve the learning outcome and address some of the discomfort related to the use of the camera in live lectures. Similarly, our findings indicate there is a lack of encouragement to follow-up students and use of tools to facilitate students at risk and students with procrastinating characteristics. Hence, similar to prior studies (Macfadyen and Dawson, 2012; Tsai and Gasevic, 2017), we encourage universities to change their

institutional culture when adopting LA in higher education, and focus on engaging its stakeholders. By offering teachers the necessary resources and training, they could effectively utilize LA and facilitate students that are vulnerable. We suggest universities to form a proper framework for this adoption.

In terms of theoretical implications, this dissertation contributes to the domain of information systems within education and learning science. Furthermore, we suggest that there is a need for a longitudinal study within the domain of how engagement in lectures affects the learning outcome. Correspondingly, to investigate how the use of voluntary Camera and microphone by students has an impact on students' participation in class, as compared to peer effect and classroom size. Further, to what extent GDPR hinders the universities adoption of effective technologies to engage stakeholders.

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Appendix A: Statement of Ethics Approval



11th of May 2021

STATEMENT OF ETHICS APPROVAL

Proposer: Rubina A. Monir and Jørgen Melgaard

The school's research ethics committee has considered your submitted proposal. Acting under delegated authority, the committee is satisfied that there is no objection on ethical grounds to the proposed study.

Approval is given on the understanding that you will adhere to the terms agreed with participants and to inform the committee of any change of plans in relation to the information provided in the application form.

Yours sincerely,



Asle Fagerstrøm
Professor

Appendix B: Student Data

We have only included a small portion of the matrix of student findings due to the large amount of data gathered. Follow [this link](#) for the complete matrix. It is advised to view the document in this link in Web Layout in Microsoft Word to get the best experience

Academic Performance	Procrastinators		Somewhat Procrastinators			Somewhat Non-Procrastinators			Non-Procrastinators		
	Participant 2	Participant 3	Participant 5	Participant 9	Participant 10	Participant 11	Participant 12	Participant 18	Participant 22	Participant 24	Participant 25
Academic Satisfaction	So academically, I notice it on my grades as well. They're not where they are supposed to be.	I've kind of been happy with the grades I've actually got. Except for the one I delivered 3 minutes before.	my grades have been fine	Everything that may affect my grades negatively is worrying. I have felt it during this semester	it was exactly what I was expecting to get. And the same with before the summer, I performed as I usually do.	I feel like I've achieved a good result, based on the work I've done, and that's approximately where I want to be.	I've done it better academically during this pandemic as opposed to what I did before. (...) It might have something to do with the fact that you have more time to study.	I perform better now.	I believe my performance is higher while I'm alone	Yeah, I'm happy with my grades I think	I feel like it has gone very well, and I've achieved good results
Learning Outcome	I don't get the same learning outcome as I would've got if the lectures were physical.		nowadays I'm not working so I have a lot of free time and I can actually sit through the lectures and that is a lot of fun	It's simply just boring to hear a teacher talk for 3 hours, on a PowerPoint he shares on the screen. It's simply just boring, even though the subject may be ever so interesting (...)	it goes a lot faster and you're kinda left with the feeling that something is missing, or like "shouldn't this take more than just 40 minutes to explain?"	Absolutely not. (...) Data science is a very practical subject, and having to sit at home with a practical subject and work alone, is a lot more difficult	"learning outcome from the lecture, I think that's a lot better during physical lectures." "when you have a lot of pre-recorded lectures too, I often feel that I'm left with a lot of questions I don't really get an answer to."	I think I would have gotten more out of the lectures if they were physical	if I am not familiar with the topic, I directly go to YouTube and Search" " I watched several YouTube videos, and It was like that before.	I think my studies after the corona have improved. Because I don't have prior knowledge of It, so considering that I do not have much experience or knowledge, it's going on pretty nicely	I think the learning outcome has been very good. Of course, it's varying from one course to another, and what interest me the most. (...)This is also in line with what I was expecting before I started

Appendix C: Teacher Data

We have only included a small portion of the matrix of teacher findings due to the large amount of data. Follow [this link](#) to view the complete matrix. It is advised to view the document in this link in Web Layout in Microsoft Word to get the best experience.

Teacher Interview Data				
Concerns Regarding Students	Teacher 1	Teacher 2	Teacher 3	Teacher 4
Learning Outcome	"When it comes to the pure learning outcome, I don't think you would be able to educate people as well, and by educate, I mean more... Things are more comprehensive when it comes to providing people with more informal understanding. The things you get through me having comments or having small sporadic stories from practice etc., and of course by exchanging thoughts in the class, asking for comments etc. because that becomes a lot more moderated and limited digitally, because the moment you are recorded, people are more careful of what to say."	"It has been problematic, definitely. Because many of the lectures I give is workshop-based, so it is supposed to be, for instance, corporation tasks where you use Lego to try to build something, because there's a group assignment so they share experience, how they interact, it's very important to get the impression of how to work agile, for instance. And it's doable to do it digital, because that is the way the world work now, so it's doable, and I think it's satisfactory, but I think it's not as good as the physical experience."	"No, among other things, I really miss varying the teaching method. What I do is show things, use my arm, or show things with myself or with body language. Rather stand a little away from the camera rather than right up on the camera, where they only see my head (...)." "(...) Exactly the slides I think is just as good, but you lose that whole round of what else you can do."	"Yes and no. yes, because I feel that we're getting through the same stuff and it gives a few opportunities, but at the same time... It's not really the learning outcome that is the problem in terms of... It's more that the students struggle a bit more with their everyday structure. It is harder when you have to do everything yourself. Learning is a collaboration; you need to discuss things with people."
Relation with Students	"few of them reached out to ask for literature, with questions, to get more information. So, to me that just showed me that for them it was simpler to communicate or have contact with me when they have met me in person. While the ones who hadn't, there I had some questions but that were normally like the day before exam, wondering if they should do the exam or not"	"I think there is a large gap, there's a large distance." "But I think that also the social interaction is lacking when you are on digital. I also think that it's an important part of the learning experience to share the experience." "much less knowledge about you as students. It has been always great motivation, and also a very important part of our education, to get to know you all together, just meet you in the hallways, drop by the classroom, chat with you, you know, on different occasions"	"I don't know what any of them are called or what they look like because they don't even have on camera on zoom, I teach 400 people that I have no idea who is. It's a different to kind of getting in touch than standing in the classroom talking to them, talking about other things during the breaks such as their hobbies (....) the relationship is absent now that it's digital."	"more distance, I can't catch the signals in the same way. It disappears more and more, unfortunately. I haven't had a lot of lectures this semester, so it might be because of that too, but yes. I lose a bit of the touch on the vibe."
Student Performance	"I do think it's a lot easier for an un-engaged student to engage even less now, when there's no physical imperative to attend or be somewhere to meet the people you study with. So, I think it's probably easier to perform less, or do less, now than it was in person."	"If you look at the numbers, it looks like it's less students that fail courses than before. Is it because we have changed some of the grading? because some of the grading has been changed from an A-F to a Pass-No pass, at least at the bachelor level. Not at the master level, because there're most assignments and so on. But it looks like the overall statistics, and also nation-wide, that less people are failing, and I don't know for sure why."	"poorer, but there are two sides of it. They learn less they perform worse. But then we have made it easier for those in the exam, and hence, the exam's grade is at least as good or maybe better."	"but when I view the results, it's basically the same. Because we have quite a few data on how people are doing on different exams, and fail-ratios, and so on. It doesn't seem like the results are any worse (...) Maybe it could have something to do with the opportunity to watch things multiple times, that you have... In general, people might have more time, but I don't know if people are actually making use of that time to study."

Appendix D: Student Interview Guide

Concepts	Questions	References
Social	1. How is your situation? (Age, Course, part-time/full-time, job)	Khalil et al.,(2020), Rasheed et al. (2020), Winters et al. (2008), Schlenz et al.,(2020), Adnan & Anwar (2020), Son et al. (2020)
	2. How has the pandemic impacted you from a social context? Social life in general?	
	3. How do you feel about your university experience during this pandemic? How is your affiliation to the university? Social with classmates? Could you describe how you experience the class environment?	
Learning During Corona	4. How has the pandemic impacted you from an educational context?	Khalil et al., (2020), Schlenz et al.,(2020), Adnan & Anwar (2020)
	5. How do you experience your learning outcome? Any difference now versus prior the pandemic?	
Learning Analytics and learning platforms	6. What do you think of the University's ability to communicate and give support during this pandemic?	Arnold and Pistilli (2012), Herodotou et al. (2019), Ifenthaler (2017), Pardo et al. (2019)
	7. How have you experienced the teachers during this digital shift?	
	8. What is your opinion on Learning Analytics in Higher Education?	
	9. What do you think about teachers and staff using the data to formulate individual responses?	
	10. Do you think course instructors should have access to your video logs? Do you see advantages or disadvantages in this?	
Procrastination	11. What do you think of KUC's Learning Management Systems i.e., Canvas, Panopto, etc.?	Dewitte and Schouwenburg (2002), Howel & Watson (2007), Steel (2007), Van Eerde (2003)
	12. What are your thoughts on Canvas showing numbers telling you how much time you spent as compared to the rest of the class?	
	13. How has your study activities and habits changed? Do you notice any difference in your behaviour compared to prior the pandemic?	
	14. How do you work towards deadlines? Has this changed during online lectures, and why? How do you cope with time pressure? Is it more difficult or easier now versus prior the pandemic?	
	15. Do you notice any change in how you perform now versus prior to digital learning?	
	16. Do you get distracted during study? Have you experienced any issues with your ability to stay focused? Why?	
	17. Would you describe yourself as an active student? Why? Has this changed now as the lectures are conducted digitally?	
Self-Regulation	18. How do you structure your studies? Has the pandemic affected your ability to structure your studies?	Selwyn (2016), Abuhmaid and Mohammad (2020), Yilmaz (2017)
	19. Has your motivation changed? Do you experience any issues with staying motivated? Is this due to the pandemic or online learning?	
	20. Do you watch live sessions or recorded? Why? Does this freedom to choose affects your ability to structure your time?	
	21. Do you prefer online classes or physical classes? Do you experience online classes as an advantage or disadvantage?	
	22. Are you worried about your academic performance during this pandemic? Why/why not?	
Exam Anxiety	23. How satisfied are you with your own grades? (scale?)	Alsaady et al. (2020), Abdulghani et al. (2020), Pascoe et al. (2020), Babar et al. (2015).
	24. Do you normally experience stress related to exams? Does this affect you positively or negatively? Has this changed during the pandemic?	
	25. Do you communicate with your peers about exams or assignments? Do you feel that it helps you coping with stress related to exams? Do you communicate less with your peers now than prior to the pandemic? Any experience with group assignments during this pandemic?	

Appendix E: Teacher Interview Guide

Concepts	Questions	References
Online learning	<ol style="list-style-type: none"> 1. How do you use learning management systems? Could you elaborate on how effectively you use Canvas and Panopto? 2. How do you feel about the chosen platforms by the university, do they support e-learning? 3. Do you feel the platforms selected by university include necessary features and function you need? 4. How is your experience with the use of these systems before COVID and now during the pandemic? Has anything changed on how you use canvas, Panopto or other tools? 5. Are there any challenges or irritations associated with these systems? 6. Do you use these or other platforms to communicate with your students? If so, could you explain a bit. (mail etc.) 7. How effective/ ineffective is the communication with the students through these channels? 	<p>Khalil et al. (2020). Rasheed et al.(2020)</p>
Learning Analytics	<ol style="list-style-type: none"> 8. Do you use learning analytics in educations? How do you use it? 9. What is the purpose of using it? What information are you looking at? 10. you incorporate analytics into the feedback and support to the students? 	<p>Herodotou et al.(2020), Kollom et al. (2021)</p>
Lectures	<ol style="list-style-type: none"> 11. How do you feel about conducting lectures online instead of physical? 12. Do you see any advantages with online lectures? 13. How is your experience with pre-re-coded lecture? Does it take more work to create the content and what do you prefer? 14. Do you feel you get through the learning outcome just as well as physical lectures? 15. Do you experience any stress, zoom fatigue and more isolated work environment with digital teaching? 16. What initiatives do you apply to engage your students? 17. Do you feel student procrastinate more during online learning? 18. How is your relationship with the students now under this pandemic? 19. How do you feel the student perform with studies being online? 	<p>Hassan et al. (2020), Almazova et al.(2020)</p>

Appendix F: Interview Transcripts

Below we have included a transcript of one of our interviews. In total, we transcribed 16 interviews, including 11 students, 4 teachers, and 1 Manager of the Teaching Technology Centre. All transcripts have been made accessible through this link: [Click Here](#)

Interview with Teacher 1

00:09 Rubina:

How do you use learning management systems?

00:21 Teacher:

By learning management systems, are we talking about the thing we use to like arrange the classes?

00:30 Rubina:

yes, such as Canvas, Panapto, and those platforms.

00:37 Teacher:

Okay. Obviously, now I'm only talking from the experience of one class. The data ethics class, as a part of the Data Science degree for bachelor students. I taught together with *** last year, last autumn. And we use it for sharing the recordings of our lectures. We use it to share the literature. We try to some extent to use it somewhat interactively by providing relevant articles and information based on the questions we've been asked during the lecture. Yeah, it's fairly static.

01:27 Rubina:

What platform was it?

01:30 Teacher:

That was Canvas, I believe. That's the main one, isn't it?

01:34 Rubina:

Yeah. Canvas and Panapto. Can you elaborate how effective you use Canvas or panapto?

01:44 Teacher:

Okay, so. Panapto we did not use effectively at all, cause neither of us understood how to use it, and we started looking at it like the day before our first lecture. So, we never got around to actually use that. All the less, they gave us a brief introduction, so the goal is to use it the next time. But for now, we didn't use Panapto at all. It was just Zoom and recorded and then put it up on Canvas.

02:14 Rubina:

Do you feel that it works effectively?

02:28 Teacher:

It's completely... so, my challenge is that I had my two lectures. And why I had two lectures, which were both physical and digital, and then I had two lectures which were just digital, and they were recorded. So, the digital physical was odd because I had no... I didn't see the people who were there digitally. I think about one third or half were on Zoom, while the rest were in the classroom, so I didn't really get an impression of how effective it was. I think the most concrete example was that the people who were there on Zoom did not participate in the assignments, even though I... Well, we tried to give the exercises which they could participate in through the chat or by submitting them. But in general, that interest was a lot lower than in person. So, I thought it was hard to get the same engagement with them.

03:50 Rubina:

How do you feel about the chosen platform by the University? Do you feel like they support e-learning?

04:14 Teacher:

I would say yes. They have a fairly, like descent ecosystem with both the office, the Microsoft 365, and the Canvas and Panapto. So, I think that the tools are there. I think that the challenge is more... In a way you have to structure and think about teaching in a very different way. The knowledge of how to use them effectively is there.

04:59 Rubina:

Do you feel like they have the necessary features and functions that you need for e-learning?

05:08 Teacher:

I think that you could probably separate between the infrastructure. We had that infrastructure we will have. I think that in a couple of years we will think that it was quite outdated, which I think maybe is due to the lack of interaction potential between student and teacher. As a teacher you upload things and you hope they open them, but you don't have any... like a mirror function where you have post-it notes and you can divide in to two places. Like, you don't have anything like that, at least not facilitated through the class. Of course, you can do it on your own, but it wasn't a part of the teaching platform.

06:05 Rubina:

How do you use these systems before versus now during the pandemic? Has anything changed in how you use Canvas or other tools?

06:17 Teacher:

This was my first time I ever taught in Norway. This is also the first ever time I'm at the university of Norway, so I've never had any experience with Canvas or anything like that before. I can't really say from personal experience, but it feels like it was the same platform. You just added on new services where possible.

07:05 Rubina:

Are there any challenges associate with these systems?

07:12 Teacher:

To me, the biggest challenge was that you have to think about teaching a lot more in a way like you think about entertainment and about modern entertainment. Back when lectures were physical, or events or presentations were physical, I think the people speaking were a bit privileged, in that they could say whatever they wanted, they could take as long as they wanted, because people didn't just stand up and leave. Now when it's digital, you have to think all time that the person watching can just leave, just exit that window, and not watch you if you are boring. I think it is good for me because it makes me a lot more straight to point. I could've start talking about things I thought was interesting, but in reality, wasn't that relevant for them. But it also made me leave out certain aspects which I think they would have benefit from, but I thought would make them pay less attention. So, I think the challenge is that you have to plan before a shorter attention span, for a crowd that you can't see, so you have no control. You can't mention their names, call them out, so you have to think of it like you would have planned a Netflix show.

09:26 Rubina:

Do you use other platforms to communicate with your students? If so, could you explain a bit?

09:38 Teacher:

I only used Canvas for official documents and updates etc. They contact us on email for questions regarding lectures or inquire more knowledge etc. Zoom, obviously, for the conference, and Dropbox for the literature. That's all we used.

10:07 Rubina:

How effective/ineffective is the communication with the students through these channels?

10:14 Teacher:

The problem is that it's one-way communication, so I mean, it's extraordinary effective for me but I have no idea if anyone downloaded it, if anyone had a look. For example, I'm fairly certain that no one ever watch the recorded lectures we put out. Because we had one about academic writing and referencing, where it was very clear that no one had watched that. So, it's very effective for me, but I think the question is "what is the impact?", and the impact I don't know. Which I know would be different if I had used the Panapto, because then I could track who have watched what.

11:03 Rubina:

Do you feel like mailing to each other is an effective way of communicating?

11:19 Teacher:

I would say no, because in the moment you have to write something, you have a secondary way of communicating, so someone might not be that good at writing. And now of course, I read what they write, I will interpret what they wrote, and then again write something which they can interpret. I think there's a lot of nuance which are being lost in that. Well, I think that when you speak, like when you meet people physically, especially when we're in the classroom, they have a question because you're not entirely sure about something. And if you're not entirely sure about something, it's very hard to ask a question, so that's why, you know, when you do that in person, they understand more and they take long time to explain what it means. But then you have the opportunity to understand it, but when it's written I don't that is the case. The people who contacted me on email, where in general people who were very engaged with the class already. It was not the people who had not participated much.

13:17 Rubina:

Do you use learning analytics in teaching, and how do you use it?

13:31 Teacher:

The answer here is no, we did not use any of that. *** showed us how it worked, and it was very clear that it would benefit us a lot. But obviously we did not get around to actually getting into it before we had our class.

13:54 Rubina:

Do you use Canvas to look at the numbers?

14:15 Teacher:

No, we did not use that. I mean, obviously I can only talk for myself, because *** might have used it. She was the coordinator of the class, so like, the one responsible. But I did not use it.

15:00 Rubina:

How do you feel about conducting lecture online instead of physical?

15:13 Teacher:

I think that I've summed up a lot of it when I spoke about the planning part. I've done a lot of public speaking, and public speaking is... what makes that very different with public speaking, is that you can actually see your audience, so you can see when people are falling off, or you can see when they are interested or not. You can be very dynamic when you do in person, but then when it's digital you have to be more efficient and effective in the way you plan and execute it. You have to be a lot more on point with the language you use, and you also have to be a lot more formal in the language because you know it's recorded, so you have to leave out a lot of rhetorical mannerisms. So, I felt that it became a lot more duller, a lot straighter to the point, but... it was harder to animate the content on the narrative you're trying to make. My lectures were mostly on philosophy, in which case there are very few facts which are relevant, and is more about understanding nuances, and I felt like the digital tool is better for clear cut facts than trying to encourage reflection or thought.

17:38 Rubina:

Do you see any advantage with having online lectures?

17:45 Teacher:

Definitely when it comes to accessibility. It democratizes teaching and learning. For example, it removes geographical barriers. Also, when you have on demand, so like, having digital is one thing but having recorded is another thing. People with busy schedules, people who work, people who have families etc., they will be able to sit down and attend the lecture on your own. Also, you can make it clearer what the students should expect to learn from the lecture. For instance, you can break up the lectures, like, instead of having one very long day you can have it like "this hour is about this topic, this hour is about this topic, this h...". And probably the biggest benefit I can see, is that you are able to re-watch it if there's something you don't understand.

19:54 Rubina:

How is your experience with pre-recorded lecture? Do you feel like they take more time to create the content? And what do you prefer?

20:10 Teacher:

It's a good question. Pre-recorded I think are... they lose out a lot when it comes to the lack of interaction and you can't get comments from your students, you can't ask people if they're

following. I think they're good for me in a sense that they do force me to think "What is it that I actually want them to learn?". You can't go up there and talk about something you know very well on your own, which is very often the case I think, especially like in academia is... you know, people sit with this all time and think about it all time, so you just get up there and are like "yeah, I'm just gonna talk about it". You have to think like, what are the key take-away's - if the students are gonna learn three key things, what should they learn? So, in the pre-recorded ones, you have to think about that, so it takes more planning, it will become more formal. But I think the product becomes more lasting in a sense that you have taught about it more carefully than what you previously would have done, when you just had an in-person lecture.

21:37 Rubina:

Do you feel you get through the same learning outcome in online, just as effectively as in physical lectures?

21:56 Teacher:

I think you can, and that would depend on the technology and the solutions you have available. It will depend on how you would use them, and it will depend on how you plan your lectures. When it comes to the pure learning outcome, I don't think you would be able to educate people as well, and by educate I mean more... Things are more comprehensive when it comes to providing people with more informal understanding. The things you get through me having comments or having small sporadic stories from practice etc., and of course by exchanging thoughts in the class, asking for comments etc. because that becomes a lot more moderated and limited digitally, because the moment you are recorded, people are more careful of what to say. So, I think that in pure conveying of information, definitely, but when it comes to your pure reflection and the learning how to think, I think will be much more difficult than just learning what to think.

23:22 Rubina:

Do you experience any stress or Zoom-fatigue in a more isolated work environment with digital teaching?

23:33 Teacher:

(...) I think we went from thinking that events or presentations online could last for 3 hours, to now I think that nothing should be more than 45 minutes.

24:11 Rubina:

With Zoom fatigue, can you elaborate more? What do you feel? (...) Why would you say that you experience Zoom-fatigue?

24:27 Teacher:

When I say I experience Zoom-fatigue, its more as a listener, rather than the person speaking, because everyone loves hearing the sound of their own voice, and especially people in academia. They love talking about what they think the people should care about, but as an audience I think that if you don't hit the right... According to research, like, after 15 minutes people start stopping to pay attention (...) and I think when you have it on the screen, it is even easier to drift of and just allow it to be white noise. (...)

26:45 Rubina:

Do you feel like students procrastinate more during online learning?

26:53 Teacher:

Very good question. I think students procrastinate no matter what learning method or tool you have. I don't really think it's about the channel you get it from, I think it's more about life as a student.

27:15 Rubina:

How is your relationship with the students now under the pandemic?

27:23 Teacher:

The interesting part is that the ones who were very engaged physically in class, they often... well not often, but a few of them reached out to ask for literature, with questions, to get more information. So, to me that just showed me that for them it was simpler to communicate or have contact with me when they have met me in person. While the ones who hadn't, there I had some questions but that were normally like the day before exam, wondering if they should do the exam or not.

28:19 Rubina:

Do you feel the students perform better now under digital learning?

28:28 Teacher:

I do think it's a lot easier for an un-engaged student to engage even less now, when there's no physical imperative to attend or be somewhere to meet the people you study with. So, I think it's probably easier to perform less, or do less, now than it was in person.

29:19 Rubina:

I think we are done.