University Teachers' Pedagogical Work with Canvas

An exploration of teachers' conceptions, design work and experiences with an LMS

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Abstract

The popularity of digital technologies such as Learning Management System (LMS) in the higher education sector has increased considerably in the past years. LMSs has been seen assigned high value and assumed to support teaching and learning in many ways. While much trust has been placed in the LMS environment to solve various issues common to teaching-learning situations, research has eventually shown that quality teaching and learning with the endorsed LMS does not happen spontaneously. Rather, it largely rests on how teachers undertake their pedagogical design work and how they find ways to connect LMS to this effort and to subsequent teaching efforts. However, research on these processes are still largely under-researched.

This thesis examined the way teachers include LMSs (i.e., Canvas) in their teaching and was aimed at providing deeper insights into the nature and challenges of teachers' pedagogical development work and teaching including LMS technology. Specifically, this empirical study explored their ideas concerning LMSs, the approaches to integrating LMS in their design processes, and their experiences of teaching and learning with LMS.

The empirical work consisted of stimulated recall interviews of 14 teachers at the University of Oslo, selected based on their varying experiences of working with Canvas in their teaching. A systematic literature review led to creating a baseline understanding of existing knowledge and developing an interview protocol, allowed collecting data about teachers' conceptions of LMS, their design processes, and their feelings and reflections of Canvas use in the shared course. Screenshots of teachers were used to prompt their answers. The data was analyzed through the combined process of inductive and deductive thematic analysis, which conducted both on the paper and on the computer. An analytical framework based on sociomaterial and sociocultural theories allowed interpreting the data and led to a rich set of findings.

The findings provide a varied insight into teachers' work and views. They indicate that teachers may endorse multiple conceptions of LMSs since they conceive the LMS as tool to store and present information, as tool to operate the processes of various educational activities, as tool to expand teaching and learning spaces, as tool to navigate teachers and students in progress of the course, and as the one-stop platform for integrating sub-tools, but not as the tool to clarify concepts or develop metacognitive skills. Further, the findings show that university teachers include LMS into their courses during designing in one out of four approaches: some redesign the whole course or elaborate parts of the course with

Canvas, while others reactively modify or fill pre-existing course design into Canvas. Individual teacher's experience of teaching and student learning might be unrelated to LMS use or affected by LMS use to different extents. The integrative view of the findings shows that 1) teacher's approach to design is the pivotal aspect in their pedagogical design work, since the sophistication of approach to design is informed by the complexity of their conception of LMS and predetermines the favorableness of their experience with LMS, and that 2) teachers can promote or demote the role of Canvas in designing while the materiality of LMS can inspire or hinder teachers' certain design actions. Thus, the pedagogical design work is jointly achieved by teachers and their digital tool of LMS.

These findings extend the knowledge of integrating LMS in teaching and learning in terms of teachers' pedagogical design work. They have implications for the educational practices in higher education. For quality teaching and learning in universities, teachers need to proactively know about and include LMS into practice while department leaders should acknowledge the impacts of LMS and strategically disseminate the successful LMS use cases. LMS suppliers and the institution need to assure the iteration and deployment of LMS as the inseparable material element for education.

Future research should consider to better understand the technology-involved higher education practice in terms of students' experiences, teachers pedagogical design rationales, and productive course design components.

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Abbreviations

ICT	Information and Communication Technology
LMS	Learning Management System
VLE	Virtual Learning Environment
DLE	Digital Learning Environment
CMS	Course Management System
LAMS	Learning Activity Management System
TAM	Technology Acceptance Model
UiO	University of Oslo
LINK	Centre for Learning, Innovation & Academic Development
NSD	Norwegian Social Science Data Services
GDPR	General Data Protection Regulation

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1 Introduction

1.1 Background

The development of Information and Communication Technology (ICT) have constantly changed the way our society deals with information, including with education (García-Peñalvo et al., 2011). The ICT, and especially those technologies designed to support education practice, have tremendous communicational and organizational potential for teaching and learning. For the past three decades, the use of ICT in school education has become a fashion, which was funded and supported by governments with hardware, software, and trainings (Wellington, 2005). The higher education sector is not an exception either. Many universities and colleges have linked ICT to their institutional strategies to cope with the challenges raised by fast information development and pressures from external and internal stakeholders (Stensaker et al., 2007).

Educational technologies have been assumed to be the highly demanded and inevitable infrastructures in higher education environment (Kirkwood & Price, 2014). Among the most used digital technologies in higher education are the Learning Management Systems (Coates, James, & Baldwin, 2005). Learning Management Systems (hereafter referred to as LMS) are institutional online platforms including a suite of embedded digital tools that enable easy access, online delivery of content, communication and collaboration, course management, learning assessment, and course analytics (e.g., De Smet et al., 2012; Rhode et al., 2017). It is also referred to as Virtual Learning Environment (VLE), Digital Learning Environment (DLE), Course Management System (CMS), or Learning Activity Management System (LAMS). Nowadays, it is considered that LMS has become the entry-point to educational technology for university teachers.

Meanwhile, the prevalence of educational technologies also brings about the challenge of successful integration of the digital tools for the effective teaching and efficient learning. As the primary digital tool endorsed in university, several attempts have been made to advance knowledge of LMS integration issues within the field of higher education. Questions such as LMS usage in general, adoption rates, what factors influence the LMS integration, how university teacher's beliefs affect LMS usage have been often raised and researched. The knowledge about the adoption rate and the usage of LMS is the stepping-stone to shed light on the issue of integrating LMS for enhancement of education. First, according to the studies in different countries (e.g., Brown, Dehoney, & Millichap, 2015;

Browne, Jenkins, & Walker, 2006; Kruse et al., 2012), LMS has swept across the higher education institutions with high adoption rate all over the world. Moreover, many studies investigating LMS use in different contexts with distinctive platforms has revealed that teachers and students, on average, mostly use message and repository storage features in LMSs, while technically advanced synchronous and collaborative features are seldom used (Dahlstrom, Brooks, & Bichsel, 2014; Hustad & Arntzen, 2013; Morgan, 2003; Schoonenboom, 2014). These studies indicate that different LMS systems contain a couple of similar embedded sub-tools; even though LMS remains as a digital infrastructure for teaching and learning in the universities, the identical low-end usage tendency keeps appearing across a range of LMS systems. Therefore, the main criticism on LMS is its lack of integration into higher education practice.

A large body of literature has sought to unravel the factors influencing the LMS integration. Some qualitative studies (e.g., Buabeng-Andoh, 2012; Morgan, 2003) indicate that the technological condition is the key factor, which both encourages and decreases the LMS use. Social, cultural, and pragmatic issues concerning the particular institution and user's ability are also influential to the successful integration. The results from Chang's (2008) quantitative study suggest that there is a significant positive relationship between faculty's perceived LMS design and perceived LMS use, so is the relationship between their use capacity and perceived eLearning. Similarly, by expanding Davis's (1989) widely used Technology Acceptance Model (hereafter referred to as TAM), the results from Fathema, Shannon and Ross's (2015) quantitative study manifest that quality of LMS system, teachers' LMS use self-efficacy, and institutional condition have positive effects on LMS use. These studies suggest that the dominant LMS itself associated with the institution and its users have been identified as the three factors influencing the issue of integrating LMS for higher education practice.

Many researchers have taken a step further to explore how teachers' beliefs implicitly influence their LMS use. Steel and Levy (2009) and Steel (2009) showed that teachers have difficulties in reconciling their distinctive pedagogical beliefs and technological beliefs with their LMS use practice since LMS could not fit all their needs. Also, Steel (2009) points out that the successful practice requires teachers to resolve tensions of their beliefs in learning design with LMS. With an emphasis on the consonance and dissonance between teachers' eLearning beliefs and practices, results of Scott's (2016) longitudinal study suggest that teachers' belief and respective practice change because of their reflection on experience, but the changes are not one-directional but very contextual.

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The above studies on usage status, influential factors, and challenges of translating thinking into practice with educational technology have provided many useful insights. Through the theoretical frames of TAM and the social constructivist perspective, teacher's intrinsic thinking such as pedagogical belief underpinning their approaches to LMS integration has been articulated. Paradoxically, as a response to the rapidly changing technology-enriched society, the use of LMS in the universities becomes the reason for the increased uncertainty and complexity of users' thoughts and behaviors, rather the improvement of education practice that is longed for. In order to find a way out of the predicament, investigating LMS integration practice is a continuing concern within the higher education sector.

1.2 Rationale of this study

The starting point of this master thesis was set by the author's experience of witnessing the University of Oslo (hereafter referred to as UiO) updating its adoption of LMS from the previous system to the new open-source commercial platform of Canvas. After the pilot semester with Canvas, UiO leadership made the decision that the whole university would employ Canvas from the academic year of 2018 as the only LMS, which introduces new methods, and tools that facilitate more active learning and smart teaching (Canvas, 2018). It is therefore meaningful to study the LMS integration phenomenon here at UiO, by focusing on how the better teaching and learning experiences can be gained with LMS as the endorsed primary educational technology in university. This complex issue needs to be decomposed to be researchable.

The traditional higher education practice is becoming more design-oriented. That is, quality teaching and learning in campus-based universities have made a greater demand on appropriate design beforehand due to the availability of technological innovations, the diversity in students' needs, and the pressures from institutions and employers (Goodyear, 2015). Some empirical studies on student's use of LMS show that teachers' use of LMS has an impact on students' experiences with the technology (Weaver, Spratt, & Nair, 2008), the amount of time the students use technology (Nguyen, Huptych, & Rienties, 2018), and students' value of technology (Lonn & Teasley, 2009). Rienties, Toetenel and Bryan's (2015) findings indicate that academics' design activities with/in LMS influence students' engagements and their learning performances. The anticipated improvement in learning experiences with LMS does not come from nowhere, but rather relies on the teachers'

design work. Since teaching as a design output would indirectly influence students' learning activities, design is gradually becoming a more recognizable and significant part of teachers' professional work (Beetham & Sharpe 2013; Conole 2012; Goodyear & Dimitriadis, 2013; Goodyear & Markauskaite, 2009; Laurillard 2013). Goodyear (2015) draws together arguments that are emerging from recent studies to re-conceptualize teaching in higher education as the design for learning.

Moreover, it is during the design work that teachers initially make decisions on technology integration in the teaching and learning practice. When we take technology into use in practice, it is assumed that technology is reshaping the educational activities and processes at the same time (Säljö, 2010). The development of digital technologies may bring opportunities and challenges for designing and the design for teaching and learning as well. On the foundation of teaching and learning as the design science, the first step to enhance the teaching and learning with LMS in the higher education environment is to extend our knowledge of teachers' design work with technology.

When it comes to describing and explaining design work in education science, many terms have been used. In general, similar as architecture design, the design with pedagogical purposes is both a process and an output; both dimensions are important. Throughout this dissertation, the term "pedagogical design" is used to refer to the process through which teachers configure the coherent educational arrangement for a course they teach in, and the artifact of structured tasks, learning resources, and social organizations for students as the particular consequence of design process.

Along with this increasing concern over design science in education, existing research on pedagogical design work with technology provides insights on several aspects. First, university teachers' concepts of educational technology are relevant to their design work with technology (Ellis et al., 2009). Meanwhile, experiences of technology use are an integral part of design work for university teachers (Kali, Goodyear, & Markauskaite, 2011; Wilson, 2007), since experiences are both the outcome of enacting the pedagogical design with digital technology and the resource for reconceptualization of technology (Ellis, Steed, & Applebee, 2006). When it comes to the process of design work, researchers (e.g. Bennett, Agostinho, & Lockyer, 2017; Goodyear & Dimitriadis, 2013; McKenney et al., 2015) report that the design process is rather improvisational and iterative, thus difficult to capture. Other researchers have tried to frame the approach to design by characterizing teachers' use of digital tools in pedagogical design work (Ellis et al., 2009; Ellis, Steed, & Applebee, 2006; Jahnke et al., 2017; Rienties, Toetenel, & Bryan, 2015). These findings suggest that

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teacher's conception of LMS, approach to design, and respective experience with LMS could be highlighted as the three key aspects in understanding design work with LMS.

So far, the empirical research on teachers' pedagogical design work with educational technology is still in its infancy. Little is known about in what ways teachers develop their pedagogical designs with LMS for the course they teach in. Few studies have been able to investigate all the highlighted three aspects and the way these are integrated and used in the teaching practice. Conceptually, prior studies either lean on the technology-centered TAM or the human-centered sociocultural perspective on teaching and learning. The phenomenon under the investigation in this study has not been seen through the lens of sociomaterial perspective on teaching and learning. Yet, as one of the most widely used LMS system, almost nobody has conducted research on design work with Canvas. This requires research to elucidate teachers' pedagogical design work with Canvas from an integrative view, thereby deepening the understanding of integrating LMS for quality teaching and learning in the higher education settings.

1.3 Research Question

The aims of this study are threefold. Firstly, it aims to reveal the digital technology integration practices from the perspective of pedagogical designs that are created with or within the LMS. In addition, it aims to broaden the knowledge of enhancing pedagogical use of LMS by identifying the possible dynamics among teachers' conceptions, approaches to design, and LMS use experiences. The final aim is to contribute more to the understanding of constitutive role of LMS, especially by seeing LMS inseparable from higher education practice through the lens of sociomaterial perspective.

In view of all that has been mentioned so far, the overarching research question investigated in this interview investigation is formulated as follows:

How do teachers develop their pedagogical designs with LMS?

In order to address this issue, the current thesis needs to answer three subquestions.

1) What are teachers' conceptions of LMS such as Canvas?

The first question concerns teachers' understandings of how LMS as the digital tool contributes to teaching and learning in practice, and the distinctive meanings attached by teachers to LMS, especially Canvas.

2) How do teachers approach their pedagogical designs with Canvas?

The second question highlights teachers' design approaches when they structure their course with LMS. It concerns ways in which they work with Canvas to undergo the process of pedagogical design.

3) What are teachers' experiences of teaching and of students learning with Canvas?

The final question focuses on identifying teachers' insights into their experiences in enacting the pedagogical design with Canvas. It is concerned with how teachers perceive and reflect the use of Canvas in teaching and learning.

Owing to the implicit nature of teachers' pedagogical design work, this study uses the method of semi-structured interview to co-construct the knowledge together with the participants that are recruited through convenience sampling in UiO. Within the empirical setting, the participants are academic teachers, research fellows, guest lecturers who once designed and taught a course for at least one semester with LMS in this traditional campus-based university.

1.4 Thesis Outline

Chapter 1 is the introduction chapter consisting of the background and the rationale of the study, followed by the aims of this study and the statement of the research question.

Chapter 2 contains the choices and clarification of the relevant terms and theoretical resources, the literature review of prior empirical research related to pedagogical design with educational technologies such as LMS, and the demonstration of how analytical framework has been formulated in this study.

Chapter 3 is dedicated to illustrate and justify the methodology that is employed in this study, namely empirical context, research design, participants, the data collection and analysis, and how the quality of this thesis is ensured.

Chapter 4 presents findings from interview data as the outcome of analyses through the established analytical framework, first in a way that answers back to subquestions, then answering back to the overarching question.

Chapter 5 is the section elaborating on findings and discussing the meaning of the findings in relation to existing literature and theoretical concepts, by which also points out

implications for higher education practice, limitations of this study, and the suggestions for the future research.

Chapter 6 provides the final conclusion about this empirical study.

2 Theoretical Perspectives, Literature Review, and Analytical Framework

This chapter begins to clarify the definition and aspects of pedagogical design that have been studied in this research. The two most relevant perspectives on teaching and learning with tools and some of the core concepts, which are applied to guide this research, are presented in the theoretical review part. The following section is about the reviewed empirical literature and the analytical framework drawn based on the theoretical ideas examined in this review.

2.1 The Clarification of Terms about Design in Education Practice

While design work is gaining ground in educational practice, a variety of terms are adopted in literature to study the similar actions in several empirical contexts, and to draw on different aspects of design activity at various levels of granularity.

Some researchers (e.g., Garrison & Kanuka, 2004; Seel et al., 2017) adopt the term "instructional design" in which, sometimes, the designer is not the teacher who involves in enacting the design with students in the corresponding course. Instructional Design is historically grounded on objectivism (Vrasidas, 2000), which tends to focus more on planning fixed teaching and learning trajectory comprehensively at the micro level of the detailed interactions of instructional materials and activities.

Others (e.g., Bennett, Agostinho, & Lockyer 2015; Rienties, Toetenel, & Bryan, 2015) use the term "learning design" which mainly concerns the students' learning activities. The design focus varies from single learning activity to a systematic set of learning activities within a whole study program at the macro level. Goodyear (2005) puts forward the term "design for learning" that stems from "learning design" to emphasize only students experiences can be designed rather than learning itself. "Learning design" and "Design for learning" both serve as a framework for documenting, sharing and supporting design actions with technologies towards the optimal learning experience of others (Beetham & Sharpe, 2013).

Many researchers have also discussed the content of design work and the role of teacher in design work. Goodyear (2005, 2015), as one of them who have been working on the educational design area for a long time, argues that things can be designed are learning

tasks, supportive physical and digital environments, forms of social organization, and divisions of labor. Goodyear (2015) emphasizes two aspects of design activities: one is that educational design, which is similar to architecture or industrial design, rarely aiming to create brand new things, but to select and configure existing things into new entanglements; the other is that educational design is not a fixed product, but is open for students to adapt, interpret and customize. In line with Goodyear, Jones (2013) points out the indirect nature of design work in education practice, and assumes that "design is not a once and for all activity of preparation but a process that is both iterative and includes the enactment of the design in use" (p. 208). Similarly, Jahnke, Norqvist, and Olsson (2014) define design as "the teacher's act of modeling the teaching practices with the purpose to enable engaged student learning" (p. 167), in which teacher are not only experts but also process mentors and learning companions while students are not only consumers but also producers, prosumers, reflectors and co-designers.

Such ambiguity around the terms describing design work means that it needs to be clearly defined in the context of the current research intent and meaning. For this study, the research intends to explore teacher's design work for a semester-long course as a practitioner with the LMS of Canvas, in which tensions from learners at micro level intersect with tensions from the institution at macro level. Thus, the term "pedagogical design" is chosen to refer to teachers' design work for a course they teach in. More specifically, it defines not only the process of how teachers model the coherent learning experience for student towards a particular end after pedagogic, practical, and technological considerations but also the configured tasks, learning materials and spaces, and social organizations for teachers and students in a course as the ready-to-enact consequence of the design process.

Pedagogical design with LMS can thus be understood as the process that becomes realized in the interplays between humans' and digital. Therefore, both sociomaterial and sociocultural perspectives on learning and activity are instrumental in this study.

2.2 Perspectives on Teaching and Learning with Technology

2.2.1 The sociomaterial perspective and the core concepts

Along with the ICT sophistication, digital technology has become not only ubiquitous, but also powerful in teaching and learning practice. Nowadays, in this technology-enriched society, teaching and learning environment has always been constituted with a wide range

of human and non-human (or technological) elements. The materiality of learning has gradually been recognized, emphasized, and reflected by many researchers (e.g., Johri, 2011; Säljö, 2010; Sørensen, 2009). Subsequently, the sociomaterial perspective has been increasingly employed in empirical research of education practice.

The main premise that sociomaterial approaches share is the nature of the interdependence between human actions of teaching and learning and the materiality. It does not contradict other learning perspectives and theories. Rather, it accounts for those educational actions that are bound up with the social and the material simultaneously. Sørensen (2009) asserts that non-human materials matter, not as discrete objects, but as combinations with human in different ways to elevate particular purposes and particular effects in everyday education practice. Fenwick (2015) describes material as more-than-human force that has a mutually constitutive relationship with human force. LMS, as the sophisticated and primary human made digital tool in universities, perhaps, has become the more-than-human force that is constitutive, shaping everyday actions in higher education sector. Focusing on all kinds of interdependent negotiations and accommodations among human and more-than-human forces, in other words, the sociomateriality of organizing practice, could help us understand how teachers LMS integration practice are better than we have tended to (Orlikowski, 2009).

After acknowledging the significance of sociomateriality, the phenomena of teaching and learning with digital technology is often understood as *assemblages* of materials, social notions, and other distinct objects that are always reconstituting themselves (Fenwick & Landri, 2012). The concept of sociomaterial assemblage indicates the particular educational situation in which all relevant elements, no matter human or non-human, are understood to become an indispensable temporary combination. LMS, thus, could be seen as an inseparable combination of multiple stuffs. Sociomaterial assemblage also broadens our insights into the dynamic and fluid nature of education practice with digital tools. It helps us to identify and explain certain kind of education practice that is reconstituted after being extensively entangled with the sociomaterial presence of LMS. Instead of studying the educational technology as an object or actor, Sørensen (2009) describes the software as an assemblage that involves in accomplishing technology-involved education practice, who also suggests that the performance of educational actions could be an involvement in the sociomaterial assemblage.

Sociomaterial perspective also implies a *performativity view* on education practice. The pedagogical design work and other educational actions are always performative in their

nature, since they are all accomplished towards the particular and productive end—ideal student learning performance. LMS, as a sophisticated assemblage, now could perform a range of acts at lower cognitive cost for the users. After attaching meaning to LMS, when teachers consider their design actions with LMS, they might be invited to certain approaches to design to model teaching and learning in practice. When users, no matter teachers or students, operate in LMSs, they might be invited to certain forms of enactment of pedagogical design. Johri (2011) notes that "tools and technologies have functions that are expected to lead to certain kinds of learning" (p. 210). In alignment with Johri (2011), Fenwick (2015) indicates that human and more-than-human forces act together to exclude, invite, and regulate particular forms of enactment. Fenwick (2015) suggests that learning and knowing are enactments of the interrelated social and material, rather than simply internal mental processes or knowledge received from outside. Even though teachers and students may negotiate and interact in the enactment pedagogical design respectively, the education practice with LMS could often be examined in a performative sense. The concept of performativity in the theatrical sense helps in explicating why certain aligned patterns of conception of LMS, approach to design, and experience of use are more likely to emerge.

As introduced by Levi-Strauss (1966), the concept of *bricolage* is the analytic tool to identify the situation that people make do by putting whatever they have in availability. Based on the work of Orlikowski and Scott (2008), Johri (2011) expands the term of bricolage to the sociomaterial bricolage analytic concept. The sociomaterial bricolage encapsulates the idea that workers' practices emerge with pre-existing tools that are available to them, that is, they engage in sociomaterial bricolage. In other words, sometimes, people behave differently by trying out affordances they find at hands in situated contexts, rather than sticking to a planned approach. The sociomaterial concept of bricolage can be useful to understand teacher's incidental design behaviors with the presence of LMS. This concept might help in the efforts to explain why there are dissonances between teacher's conception of LMS and her or his approach to design.

2.2.2 The sociocultural perspective and the core concepts

As the mainstream theoretical model of learning, sociocultural perspective on teaching and learning also provides useful framework for education practice, which can be applied in understanding pedagogical use of digital tools as well. One of the main notion of sociocultural approach is that learning can be outlined as the process of developing understanding and competence, which is influenced by learner's interactions with

knowledgeable others and the culturally organized contextual activities they engage in. The sociocultural accounts of teaching and learning derive from Lev Vygotsky' (1978) theory by stressing the social and cultural origins of cognitive development. In general, it tends to place great emphasis on the interactive and collaborative knowledge construction nature shared among learners, teachers, technological tools, and other objects.

Learning activities can be conceived as the development of knowing in certain domain and problem solving competence in the sociocultural sense. As Vygotsky (1978, pp. 89) defines, "The only good learning is that which is in advance of development" (p. 89). Learner's development occurs through two main aspects: on one hand, it occurs through interactions with external material aids to master concepts within a certain subject; on the other hand, it occurs through interactions with knowledgeable others, in which learners discuss and reflect on principles to regulate their own ways of solving problems. Apart from guiding teaching and learning activites in higher education institutions, sociocultural perspective might influence the design and iteration of LMS systems as well. Consequently, in this study, sociocultural perspective can help in understanding teachers' perception of LMS, their action of design, and their experience with LMS in general.

Furthermore, Vygotsky (1978) incorporates the key concept of *mediation* to emphasize the role of tools (most importantly, language, or other real and symbolic tools) for learning. Mediation describes the phenomenon that, with certain accessible tools at hand, human purposely establish new relations with nature according to their educational needs and goals and act differently in the educational situation. Vygotsky (1978) asserts that the human action of internalizing the concepts and principles from more knowledgeable others is mediated by physical or/and semiotic tools. Tools, thus, become mediators between human and nature. Daniels (2015) cited Wertsch (2007), who terms mediation as the process that artifacts work as psychological tools. Wertsch (2007) implies that the artifacts could be used to influence human behaviors from the outside when the tool is used in the form of the attached meaning to it (becomes semiotic tool) instead of its instrumental form (physical tool). Hereupon, through the sociocultural approach, the LMS could be seen as the mediator in designing and in the enactment of design output.

Karpov and Haywood (1998) elaborate Vygotsky's concept of mediation into two categories: metacognitive mediation and cognitive mediation. The "cognitive mediation" means that the development of learner's intellectual abilities to obtain and apply concepts is mediated by physical or/and semiotic tools. The "metacognitive mediation" refers to the learning which is mediated by using physical or/and semiotic tools of self-regulation, self-

planning, and self-evaluation. In other words, learners develop the awareness of what should be learned and how to learn by using tools. The elaborations of the concept might be helpful to explain teacher's perception and feeling of LMS.

In summary, the emphases of sociomaterial perspective and sociocultural perspective are different while their strengths are complementary. These two perspectives and some of the core concepts constitute the comprehensive theoretical frame for this study to explore and explain teachers' design work with LMS more thoroughly.

2.3 Empirical Research on Teachers' Design Work with Technology

Aligned with the conceptual and theoretical explorations, many empirical efforts have also been made to examine teachers' design work in the technology-enriched higher education environment.

Morgan (2003) reveals that when teachers take LMS into use, sometimes, they come up with innovative pedagogical ideas. That is to say, in teachers' design work, their thinking on teaching and learning is inadvertently provoked. Morgan (2003) puts forward the phrase of "accidental pedagogy" to describe some of the unplanned pedagogic design behaviors with LMS. In their study, Ellis, Steed and Applebee (2006) interviewed 21 teachers from two Australian universities to identify their conceptions of blended learning and blended teaching, and the relationship between these conceptions and approaches to design eLearning (mainly with the technology of LMS). The results from distribution of variations amongst these categories suggest that the cohesive/fragmented conceptions of blended teaching or learning are closely and positively associated with deep/surface approaches towards design. Ellis, Steed and Applebee (2006) also imply that the incremental experimentation with using LMS for learning could be helpful for some teachers to reconceive of educational technology.

Ellis et al., (2009) investigated one British and one Australian university teachers' conceptions of learning technologies, approaches to design, and approaches to. They implemented the semi-structured interview method to identify the associations amongst conceptions and approaches. The results show that cohesive conceptions of learning technologies are positively linked with the integrated approaches to design, so are integrated approaches to design and student-focused approaches to teaching.

Kali, Goodyear and Markauskaite (2011) synthesized lessons learned from two parallel strands of empirical research on teacher's design activity. The results reveal that teachers

have difficulties in specifications in different contexts and in maintaining pedagogical coherence during the process of reconciling ideas into concrete pedagogical design with technology. Kali, Goodyear and Markauskaite (2011) drew on the notion of knowledge-in-pieces as the lens to explain peoples' previous experiences as the source for observed inconsistencies between their understandings and actions.

Few studies have touched on the question 'what happened during teachers' design work with technology. Kidney and Puckett's (2003) article on online course design indicates that designers could be distracted by the plethora tools and flexibility offered by LMS thereby they lost the focus on learning itself. Conole (2012) cited Wilson's (2007) case studies on LMS use to illuminate that online resources like case studies, theoretical frameworks, toolkits are used very little during designing; there is an uncertainty of use associated with functionalities offered by technologies; and the more available online materials and activities have led to the necessity for constant redesigns of courses. Wilson (2007) also highlights that teachers rely extensively on their prior experience and the local context in designing.

Three studies not focusing on technology broaden the knowledge of design work in general. The interview investigation of Bennett et al., (2011) reveals that teachers are not overly constricted by the predetermined conditions, such as assessment policies; they design both individually and collaboratively; most of the time they make iterative enhancements to pre-existing course units while sometimes they design a unit from scratch. As cited in Conole (2012), findings of Clark and Cross's (2010) qualitative study show that individuals have different preferences of how to carry out the design process: some sketch and link together their ideas; some systematically configure around learning outcomes; whereas others develop based on subject content; or they combine these approaches at different stages of the design. Bennett, Agostinho and Lockyer's (2017) interview study on the process of designing for learning has found that: firstly, the starting point of design could be outcome-oriented, content-oriented, or specific modification-oriented depending on the nature of design problem; secondly, design moves from broad framework or structure to specific details about design decisions; and thirdly, design occurs before, during, and after a unit's implementation.

Overall, prior studies on design work highlight their relevancies to teachers' conceptions of teaching, learning, and technology, to teachers' design experiences, and to their LMS use experiences. Design work is rather contextual, improvisational and iterative in its nature in which each teacher develop the pedagogical design respectively. Teacher's

experience is both the outcome of how they use digital technology and the resource for reconceiving technology.

2.3.1 Conceptions of eLearning, online teaching, and educational technology

To understand and explain teachers' design work, it is necessary to know their conceptions of educational technology, approaches to design, and their experiences of pedagogical use of LMS. In the interview investigation on teachers' conceptions of blended learning and blended teaching, and the approaches to design for eLearning within LMS, Ellis, Steed and Applebee (2006) suggest that there are: a) a student/cohesive perspective (investigating real world changes and actively building understanding) and b) a technological/fragmented perspective (learning through replaying media and using different media) on the conceptions of blended learning. Similarly, there are c) cohesive/supporting student learning perspective (helping students develop and apply new concepts, and developing student understanding through alignment of media to learning outcomes) and d) fragmented/providing technological media perspective (using technological media to deliver information and using technology media to replace the teacher) on the conceptions of blended teaching. Subsequently, Ellis and colleagues (2009) showed that learning technologies are conceived as: 1) tools for access, 2) tools for information delivery, 3) ways of providing active learning opportunities, and 4) ways of building knowledge by university teachers.

González (2009) interviewed seven lecturers to investigate the conceptions of online teaching and approaches to online teaching. The data collection is informed by the frameworks of Kember's (1997) conception of teaching, Kember and Kwan's (2000) teaching approach, and Roberts's (2003) conceptions of teaching using the web. The findings indicate three modified conceptions of online teaching: 'for individual access to learning materials and information, and for individual assessment'; 'for learning related communication (asynchronous and/or synchronous)'; and 'as a medium for networked learning'. Following the phenomenographic approach, González (2010) showed that eLearning has been seen as a medium: to provide information, for occasional online communication, for engaging students in online communications, and to facilitate knowledge-building tasks.

Lameras, Paraskakis and Levy (2008) investigated teachers' conceptions of teaching and learning using VLE in a phenomenographic approach. The interview data was analyzed through six dimensions of variation: focus on teaching, focus on learning, role of the student,

role of the teacher, focus on use, and focus on context. The results identify three categories of conceptions: information transfer and access, concepts understanding and interaction structuring, and personal meaning-making through social negotiation. The interview study of Lameras and colleagues (2012) illuminates that the spectrum of computer science teachers' conceptions and approaches to blended teaching vary from 'teacher-focused and content-oriented', through 'student-focused and content-oriented', and to 'student-focused and process-oriented'. The data were analyzed through the five dimensions of variations: the role of teacher, the role of student, the relation between modes, the epistemic status of subject matter, and the level of study. In findings, VLEs are described as a means of supporting: A—information transfer; B—application and clarification of concepts; C—exchange and development of ideas, and resource exploration and sharing; D—collaborative knowledge-creation, and development of process awareness and skills.

Together, these findings indicate that teacher's conceptions of educational technology are highly related to their conceptions of technology-involved learning and teaching and to how technologies contribute to learning materials, activities, and process. The conceptions of educational technology are described at different levels of abstraction, which is represented by a single function of LMS or the contribution of technology to education practice.

2.3.2 Approaches to pedagogical design with technology

Ellis, Steed and Applebee (2006) categorize the approaches to design into four types based on teacher's corresponding teaching experience: to reshape approaches to teaching, to influence approaches to teaching, to overwhelm relationships to teaching, and to be unrelated to teaching. Ellis, Steed and Applebee (2006) structure the first two categories as the deep-embedded perspective, the latter two as the surface-unintegrated perspective. The results from the semi-structure interview study of Ellis and colleagues (2009) indicate that approaches to design vary in a range of "contexts for pragmatic ends", "in order to add on", "to encourage active learning", and "to develop applied understanding". Rienties, Toetenel and Bryan (2015) introduce a learning design taxonomy that identifies seven forms of learning activity including assimilative, finding and handling information, communication, productive, experiential, interactive, and assessment. The data on learning design of 87 course modules in UK Open University collected through module mapping process were analyzed by cluster analysis. The findings inform four approaches to design for online course: constructivist, assessment-driven, balanced-variety, and social constructivist. This

study implies that digital footprints and course environments in LMS are also the representation of teachers' pedagogical design work.

Guided by the framework of Digital Didactical Design, Jahnke and colleagues (2017) collected design data on the teaching goals and intended learning outcome, learning activities, assessment, social relations and multiple social roles, and the multimodal manner of technology integration through the mixed methods of observation and interview. Three clusters of design: deep and meaningful/fully integrated all five DDD elements, semi-integrated, shallow or no integration have been identified.

So far, starting from different baselines, a limited number of studies explored and described teachers' approaches to design with self-reported or LMS log data. There is evidence to indicate how teachers approach design with technologies in terms of design as the output for actual teaching and learning, design purpose, learning theories, and to what extent technologies are integrated into practice. What is still not clear, however, is in what ways teachers incorporate LMS into their pedagogical design work.

2.3.3 Experiences of teaching and learning with LMS

West, Waddoups and Graham (2007) investigated the experiences of teachers' adoption and implementation of the LMS system of Blackboard at a university in United States. It is demonstrated that teachers adopt LMS through the path of exploring the individual features, facing challenges, and trying to adapt features to goals. The study characterizes the pattern of implementation experiences into three groups: embraced and relied on LMS, reduced use to some features, and discontinued the tool.

Yueh and Hsu's (2008) internal survey results indicate that there is no disciplinary differences in LMS use interests or use capabilities among teachers. 95% of teachers feel the self-developed LMS of Collaborative Enhanced Instruction by Asynchronous Learning serves their needs so that they would continue to use it. 80% of teachers feel like their courses are more complete and better structured, course content are enriched, and students perform better. About 80% teachers perceive that their course had become livelier.

Morgan's (2003) study on faculty's LMS use also shows that some faculty conceptualized LMS as highly structured but less customizable technology because using experiences sometimes would get in the way of good pedagogy while other experiences ended up in positive pedagogical impact. Lonn and Teasley's (2009) conducted a two-year longitudinal study focusing on efficient or interactive teaching and learning practices at one

large American university with the LMS system of Sakai. The results indicate that teachers perceive LMS relatively valuable for teaching and learning activities.

Chang (2008) implies that faculty perceive LMS design did not consider pedagogy which resulted in lack of support in their teaching practice. Weaver, Spratt and Nair's (2008) survey study reveals that academic staff gained negative experience with the LMS of WebCT. For instance, they encountered large amount of software problems and using technology increased their workload because they have to learn about the LMS on their own or from external support.

In the investigation of the LMS Fronter, Hustad and Arntzen (2013) found out that teachers generally found the LMS to be a helpful and efficient tool as it centralized information in one place. Most of the teachers did regard the Fronter LMS as an infrastructure in university that has potential for pedagogy.

The studies on experiences with using LMS mainly summarize teachers' experiences in pedagogical use at institutional level. The conclusions on experiences could be clustered according to Ellis, Steed and Applebee's (2006) four approaches to design based on teacher's corresponding experiences. That is, experience of teaching and learning is reshaped by the use of LMS (Yueh & Hsu, 2008), teaching and learning is influenced (Morgan, 2003; Lonn & Teasley, 2009), teaching and learning is overwhelmed (Chang, 2008; Weaver, Spratt, & Nair, 2008), and teaching and learning is unrelated to LMS use (Hustad & Arntzen, 2013). There have been no studies have linked the individual teacher's pedagogical use experience back to the approach to design and to the conception of LMS.

2.4 Analytical Framework

The analytical framework was formed based on both theoretical resources and results from previous empirical research. Three concepts that pertains to the discussion earlier in this chapter have been used for the formation of analytical framework. The first concept is *assemblage*. This concept essentially refers to the phenomena in educational practice whereby human and more-than-human forces are braided together in particular situations. The reason behind employing of this concept is that it helps in understanding how teachers develop design comprehensively with LMS and how they enact design inseparably with LMS. Moreover, the concept of *assemblage* also indicates that sophisticated technology is also composed of human and more-than-human elements, which provides the sociomaterial lens to understand LMS as a multidimensional entity. The second concept used for analysis

is *mediation*, which substantially refers to people's formulation of interventions for concerning purposes with the help of tools. Since pedagogical design is the educational practice that models teaching and learning activities, *mediation* could also serve to explain how LMS is conceived as tool for interventions and how the teachers approach design by modelling certain pedagogical interventions with LMS. The third concept is the sociomaterial *bricolage*, which implies that, in some local contexts, workers' practices emerge with whatever tools are available to them. Thus, certain unplanned approaches that happened in teachers' design work can be recognized and interpreted by employing these analytical concepts. The literature review outcomes provide an additional basis for developing the current analytical framework.

The whole framework is structured with respect to each sub-question, within which certain categories are provided to identify and analyze the specific aspects of the phenomenon. Thus, detailed justification and explanation of the analytical framework will be presented in each aspect as below.

2.4.1 Conceptions of LMS

Under the aspect of conception of educational technologies, the concept of *assemblage* has been used to inform the new category: one-stop hub that encompasses all the tools, which is lately combined with the categories found in the reviewed empirical studies. In the studies of Ellis et al., (2009), González, (2010), and Lameras et al., (2012), technologies are described as tools to deliver information, ways of building knowledge through activities like communication and collaboration, and tools for students to access to and explore in broader range of learning materials. In line with Lameras, Paraskakis, and Levy (2008), Lameras et al., (2012) emphasizes the role of LMS in clarification and application of the subject concepts, which fits Karpov and Haywood's (1998) concept of *cognitive mediation*. Thus, this category is augmented with the parallel concept of *metacognitive mediation*, which is also put forward by Karpov and Haywood (1998).

Table 1: Categories of conception of LMS as educational technology

Conceptions of LMS	tools to store and present information
	tools to organize activities like communications and collaborations
	tools to expand students learning space
	tools to clarify and apply concepts and develop metacognitive skills
	one-stop hub that encompasses certain tools

Table 1 summarizes all the categories regarding conception of LMS based on insights from both theoretical and empirical literature review. With regard to this subquestion, the teachers may mainly conceive LMS as the information container, or as the digital tool that helps the organization of educational interactions, or as the tool that provides access to learning activities that could not be enabled without the digital platform. Sometimes, the teachers might primarily recognize LMS's role of enabling learners to acquire domain knowledge and develop skills to direct their own learning. In certain cases, the teachers might conceptualize LMS as the combination of a range of sub-tools.

2.4.2   Approach to pedagogical design with LMS

As stated in Chapter 1, this aspect is primarily concerned with how LMS is incorporated into pedagogical design during the process. Under the aspect of design approaches with Canvas, the concepts, *assemblage*, *mediation*, and *bricolage*, have also been used to uncover how teachers conduct the pedagogical design with LMS.

Informed by the concept of *assemblage*, the category that teachers perform the pedagogical design work by assembling LMS with all the content of design work could become identifiable. This category describes the approach that teachers profoundly take LMS into consideration during the design process and for the enactment of design output. Informed by the concept of *mediation*, the category might be recognizable that teachers intentionally change their pedagogical designs with LMS for some particular purposes. This category depicts the approach that teachers proactively modify their pedagogical designs with the existence of LMS to achieve set goals. Informed by the concept of *bricolage*, the category that teachers incidentally modify their pedagogical design with the existence of LMS might become analytical. This category discloses the approach that teachers adjust their pedagogical designs with LMS unintentionally. Another possible category is that the teachers approach to pedagogical design without considering LMS. The possible approaches are summarized in Table 2 as below.

Table 2: Categories of approach to pedagogical design with LMS

Approach to pedagogical design	comprehensively integrate LMS with pedagogical design
	proactively modify pedagogical design with LMS
	reactively adjust pedagogical design with LMS
	fill pre-existing pedagogical design into LMS

2.4.3 Experience of using LMS in teaching and learning

Under the aspect of teachers' experience of teaching and learning with LMS, this study adapted Ellis, Steed and Applebee's (2006) categorization of design approach with learning technologies to examine individual teachers' experiences of enacting pedagogical design with Canvas.

Approach to design that reshapes, influences, overwhelms, or is unrelated to teacher's experience of using learning technologies fall under Ellis, Steed and Applebee's (2006) original four categories. Since the word "influence" could be both positive and negative, it is somehow overlapped with "reshape" and "overwhelm". Thus, for this study, I substituted the word "enhance" for "influence" to imply that the teacher's experience is partly improved when the teacher enacts the pedagogical design with LMS in practice. Concretely, experiences of teaching and learning with LMS in the current study can be identified and grouped into four kinds: 1) experience of teaching and learning is unrelated to the use of Canvas; 2) experience of teaching and learning becomes worse with the use of Canvas; 3) experience of teaching and learning partly becomes better; 4) experience of teaching and learning is extensively upgraded when they enact the pedagogical design with Canvas. Table 3 offers the summary of categories regarding teachers' experiences of teaching and learning with LMS.

Table 3: Categories of experience of teaching and learning with LMS

	unrelated to the use of LMS
Experience of teaching and learning is	overwhelmed with the use of LMS
	enhanced with the use of LMS
	reshaped with the use of LMS

2.5 Summary of this Chapter

This chapter presented the discussion of terminology regarding design work, thereby the term "pedagogical design" is chosen to clarify the processes examined in this study. Pedagogical design refers to the process in which the teachers configure and enact the artifact of structured tasks, learning materials and spaces, and social organizations after considerations in a particular course.

Sociomaterial and sociocultural perspectives are used as relevant conceptual resources to understand and explain the design work with tools. The former perspective provides the concepts of assemblage, performativity, and bricolage, which emphasize the importance of recognizing the sociomateriality in technology-enriched educational environment. The

latter perspective provides the concept of *mediation*, which emphasizes the importance of teachers' meaningful interventions that structured with help of the digital tool in local sociocultural contexts.

Furthermore, an existing body of knowledge is captured by an empirical literature review. It provides insight into knowledge about the practice of pedagogical design work with technology, which also informs that the conception of digital technologies, approach to design, and the experience of teaching and learning with LMS are three key aspects to answer the research question. Several missing pieces are identified in the field of study: little is known about how teachers approach pedagogical design with the presence of LMS; there has been little exploratory and discussion about teachers' design work with LMS in an integrative view; no previous empirical study has investigated the pedagogical use of the Canvas LMS system. Finally, the theoretical and empirical resources lead to the formulation of analytical framework for this study. The framework is structured with respect to the three aspects of design work. Under each aspect, certain categories are framed to uncover and analyze the data. The choices in theory and the knowledge from review build the frame for both the methodology and data analysis.

3 Methods

This section presents the research design and methods, after which it outlines the empirical context and selection of participants. The procedures of data collection and analysis are also presented and explained here. Lastly, this section further addresses concern of the quality of this study.

3.1 Research Design

Research design is the logical plan that links the empirical data to be collected to the initial research question of the study (Yin, 2017). The overarching research question focuses on a "how" issue that is not easy to measure, and which requires an extensive and in-depth investigation of a contemporary and complex phenomenon. The substance of the research problem informs that this study is concerned with the underlying qualitative dimensions of the phenomenon, rather than the quantity of the certain phenomenon. Whereas quantitative research emphasizes demonstrating the phenomenon by collecting and analyzing numeric data of particular behaviors that humans undertake, qualitative research focuses on helping researchers to understand *how* and *why* such behaviors take place (Bryman, 2016). Bryman (2016) asserts that social research subjects, people, are capable of attributing meaning to their particular experiences, and the social world must be interpreted from the perspective of the people being studied through their participations in the research. The emphasis and strength of qualitative research is its ability to provide detailed individual interpretations of how participant experience a given research issue, which can enable the development of understanding through participants' thoughts and feelings of what is going on (Bazeley, 2013; Mack et al., 2005; Patton, 2002). Based on insights gained from the extensive literature review, this study seeks to examine teachers' pedagogical design work with LMS by looking into the three aspects of what they think of LMS, the way they approach the design, and their experience of enacting the design with LMS towards a integrative view. The complexity of the phenomenon requires the in-depth investigation to gain meaningful information about human opinions, actions, and feelings at the same time. Thus, the qualitative research approach is adopted, as the best suitable approach that allows individual's open-ended and detail-oriented accounts for their behaviors of a given issue.

This study entails an interview approach to examine teachers' pedagogical design, and is chosen for several reasons. First of all, interview studies help researchers directly access the thoughts and feelings of participants, by which data about the conception of LMS and experience with LMS could be gathered. When it comes to gather data regarding the approach to design that characterizes teachers' design work, interviews also helps in coping with the challenges due to the unique and complex nature of pedagogical design work. As pointed in Chapter 2, pedagogical design work is implicit and improvisational in its nature. In other words, teachers' design actions is mainly undertaken without being directly expressed or documented; also, the place and time to undertake design work are usually subject to teachers' availability and inspirations. It is rather difficult to obtain information about design actions through other qualitative research methods such as observation and document analysis. However, this obstacle can be overcome by letting participants recall and describe their design actions in interviews.

Considering practical issues such as timeframe and accessibility, this study uses a convenience sample, in which participants are a group of teachers who work with Canvas in the university as author attends. As Sandnes and colleagues (2007) emphasized in their empirical study, LMS is primarily employed at institutional level according to local conditions. Thereby, the convenience sampling approach adopted in this interview investigation is not only acceptable but also actually ideal, because it also minimizes the institutional impacts in the empirical context, namely, institutional ICT strategy, the choice of LMS, and the deployment of the LMS.

3.1.1 Research method

More specifically, the method of combining stimulated recall with a semi-structured interview is adopted for this interview study. Primarily, the semi-structured interview as one of the most widely used qualitative research method is considered for making the implicit work explicit by taking participants' descriptions and interpretations into account. Moreover, semi-structured interview will be preferred when more than one person would carry out the fieldwork with a clear intention (Bryman, 2016), which fits the joint data collection situation that would be explained later. Finally, yet importantly, semi-structured interview ensures the flexibility for interviewers and interviewees to construct the knowledge of pedagogical design work with LMS together.

Based on the insights gained in the review of empirical study, simulated recall approach could be helpful to improve quality of data collected in interview investigation.

Stimulated recall has widely been employed in a number of different forms in educational research, generally involving the replay of audio or/and visual materials with regard to the phenomenon under investigation (Lyle, 2003). Lyle (2003) states that stimulated recall is valuable for investigating implicit work, however, with two main limitations. That is, when employing stimulated recall approach, on one hand, there might be some incursions into tacit knowledge or secondary ordering of cognitions; on the other hand, recording certain social phenomenon might contaminate its proceeding in natural settings (Lyle, 2003). For the former, there is no better solution to generate the data necessary for this investigation. For the latter, this study chooses not to record the design process but provide the used output of design work, the screenshots of the chosen course environment in Canvas, as the recall stimulus for participants. Thereby, the method of semi-structured interview based on stimulated recall is applied to attain verbal accounts on teacher's pedagogical design work with LMS in the given situation as authentically as possible. Moreover, screenshots of the teachers' developed course design are used as stimulus to elicit more insights from participants while maintaining the benefits of naturalistic context.

3.2 Empirical Context

The current study was conducted in University of Oslo. As a campus-based university, UiO offers approximately 200 face-to-face study programs in a broad range of disciplines mainly at bachelor and master level. The academic employees in UiO take the responsibility for the courses pertaining to each study program. In order to develop teaching-related work, UiO offers training program for academic staff ("University Pedagogy", 2019). It is obligatory for fulltime employees with teaching duties to attend the university's pedagogy course for the development of their teaching competences and pedagogical skills. In 2017, the university board created Centre for Learning, Innovation & Academic Development (hereafter called LINK) to assist the institutional digitization of teaching and learning, which is also responsible for Canvas adoption and deployment issues ("About LINK", 2018). UiO conducted a pilot with Canvas LMS over the spring semester in 2018. Before the pilot semester, the five departments at UiO whose needs were not met by previous LMS service have already used Canvas system from local supplier ("Oversikt over systemer", 2018). From the autumn semester in 2018, UiO endorses Canvas as entry-point digital technology for the whole university. More accurately, Canvas platform is a part of UiO's

digital learning environment that might be adopted in parallel with other educational technologies.

Apart from information about teachers' general working conditions in UiO, this study also requires information about the material structure of the endorsed Canvas LMS. The introduction about Canvas contains the overview of Canvas platform, the single course environment, and the backward working environment for teachers. Figure 1 shows the overview of platform environment in Canvas. There is a global navigation menu located on the left side of every page for users, which provides default links to customize LMS at personal level, to access course environment, to know upcoming events, to view internal messages, etc. Only the course stakeholders can access a particular course environment, such as the responsible teachers, enrolled students, supportive administration or IT staff. In addition, there is a mobile phone application version of Canvas for both teachers and students, which has a simplified interface with less features compared to the browser version of Canvas.
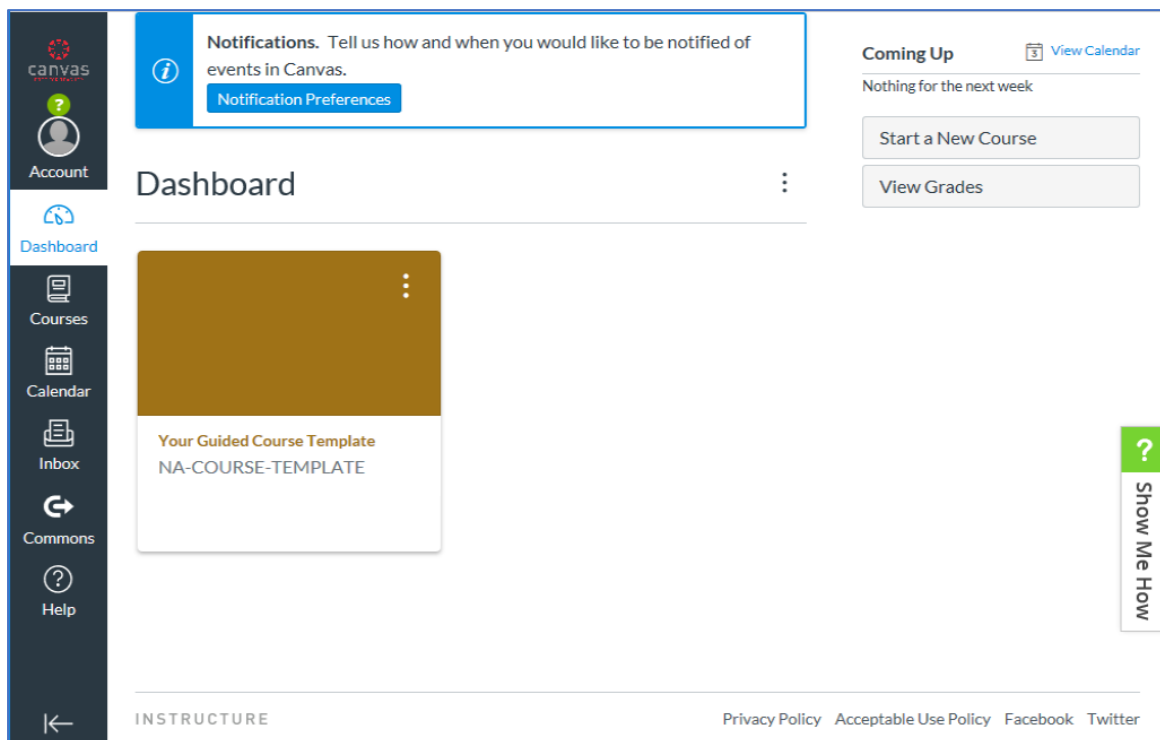
Figure 1. Overview of platform environment in Canvas

When the users enter into the course environment in Canvas, there is an internal navigation menu located on the left side of every page in course environment (see Figure 2). The course internal navigation menu consists of the default features and the chosen features for this course. There are a wide range of features embedded in the Canvas platform,

for instance, features that support interactions like chat, collaboration, discussion, rubrics, and features that support the management of the course like analytics, calendar and so on.
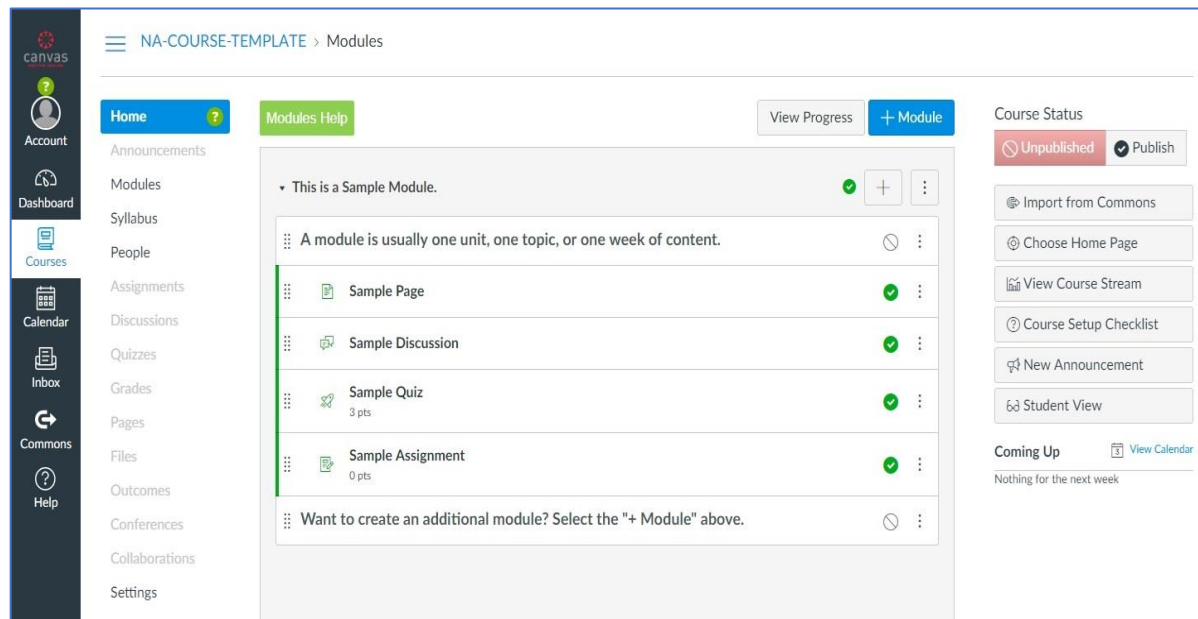
Figure 2. Overview of course environment in Canvas

Once the teacher uses certain features, the tab of the feature will appear in the course navigation menu. However, the teacher can choose to reorder or hide any of these tabs. Meanwhile, Canvas provides the "modular" structure for each course. As illustrated in Figure 2, a module represents one part of the course, which can be structured by teachers with respects to course content, timeframe, or certain pedagogical activities. Each course environment at least encompasses one module, in which learning material, pedagogical task, or certain free for use features of Canvas are presented. The backward working environment for teachers is different from the course environment for the other users. However, there is the possibility in Canvas for teachers to view the course environment from student's perspective before they publish certain modules of or all parts of the course.
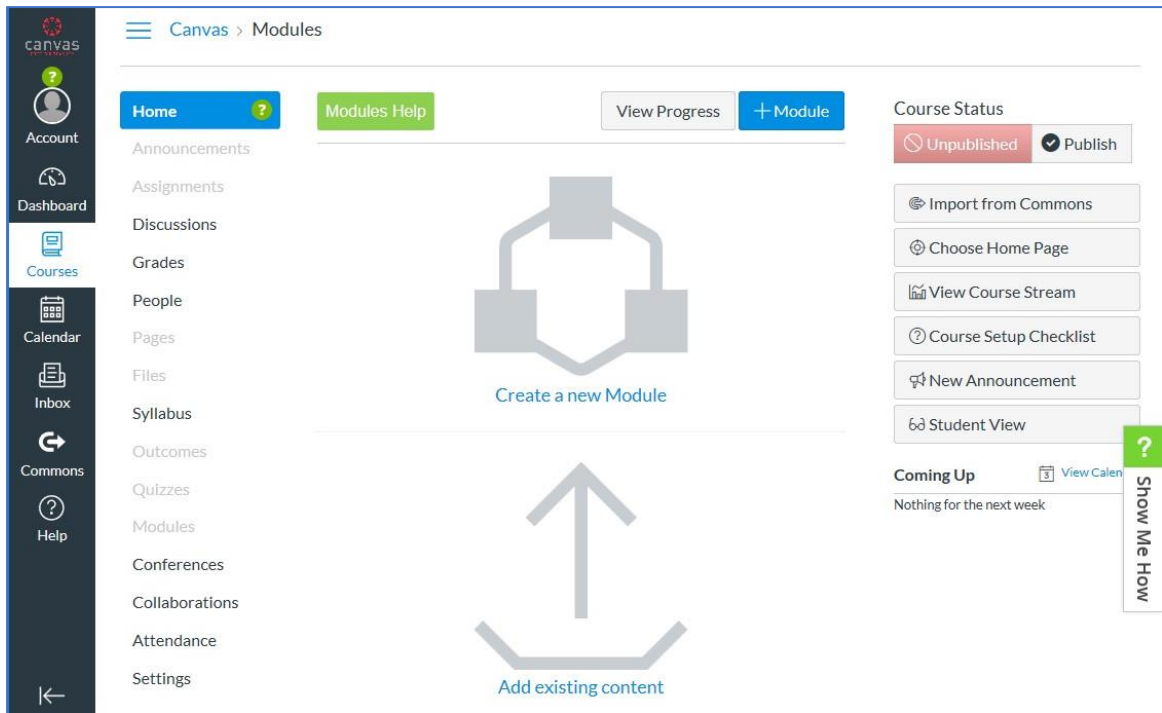
Figure 3. Overview of the working environment for creating a course
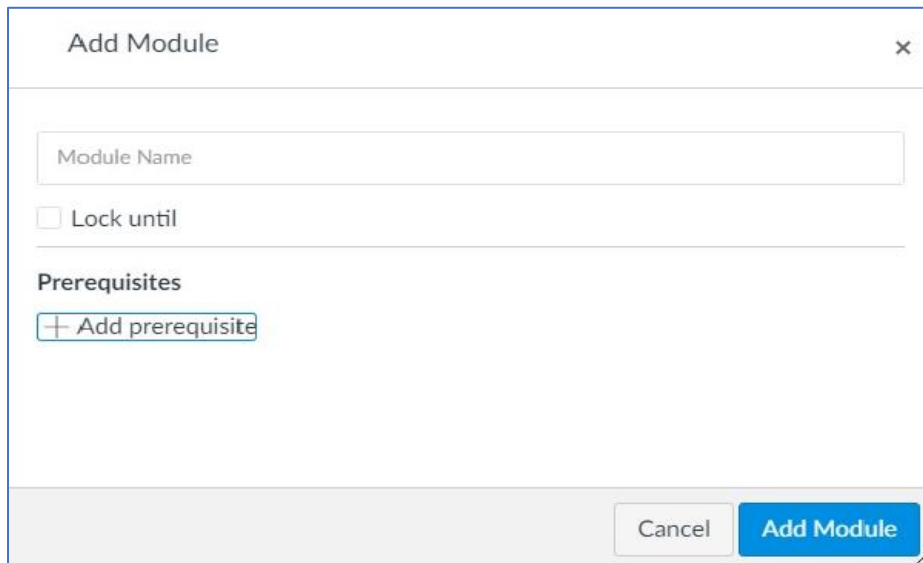
Figure 4. Overview of the working environment for creating a module
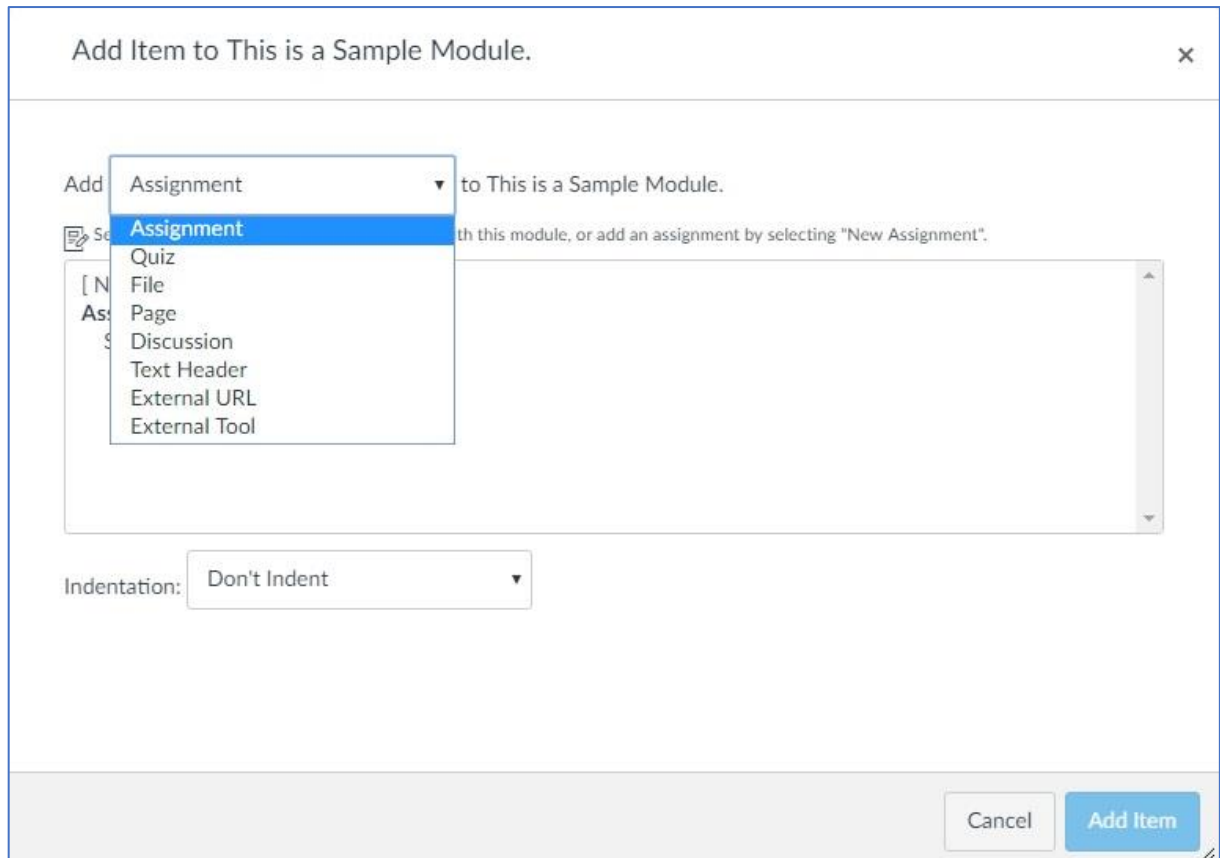
Figure 5. Overview of the working environment for editing a module

For this study, it is also necessary to see what the teachers' course design environment looks like and how design work flows in Canvas. As exemplified in Figure 3, 4 and 5, after the teacher creates the course, the work for setting up the course environment in Canvas mandatorily starts with adding a module. Yet, the teachers can import pre-existing templates or materials in the recognizable format for Canvas into this course. After the module is added into the course, teachers can compose the features, external resources, and self-generated texts into the specific module. Moreover, the teachers can decide when to publish one module, for example, before the whole course commences or when the course is ongoing. The home page of course environment in Canvas can be presented in three ways: a front page created by the teacher, certain chosen modules of the course, all the pages of the course. Nevertheless, it is up to the teachers how to present the course environment to the other users.

Above are the grounding conditions under which the research subject deals with. The description of empirical context not only provides a detailed account of the LMS setting, also benefits the design of this study in term of participants' selection and the understanding of the phenomenon.

3.2.1 Participants

This study seeks out to investigate how teachers undertake pedagogical design work when LMS endorsed as the primary entry point to educational technology. Thus, the participants are expected to be experienced LMS users, who design and teach the same course for a whole semester after Canvas pilot at UiO. The list of all the teachers who participated in Canvas pilots or shared their experiences of using Canvas in UiO's Canvas use workshop are posted on the webpage of LINK. These lists were used to approach to potential participants.

The actual participants are voluntary teachers and were recruited via an email invitation (see Appendix 2), mediated by the main supervisor. The teachers who showed their willingness to participate in this research project were then approached. After excluding the teachers who did not involve in either the pedagogical design with Canvas or the enactment of the pedagogical design with Canvas for the same course, 17 teachers took part in the research project of pedagogical use of Canvas. Three out of the 17 teachers chose to be interviewed in Norwegian.

After the data collection, 14 participants of the research project were selected purposely for this study for several reasons. The three interviewees who chose to be interviewed in Norwegian were not included in the current study. First reason for this decision is to avoid the unnecessary repetition of course discipline since two out of the three teachers teach the course in the discipline of educational sciences and one of them even teaches in the same course with one participant selected in this study. Another reason is the time constrains and the willingness to keep clear of the language translation issue. Meanwhile, considering the saturation of interview data, usually, 12 to 14 interviews are enough to reach data saturation from relatively homogenous context for an interview study (Guest, Bunce, & Johnson 2006; Hagaman & Wutich, 2017). On this point, 14 participants were sufficient to provide rich and meaningful insights for this interview investigation. The demographic information and course information of all the 14 participants are summarized in Table 4.

Table 4: Overview of teachers' demographic information and course information

Name	Gender	Teaching experience	Course discipline	Course level	Number of students	Remarks
P1	Female	8 years	Educational Sciences	Bachelor	200	Part-time students
P2	Female	3 years	Modern Language	/	7-17	Students at all level
P3	Male	23 years	Life Science	Bachelor	60-70	
P4	Female	5 years	Culture, History, Literature	Bachelor	18	Optional course
P5	Male	13 years	Anthropology	Bachelor	60-80	
P6	Female	21 years	Culture, History, Literature	Bachelor	15	
P7	Female	26 years	Philosophy	Bachelor	70-100	
P8	Female	18 years	Culture, History, Literature	Bachelor	100	
P9	Male	25 years	Musicology	Bachelor	60	
P10	Male	42 years	Computer Science	Bachelor	200	
P11	Female	23 years	Health Care	Master	15-30	
P12	Male	9 years	Innovation study	Master	25	Interdisciplinary course
P13	Male	20 years	Educational Sciences	Master	15-20	
P14	Male	26 years	Modern Language	Bachelor	100	

These 14 participants all had been using Canvas from the spring semester of 2018. They were asked to choose one course they teach as the focus of interview conversation. Most of them have taught the chosen course with Canvas in the face-to-face context for one or two times. They have a range of teaching experiences in higher education institutions from three years to forty-two years. Except for P12, all teachers have attended course of pedagogy such as the university mandatory course for permanent employees. The courses that they share their experiences about in this study not only cover all the hard-pure, hard-applied, soft-pure, soft-applied disciplines according to Becher's (1994) classification system but also provide variations in course level, course size, and course modality.

3.3 Data Collection

3.3.1 Interview guide, pilot interview, and training

The interview data was collected with a prepared interview guide. As Kvale and Brinkmann (2009) pointed, the interview guide for the semi-structured type of interview

includes questions on certain topics for producing knowledge and leaving spaces for interviewers and interviewees to step forward or open up new directions. The questions in the interview guide were created along three dimensions. Firstly, a part of the questions stemmed from the review of empirical literature. Some of the questions derived from the experience on modeling the course design process in Canvas platform. The last group of questions were generated based on the theoretical sources. The interview guide has been reviewed by the two supervisors and peer-reviewed by the collaborating student. The interview guide (see Appendix 1) consists of four clusters of questions: the background questions, questions on conception, approach to design, and experience of use. There is a certain amount of order both among all the parts and within each topic. The order is established according to the complexity of questions.

The data collection was conducted by two students undertaking their master thesis work, who developed the instrument and collected the data together, but each analyzed and reported separately. With the help of the administration of Canvas, the two interviewers got access to and took screenshots of the particular course in Canvas environment that teachers chose as the focus for interview. Then, the two interviewers organized the joint data collection collaboratively. Since qualitative data collection takes skills not only knowledge (Patton, 2002), the two interviewers carried out trial interviews twice before stepping out into the field.

Prior to undertaking the joint data collection, two interviewers conducted a pilot interview to practice the interview skills, try out the interview guide, and get familiar with how to set the interview stage. For the purpose of insuring teachers with lesser pedagogical knowledge could understand the questions, interviewers chose to run the pilot interview with a novice teacher who has not received any pedagogic training. After the pilot, the interviewee was invited to read through the interview guide and identify misinterpretations. Later, the interviewers prepared how to reword some of the questions in the interview guide based on the pilot experience. Since the interview guide was edited after pilot, the pilot interview was not included into the final data set.

The interviewers also received training from their supervisor to model how to cope with different challenges in the interviews like when should the interviewer change the sequence and form of questions, how to direct, follow up, and probe questions etc. Both pilot interview and training interview help interviewers build up self-confidence by enriching their experiences and enhancing their interview craftsmanship.

3.3.2 Data collection process

The interviews were conducted in the period of February 2019 to March 2019. Each interview took place in either the participant's office or meeting room. The participants were mainly interviewed in the two-on-one setting. The two interviewers took turns to be the main interviewer or co-interviewer in each interview. Both of the interviewers could follow up or probe questions in order to gain the benefit of the different perspectives of more than one collector. The interviewers brought a laptop containing screenshots to each interview as prompts to elicit data. In fact, many participants spontaneously logged into Canvas when s/he was interpreting her or his cognitive process and experience.

The author also managed to take field notes in shorthand during the interviews since nonverbal cues may not be adequately captured through the audio-recording conversation. The field notes were comprised of everything was worth noting, such as unique answers, emphasized sayings, which webpage was mentioned at that specific scene in each interview. The field notes were not analyzed in this study rather provide situational information on context for accurate transcription.

All interviews were recorded by two digital audio recorders. The duration of the interviews varies from 40 to 90 minutes. In order to encourage the participants to share their experiences and insights freely, the interviewers would give a brief introduction about themselves, then explain the research aims and the consent form. The interviews were conducted in English with a few exception of times when some interviewees mentioned some words in Norwegian regarding features in Canvas since Norwegian was set as the default language in their Canvas platform. These responses were translated into English by the author who took the Norwegian level B1 (intermediate) course and passed the exam. The interviews were transcribed verbatim. The ethical issues are explained later in this chapter.

3.4 Data Analysis

3.4.1 Analysis approach

In this inquiry, the author worked back and forth several times with different techniques to excavate the critical findings from the large amount of raw data, which ended up carrying out a three-stage analysis approach following a thematic analysis approach. To quote Patton (2002), "Qualitative analysis transforms data into findings. No formula exists for that transformation. Guidance, yes. But no recipe. Direction can and will be offered, but

the final destination remains unique for each inquirer, known only when—and if—arrived at" (p.432).

According to Fereday and Muir-Cochrane, (2006), there is hybrid thematic analysis approach in qualitative research. Patton (2002) sees inductive analysis as an approach that generates new explanations and concepts while deductive analysis supports existing conceptualization and results, and the hybrid analysis approach combines both of inductive and deductive analysis to look for overarching interpretations. Fereday and Muir-Cochrane, (2006) suggest that analysts should capture the overarching themes of the findings by working back and forth between data-driven codes and theory-driven ones. Since this study tries to generate new insights based on previous empirical evidences through the lens of a theoretical perspective that rarely employed before, the hybrid thematic analysis approach seems to the best choice for data analysis.

Moreover, Bazeley (2013) reminds the qualitative analysts that, using computer or pencil-and-paper, each approach has its own advantages. Using computer to support analysis allows the flexibility of sorting and convenience of tracing back while using pencil-and-paper makes it possible to see in one place all the data pertaining to certain themes and easier to connect and reflect (Bazeley, 2013). Thus, the three-stage analysis for this study was carried out both on paper and on computer screen.

3.4.2 Analysis process and the use of the analytical framework

The first stage analysis was conducted inductively on the computer, since induction is the core of qualitative reasoning (Patton, 2002). Then, the second stage analysis was conducted deductively to look for the concepts and results from the review of previous studies with printed transcripts and pen. After these two stages, the ultimate analytical framework is established to structure thinking. Finally, all interviews are gone through again on the computer to ensure that the whole data set is thoroughly analyzed by the overarching framework.

The entire data analysis process proceeded iteratively and reflexively although presented as a linear procedure. Before embarking on formal analysis, the author read through all the field notes and screenshots while listening to the corresponding recordings for getting familiar with the raw data and capturing a vague and intuitive understanding of the data set as a whole. All interviews then were transcribed verbatim from oral into written form on computer by the author. The false starts, repetition of words, and laughter were also transcribed. The transcription of the interview conversation took a large amount of

time and effort, since the author had to replay the respective responses in the recordings multiple times until every word had been transcribed. The transcription ended up in transcripts of 88775 words.

Once the transcription was finalized, the formal analysis began. The analytical framework was used as the reference for comparing and contrasting data throughout the analysis process. The whole data set was broken down into to details by coding. The codes are segments of transcripts, which are responsive to the research questions and named with a summative description of its content. The interview transcripts were highlighted in different colors with regard to distinctive topics. The author chose to highlight codes relevant to conception of LMS, design experience, experience of teaching and learning with LMS, and other meaningful information respectively in red, green, blue and purple. Each code was labeled with the brief description via the "comment" feature in Microsoft Word. After coding two interviews, the author sent the transcripts with codes to two supervisors for feedback on coding scheme and analysis approach. The supervisors reminded the author sometimes one code could be relevant to different subquestions so that researcher has to be open minded for alternative interpretations. The suggestions were applied to the whole process of analysis.

With the help of analytical framework, codes were identified and interrogated retaining the original meaning. Through this systematic thinking, the data were reduced by discarding irrelevant information. The codebook was also being used to store and manage the codes in more manageable portions during the analysis process (Bazeley, 2013). Especially in this case, the author needed to record emergent codes from the fourteen interview transcripts. In the tables of codebook, each row represented each interviewee while each column is a distinctive analytic aspect (such as, background information, design experience, etc.). The codes were distributed into codebook manually by cutting and pasting different quotes with labels into tables in Microsoft Word. By doing this, it allowed easy summarizing, cross-classification, and comparisons of codes. The author contiguously organized and reorganized the codes until they properly fit one or more than one category. The codebooks of the inductive and deductive analyses were reviewed and refined to further shape the analytical framework for final analysis. In order to make sure the raw data were appropriately interpreted through the analytical framework, the draft of findings was also sent to supervisors for peer-review. Upon supervisors' feedback, the author sharpened the systematic codes to contrast and interpret data. In the last codebook version, a number of additional categories added during analysis when codes did not fit well in the existing

ones. Thus, developing the codebooks helps in identifying and legitimating the final themes in this study. Working back and forth between the tables of the codebook and the data, the author finally reached an overarching analysis across all the interviews.

3.5 Ensuring the Research Quality

3.5.1 Research ethics and ethical concerns

This study followed the research ethics guidelines for social science, as formulated by the Norwegian Social Science Data Services (NSD) and General Data Protection Regulation (GDPR). The research project received ethical approval (see Appendix 5) from NSD for the data collection and management strategies used in this study.

Ethical concerns at Kvale and Brinkmann's (2009) seven stages of interview investigation are also taken into consideration from the very start to the end of this interview inquiry:

1. Thematizing: Despite of scientific value of the knowledge sought, the purpose of this interview study was considered with regard to improvement of teachers' educational practice with LMS.

2. Designing: The consent form was prepared before the recruitment of participants. Once participants replies with willingness to participate, they received follow-up invitation (see Appendix 3) and the consent form (see Appendix 4) that talking about how they would involve in the project and interview and how this study secured their right and privacy. The privacy issues in this study was dealt with as stated in the detailed consent form.

3. Interviewing: The involvement of participants is encouraged throughout the whole data collection process. From the first time the participants receiving the email of invitation letter, they were informed about the research purposes, phenomenon the researchers interest in, the research questions in their theses. Participants have signed the consent form before the formal data collection. The interviewers also asked for oral consent from participant every time they turn on the audio recorders. In the interviews, the two interviewers adapted to each participant's narrative style to ensure their involvement. Before the end of the interview, each participant was encouraged to add comments and to feel free to contact the researchers later in case of need.

4. Transcribing: All the data and related information was stored in author's encrypted remote desktop of UiO. The name and contact details were stored separately from the rest of the collected data. When the recordings were transferred from the recorder into author's remote desktop in the university cloud, the files were named by pseudonyms. The transcripts contained all the conversations and referent or silent details like "pointing to the screen" in brackets.

5. Analysis: In order to enrich and deepen the meaning of interviewees' words in a coherent and creative way, the author analyzed the whole data set forward and backward with different approaches and techniques.

6. Verification: The two interviewer followed up and clarified the meanings of the answers with the saying of "If we didn't misunderstand, you mean…". Thereby, they could validate their interpretations with interviewees during the course of the interview.

7. Reporting: The course name and participants identical information were blurred for anonymity. The story told to the readers is in line with the initial stories told by the interviewees.

3.5.2 Validity, reliability, and generalizability

Validity, reliability, and generalizability are usually the three salient pillars to ensuring the quality in qualitative research. For interview inquiry, Kvale and Brinkmann (2009) discuss the validity and reliability of interview knowledge and the generalizability of interview study. According to Kvale and Brinkmann (2009), validity concerns the appropriateness of the research design while reliability refers to reproducibility and trustworthiness of the study, and generalizability is about the consistency of findings across different settings and times as the outcome of the validity and reliability of the study.

For increasing the reliability, on one hand, the procedures in this study and how the author engages in these procedures are explained. After the transparency of the study is addressed, it increases the availability of repeating this inquiry. In order to ensure the consistency of this study, the author firstly explains and follows the ethical guidelines through the whole inquiry. Moreover, the author explores the research issue extensively in the conceptual, theoretical, and empirical research literature. Thereby, this study is guided through two different but complementary theoretical perspectives, which means theory triangulation was applied (Patton, 2002). With the help of the interview guide, the course of each interview was structured more or less tightly in the joint data collection. In addition,

the interview data was analyzed inductively and deductively in both physical and digital settings to increase trustworthiness of the findings.

When it comes to validity, many efforts were put into this inquiry from the beginning to the end. As pointed Patton (2002), the appropriateness of qualitative methods largely relies on the skill and rigor of the person doing fieldwork, so as the validity of interview study depends on the craftsmanship of the interviewer. As a novice researcher, the author engages in research design, data collection, and consequent analysis upon two supervisors' refined advices. Then, the author justifies all the choices made for conducting this interview study. Benefiting from the joint collection, the interview guide has been developed with the peer-student, and the interviews were undertaken in the two-interviewers setting to eliminate the datas' potential biases and inadequacy. In other words, research triangulation was applied through all the process of data collection and analyses. In the text of findings chapter, supporting extracts are included from all participants to validate the results of this study.

Regarding generalizability, Kvale and Brinkmann (2009) suggest the researchers to think about "how can one generalize" (p. 262). As an interview study with 14 teachers in a large comprehensive university with a prevalent LMS platform through multiple theoretical lenses, it seems to be problematic to anticipate findings from this study would be valid for all places and times. However, based on analysis of commonalities and dissimilarities of the distinctive situations, the findings of this study can be used as a guide to understand what may occur in other situations. The rich descriptions of the empirical context, interview process, and the procedures of interview analysis in this chapter lay the foundations for analytical generalization (Kvale & Brinkmann, 2009).

4 Findings

This chapter contains the findings from the thematic analysis, which are presented in two layers (sections 4.1 to 4.4). The first layer consists of the first three sections (sections 4.1 to 4.3), in which findings are organized to answer back respectively to subquestions: conception of LMS, approach to design, and experience of teaching and learning with LMS. The second layer is the last section (section 4.4), in which findings are organized to answer back to the overarching research question on how teachers develop pedagogical design with LMS towards an integrative view. Each section in first layer is composed of an introduction and several categories with extracts that best represent the meaning of the category. The section in the second layer is made up of one subsection of the overview of individual teacher's design work with LMS and another subsection that illustrates the pathways of how teachers undertake their pedagogical design with LMS.

4.1 Conceptions of LMS such as Canvas

With regard to conception, participants were asked questions like "value about educational technologies or how technologies can enable teaching and learning". Five qualitatively distinctive categories of conceptions are identified in the data set. Four out of them were predetermined in the analytical framework. The names of the second and third category (in subsections 4.2.2 and 4.2.3) are tweaked due to the augmented contents derived from analysis. One category emerged during the analysis whereas one predetermined category was not recognized in this data set. The categories in this section are presented as in the order of complexity.

4.1.1   Tool to store and present information

In response to questions regarding conception, all the teachers stated that LMS could work *as a container to save and transfer information*. However, some conceive LMS only as the container while others view LMS more than just a container.

In interview, all teachers mentioned respectively that LMS is the tool to store and pass out the information about the ongoing course.

It's a useful tool for putting materials. (Participant 4, Culture History Literature)

It's just a practical tool. You know, you have the lists and you can just put the papers in Canvas instead of handing it out, for me. (Participant 6, Culture History Literature)

All participants view LMS as the tool to store and present multiple course materials for the course including syllabus, slides, recordings of lectures, or practical information, etc. However, Participant 6 emphasized that s/he only conceives LMS as the information container in her later expression.

I don't think it (LMS)'s very important. It's just a plain place to put the syllabus and messages. But for teaching, it has no value at all. So the education which is face-to-face is more important. (Participant 6, Culture History Literature)

In the first category, as the interview extracts above have shown, LMS has been primarily conceptualized *as the tool to store and present information*. At the meantime, there are other ways of conceiving LMS.

4.1.2   Tool to operate the processes of educational practices

Responses in this category show that many teachers also describe technologies as the management tool to organize teaching and learning activities.

Many teachers also mentions that LMS is the tool that enables the pedagogical interactions between teachers and students or among students.

Canvas does open for collaboration. For example, you can use the conference tool. And, you can also do collaborative writing. It can also be used in a simply way where they share something then they comment on each other's work. We did do some peer feedback also on Canvas. So, that is the way to communicate and collaborate through the use of digital tools. (Participant 1, Educational Sciences)

With the help of certain affordances in Canvas, the teachers and students could establish synchronous or asynchronous communications and collaborations, which might enhance exchange of ideas and knowledge co-creation. Despite of online interactions, many of them mentioned that Canvas also empowers them to organize other educational activities.

So, for me, Canvas now is a way to give students information and also to give them exercises that they have to do. (Participant 2, Modern Language)

Now we can use also Canvas for assignments. That, students, they upload their material and we can grade it very easily without ever seeing a piece of paper using this "Speed Grader (a feature in Canvas)". (Participant 3, Life Science)

For instance, the possibilities for students handing in assignments, having them collected, evaluated, and redistributed by teaching assistants. That was possible in Canvas. (Participant 10, Computer Science)

These extracts indicate that, the teachers assume Canvas provides the possibilities to manage other educational activities such as exercise, peer review, and grading with its certain predetermined features like "Speed Grader" and "Assignment".

In the second conception of LMS, teachers indicate that LMS could be the digital tool to organize teaching and learning related activities. Not limited to blended interactions, these activities include also the organization and management of teaching and learning activities such as grouping, exercising, grading etc. Thus, the name of this category is tweaked into LMS as the *tool to operate the processes of educational practices*.

4.1.3 Tool to expand teaching and learning spaces

Based on conceiving LMS as tool of information repository and as tool of digital infrastructure to organize educational activities, responses in this category indicate that many teachers conceive LMS as tools to enrich teachers' teaching and students' learning.

Some teachers emphasize that LMS as a digital tool enables learning activities happing before, during, and after the face-to-face course as many times as they want.

So, the most immediate thing is that this type of platform enables podcast and repetitions. Apart from that, first and foremost, a storage place. (Participant 8, Culture History Literature)

Basically, as soon as we have a digital platform such as Canvas, that gives the students the flexibility to choose when it is best for them to work on certain tasks. (Participant 1, Educational Sciences)

These extracts provide insight into how the teachers conceive Canvas as the online learning platform that broaden student's engagements with flexible and sustained access to learning materials and activities as long as they have internet and terminals such as computers and smart phones. In their eyes, as digital platform, LMS could not only attract part-time students but also increase on-campus students' engagements remotely with certain resources and arrangements in LMS.

In addition, when describing the role of technology such as LMS in their course, some of the teachers expressed how they conceive LMS as the digital tool to enrich their teaching materials, techniques and approaches.

We can distribute materials that are more diverse, like videos and links to other institution's materials. (Participant 3, Life Science)

Digital technologies can help you to vary your teaching so that the students are engaged through different ways of learning. ... Some teachers are just very clever in communicating and engaging their listeners through their performance. I do think also these teachers may expand their repertory by using digital tools, but a non-great teacher will have more immediate uses of them. (Participant 9, Musicology)

Here, as multimedia digital platform, LMS could not only contain resources that are more diverse but also incorporate many ready-to-hand affordances designed for specific teaching techniques. It seems that LMS with its various embedded features has become a part of the teachers' teaching toolkit, which enables the teacher to vary and increase their means of engaging students.

This category of conception associates with LMS's contributions to enrich and hybridize on-campus education and off-campus education. The emphasis here is LMS enables user to achieve additional activities. In this category, teachers recognize LMS as the digital *tool to broaden both teaching and learning spaces*.

4.1.4   Tool to navigate teaching and learning activities

One category of conception emerges from raw data in the current study. This new category is not covered in the analytical framework and reveals that LMS such as Canvas has been seen as the tool to locate and guide student learning or teacher teaching in progress of the course.

When teachers were asked about the role of technology such as LMS in their courses, some teachers articulated that, for them, Canvas is the tool for students' navigation in learning paths in their courses.

To me, it (Canvas)'s more of a tool of making maybe something more accessible, or visualizing some linkages between different parts of the course. (Participant 12, Innovation Study)

So, here the role (of Canvas) is to link the knowledge together to structure the different topics in the course to help the students see how the different seminars related to different topics. (Participant 1, Educational Sciences)

The above extracts provide insights on how some teachers conceive Canvas as the navigational tool. It seems that these teachers believe that the more visibly and dynamically

webpages of the course in Canvas provide the crucial learning map of this course for students, with which students can achieve their learning objectives through their own paths. In other words, Canvas enables the teachers to communicate the focus, connections, and structure of learning arrangements for students through the digital course environment. Under this circumstance, designing the layout of the course webpages in Canvas becomes a part of the workload for pedagogical design work.

Meantime, teachers also perceive the navigational role of in progress of teaching the course.

> *I think there is also an advantage of using that kind of digital tools (Canvas). Because if you do changes, then you see that the changes are not working, then you can change them back. (Participant 14, Modern Language)*

This teacher assumes that Canvas, with its embedded features such as learning analytics or possibilities like following up students' collaborative writing, provides them with useful information to evidence the causalities between his teaching method and student engagement. During the process of enacting the pedagogical design, s/he could manage to update pedagogical arrangements according to the information provided by Canvas. Thus, in their opinion, Canvas could work as a navigational tool for teaching.

Likewise, many teachers report how they use the quiz feature in to navigate both student learning and their teaching process. However, most of them only express this way of using Canvas without articulating it as a conception of Canvas.

> *I used [Another quiz tool] and I also used to quiz in Canvas. And I just went through them in Canvas, then you can see the scores. It's quite easy. So then you can get the feeling of how much they know about what you're going to talk about. ... There are many quizzes in this course. And then they're supposed to use those quizzes to test themselves to find out where they stand. If you go on that quiz here and you get a 100% right, you shouldn't use this semester to work very much on that part. (Participant 9, Musicology)*

For example, the above extract has shown that, through using the "Quiz" feature in Canvas, both teacher and students can better determine their positions with reference to achieve their teaching and learning goals.

In this category, Canvas has been seen as the *navigational tool* that can visualize the overview and interconnections of pedagogical arrangements and can show the directions for upcoming hybrid pedagogical activities. This conception emphasizes that LMS could

function as the specific tool to help the teachers and students walk through the teaching and learning paths more effectively and efficiently.

4.1.5 One-stop platform for integrating sub-tools

In this category of conception, the data indicate that teachers recognize LMS as the one-stop carrier of several digital tools.

In this interview investigation, one of the participants in this study used to employ many discrete digital tools for purposes of communication, peer review, processing assignments before Canvas was introduced into UiO. When describing the design process, s/he referred to his conception of Canvas as below.

> *The main advantage of Canvas is that it combines all into one tool. So we don't have to use three or four other tools. ... So the advantage of Canvas was that it was one tool, sort of, one entry. (Participant 10, Computer Science)*

In his reflection, this teacher acknowledges Canvas as the digital hub encompassing all the previous used tools. Moreover, other teachers have recognized LMS as the one-stop platform with powerful synergy.

> *I think we can use digital technology to engage students. For that, they have to see Canvas room as their place to go, when they work on the subject. So, ideally, I don't want them to have to go outside of Canvas to be able to do all the things that I want them to do for the course. (Participant 7, Philosophy)*

The above extract implies that this teacher not only takes Canvas as the one-point entry of everything and all the activities for the course but also assumes Canvas exceeds the combined contribution of its discrete digital tools to engage students.

In this category, the conception of LMS associates with all the conceptions the implicated teacher has held, not all the conceptions presented before in 4.1. Concretely, teachers conceptualize LMS as *the one-stop platform encompassing a range of sub-tools*, which even has the superior assembly effect of integrating the discrete sub-tools.

4.1.6 <u>Not</u> the tool to clarify concepts or develop metacognitive skills

This category of conception was predetermined in the analytical framework. However, evidence from this study indicates that teachers do not specify LMS as the tool to clarify concepts or develop metacognitive skills.

In this interview investigation, none of the participant articulates that LMS is the tool to for concepts clarification and application. One of the participants' statement provide insight on this situation.

I do not find Canvas is particularly useful for teaching, but I find it quite good for management or organization of teaching. But I find the other tools I use such as, for video creation, virtual world's role-playing are more useful for teaching. ... It enables my teaching in a sense to concretize the learning theory. (Participant 13, Educational Sciences)

The above extract indicates that this teacher considers other digital technologies as the more appropriate tool to enable teaching and learning of the theoretical concepts. Similarly, other participants mentioned that they use simulation software or video software to clarify and apply concepts since these tools are more direct-viewing in terms of proving concrete examples and authentic experiences.

With regard to Canvas as the tool to develop metacognitive skills, one of the participants stated that they sense the students not only need learning materials and pedagogical tasks but also the knowledge of learning strategy.

Now, for this semester, we actually add a new module where we teach them how to navigate on Canvas within the course because we saw that they need to know how to use the Canvas as a tool to help them in their learning processes. (Participant 1, Educational Sciences)

Now for this participant's course, Canvas is not only a facilitative tool. It becomes a part of the course content. Likewise, many other teachers expressed that they explicitly instruct strategic knowledge about learning by adding written texts to the pedagogical tasks organized within Canvas. However, they did not actually consider Canvas as the tool for developing metacognition skills. Rather, working with Canvas triggers their work on the developing students' metacognitive skills.

4.2 Approaches to Pedagogical Design with Canvas

Regarding approach to design, participants were invited to share and discuss their design experiences with Canvas for the chosen course. With the help of pre-developed analytical framework, four qualitatively dissimilar categories are identified in the data elicited from stimulated recall interviews. The findings with respect to approach to design are presented in terms of the extent that Canvas was integrated with pedagogical design.

4.2.1 Filling pre-existing pedagogical design into Canvas

In this category of approach, teachers claimed that LMS has not been involved into the process their pedagogical design work, yet the output of design has not been changed when they work with the LMS system. Rather, they fill pre-determined design into Canvas environment.

I just use the same information that I used to have in a course room in [Previous LMS]. Then I just put in the most important information, which is syllables, instruction plan, and deadlines. So, I just put in the usual information as quickly as possible. I just write it first in a file in word, and then I put it in. (Participant 6, Culture History Literature)

This description of the design process indicates that the teacher approach the pedagogical design with focus on information, without considering the existence of LMS.

For one of the participants, the available digital tools for his course used to be a bunch of different software. Even though the technological ground for design work has been changed by the introduction of Canvas, s/he chose to move the existing design into the new condition.

Well, as I said, the course is an old one. So what we did last year was just, sort of, take what we had and put it into the Canvas context. (Participant 10, Computer Science)

In response to probing question of whether s/he changed his pedagogical design with the provision of LMS, s/he confirmed and then explained that the previous design is retained because they are satisfied with the experience of enacting the design. Even they enacted with other digital tools.

Of course, we made as little change as possible, because we thought that the design of the course was good in itself, and the students liked it. So, we saw no reason to change that. (Participant 10, Computer Science)

In general, this category of approach indicates the situation that teachers undertake pedagogical design work without taking LMS into consideration, yet pack their readymade designs into the LMS environment.

4.2.2 Reactively modifying pedagogical design with Canvas

In this category, the teachers stated that they did not intend to, but ended up with partly changing their pedagogical design for the course when they did design work with LMS at hand.

In responses to the question of "After using Canvas, have you changed anything of your pedagogical design", one of the participants replied as follow:

Almost nothing, except… For this specific class, it's pretty much about practice and exercise in real time. For the handing-in, Canvas has been very good because now I can actually asked the students to practice something, and then give it to me, and they get feedback on it every week. (Participant 2, Modern Language)

In answer to interviewer's probing question of "How did you come up with the idea to use Canvas for that purpose then", this teacher described the scene s/he made the decision to modify the course design.

I just found a button, which says "Assessment". Wow! Yeah! Then, I am fond of it. (Participant 2, Modern Language)

The above extracts have shown the scenario of how Canvas was involved into design work. This teacher at first does not assume s/he changed the course design substantially with the provision of Canvas. When answering this question, s/he reflected then clarified that now there are weekly pedagogical tasks in Canvas for students and her in this course. In other words, the teacher unexpectedly modified pedagogical design for this course due to certain embedded feature of Canvas.

Another participant at one time established the video-sharing course model when the university was endorsing the previous LMS. Students at that time were supposed to film short video about one part of the textbook, and then they share and use the video materials to proceed learning in this course. S/he articulated the situation that s/he has to modify the course design from video-sharing model to text-sharing model after Canvas has been deployed.

But Canvas was not introduced when I was a part of our video-course, then we used [Previous LMS]. And [Previous LMS] was brilliant because they had something close to unlimited storage. And that is a problem with Canvas all over because I need to ask for additional storage because Canvas can't take it. And so, unfortunately, I need to adjust my teaching. … I do the same course this year,

now it's not a video course. One of the things students do is that they transcribe historical documents. (Participant 8, Culture History Literature)

In this category, LMS influences the teachers' pedagogical design work in an incidental way. The focus of this category is that the teachers adjust the course designs as a reaction to the LMS context.

4.2.3   Proactively elaborating pedagogical design with Canvas

Responses in this category illustrates the situation that teachers intentionally change the design to realize particular purposes with the help of LMS.

Many teachers reported their elaborations of pedagogical design with intents in their discussions on the process of designing the shared course.

I modified, augmented, added. What I did was that… It (Canvas) gave me the opportunity, much more specifically, of earning the students producing part. (Participant 11, Health Care)

As the extract indicates, this teacher already has an assumption that the students learning would be enhanced through producing knowledge. Since Canvas, as one of the state-of-the-art LMS, brings the possibility and easiness of applying the project-based pedagogical model, s/he edited only certain parts of the pedagogical design to achieve the goal of engaging student in co-writing for their research project.

Because this has been made first in [A Presentation Software]. So, it's made with these topics as, kind of, circles (every topic in the presentation software is represented by a circle). And then it was transferred to Canvas. I also made the logo and things. So, from the very beginning of using this program (Canvas), we wanted to have that nice design (layout of the course environment in Canvas). (Participant 9, Musicology)

As shown in the above extracts, as an educational technology enthusiast, this teacher previously conducted pedagogical design of the shared course with a presentation software he chose particularly. Since s/he recognized Canvas as the navigational tool for students' enactments of the course design, s/he stated that, on the basis of filling in the previous course design, now s/he pedagogically edited the course webpages to create the learning map for students.

In this category, the approach to design is also related to the material structure of LMS. However, the emphasis is that teachers proactively elaborate their course designs with LMS for certain particular purposes.

4.2.4   Profoundly integrating Canvas with pedagogical design

In this approach to design, the extracts categorized unveils the condition that teachers take LMS into consideration to develop the pedagogical design in any manner possible.

The way that I structure now in that particular course, Canvas can be called the whole platform, and lecture and readings are just added to it. (Participant 5, Anthropology)

You can think about the pedagogical design of the whole course. You can also have pedagogical design of the pages. (Participant 1, Educational Sciences)

These extracts indicate that when some teachers undertake the pedagogical design they braided LMS with their course design as much as they could. Some teachers even design and use the webpages of the course in Canvas for pedagogical purposes.

Later, Participant 7 put forward more information on their approach to pedagogical design with Canvas in this course.

I use Canvas for everything about the course. ... It's still the same idea to have one-point entry that everything that they need is there. And that I try to make them go to Canvas and try to engage them through Canvas. (Participant 7, Philosophy)

S/he explained the idea that Canvas is the one-stop hub so that s/he tried to entangle all kinds of learning resources and activities within Canvas to engage students in the subject learning.

In this category, Canvas is extensively integrated with the pedagogical design in terms of course information, educational activities, visual course environment and so on by the teachers.

4.3 Experiences of Enacting Pedagogical Design with Canvas

In the section of experience, participants were invited to share their feelings of how the pedagogical design works in that semester. With the help of pre-developed analytical framework, four qualitatively different categories are identified in the data elicited by questions structured in interview guide. The findings regarding experience are presented in terms of the extent Canvas use contributes in that course.

4.3.1 Experience of teaching and learning is unrelated to Canvas use

In this category of experience, the extracts categorized reveals that teachers feel their experience of teaching and learning is unrelated to LMS.

When invited to discuss on how Canvas works for teaching and learning in that course, one of the interviewees stated as below:

Well, I have to learn Canvas, which was annoying, because it was very time-consuming. I have much other things to do, but I didn't know about how to use it at the beginning. I think it has also many possibilities, as I said, that I don't use. So, I don't want to be a technological expert. But it doesn't change my teaching. ... I don't really use technology for enhancing learning. (Participant 6, Culture History Literature)

From this teacher's view, the provision of LMS brings extra workload. Moreover, the course goes on well in pure face-to-face setting so that there is no need for her/him to use LMS for enhancing teaching and learning in the course.

The emphasis of this category is that LMS has no contribution to teaching and learning in this course.

4.3.2 Experience of teaching and learning is overwhelmed by Canvas use

Responses in this category disclose that teachers' experience of teaching and learning for their course is undermined by using LMS.

When answering the question of "how the course design in Canvas worked for student learning and the way you teach", one of the participants expresses as follow:

Well, I think it worked all right. As I said, the actual parts were a bit inferior to what we had. The students didn't like it. (Participant 10, Computer Science)

This teacher compared their feeling of using Canvas for teaching and learning with the feeling of using several digital tools. In their opinion, concerning experiences of both teaching and learning, Canvas is defeated by the previous range of discrete tools.

For the same question, another participant expressed disappointment with Canvas. S/he used to engage the students in learning by video-generating, sharing, processing in the course.

So that's a shame because things I could do before, I can't anymore. Or, at least, I need to find different ways to get around it. (Participant 8, Culture History Literature)

The above extract reveals that after using Canvas, s/he could not apply the previous pedagogical model due to the limitation of storage for the course in Canvas environment. S/he assumed that using Canvas leads to the disadvantage of teaching and learning, or it took extra efforts to achieve prior desired teaching and learning effect.

In this category, the previous experience of digital technology has been the important framing for teachers. The focus of this category is that the teachers feel the teaching and learning in the course become worse when they enact their designs with LMS.

4.3.3 Experience of teaching and learning is enhanced by Canvas use

In this category of experience, the extracts indicate the situation in which teachers sense the certain extent of advancement in teaching and learning for their course after using LMS.

When discussing the value of LMS in enacting the course design, one of the participants first shared the detailed experience that students benefit from the additional learning resources and teachers enjoyed the convenience of organizing teaching activities.

From the students' perspective, I guess this access to additional materials is good. From the teachers' perspective, I think it's much easier to collect and grade the assignments. (Participant 3, Life Science)

After expressing the positive feeling on using Canvas, s/he then reflected his experience of using Canvas for teaching and learning in a deep level.

I think, at least up until now, it hasn't really in a big way changed the way we teach. I think it's a gradual process to integrate this kind of new learning platforms into our teaching. ... But that's not only a question about Canvas. It's the whole idea of doing less kind of passive learning situations that we should use more time on active learning. ... And Canvas has made this transition easier, I think. (Participant 3, Life Science)

As the above extract has indicated, for teaching and learning, this teacher holds the pedagogical assumption that it would be better by shifting the focus more to engage students in doing educational activities. In their opinion, teaching has not yet been fundamentally and dramatically changed through using Canvas. However, after experiencing the easiness of administering teaching and learning with Canvas, s/he acknowledges Canvas has been the inseparable but not initiative part to advance teaching and learning.

In this category of experience, the focus is that teachers feel the teaching and learning in their course has become better to a certain degree after using LMS.

4.3.4 Experience of teaching and learning is reshaped by Canvas use

In this category of experience, the extracts depict the pattern that the experience of teaching and learning has been fundamentally improved with the use of LMS.

During the course of the interview, participants were invited to comment on how pedagogical design with Canvas worked for student learning and her or his teaching, one of them expressed his feeling of student learning.

> *I think, the students, based on the feedbacks that I got, they got a better understanding of why they learn, what to do, and why they read, or why we teach the way that we do. So I think Canvas help them to get a better overview of the learning process. (Participant 5, Anthropology)*

In this teacher's opinion, student learning has advanced in terms of motivation, direction, and metacognition etc. The advancement of learning happened in many aspects at the macro level when they enacted the pedagogical design with Canvas.

Many of them also reported their feelings from teacher's perspective, one of them reflected the enactment of course design with Canvas as below.

> *I think Canvas changed a lot. For me, I think it made me a better teacher. I think it allowed me to develop much faster. And, it gave better opportunities to students. So, I'm personally very happy with this. (Participant 7, Philosophy)*

As the extract shown, s/he felt teaching and learning has changed intensively due to the use of Canvas. In her opinion, working with Canvas prompted much speedier developments of how to structure and teach the course, which brought more chances for students enactment as well. Thus, the experience with Canvas quite satisfied her/him.

This category indicates and emphasizes that the teacher's experience of teaching and learning sometimes would be profoundly upgraded when enacting the pedagogical design with Canvas.

4.4 Pedagogical Design Work with LMS as Individual and as Cohort

After identifying all the categories of findings regarding each subquestion, the author examined the whole data set again to discover the threads of teachers' pedagogical design work both as an individual and as a cohort. Thus, findings in this section are presented in

an integrative view on teachers' design work with LMS. The first subsection of findings consists of the overview of individual teachers' design work, with an emphasis to present the consonances and dissonances among their conceptions, approaches to design, and experiences. The second subsection is comprised of the pathways of undertaking the design work, with an emphasis to depict the promotion and demotion of pedagogical design work with LMS.

4.4.1 Overview of individual teacher's design story with LMS

Table 5 displays all individual participant's conception of LMS, their approach to pedagogical design with LMS, and their experience of using LMS for teaching and learning at the same time. In the table, participants are sorted in descending order in terms of the complexity of their conception of LMS, then the sophistication of their approach to design, and the extent of advantageousness of their experience with Canvas.

Table 5: Summative table of individual teacher's design work with LMS

	Conceptions of LMS	Approach to design	Experience
P1	①tool to store and present information ②tool to organize educational activities ③tool to expand teaching and learning spaces ④tool to navigate teaching and learning activities ⑤the one-stop platform	Extensively integrated	Transform
P7	①tool to store and present information ②tool to operate the processes of educational practices ③tool to expand teaching and learning spaces ④tool to navigate teaching and learning activities ⑤the one-stop platform	Extensively integrated	Transform
P5	①tool to store and present information ②tool to operate the processes of educational practices ③tool to expand teaching and learning spaces ④tool to navigate teaching and learning activities	Extensively integrated	Transform
P9	①tool to store and present information ②tool to operate the processes of educational practices ③tool to expand teaching and learning spaces ④tool to navigate teaching and learning activities	Proactively elaborate	Enhance
P14	①tool to store and present information ②tool to operate the processes of educational practices ③tool to expand teaching and learning spaces ④tool to navigate teaching and learning activities	Proactively elaborate	Enhance
P10	*①tool to store and present information* *②tool to operate the processes of educational practices* *③tool to expand teaching and learning spaces* *⑤the one-stop platform*	*Fill into*	*Overwhelm*

P12	①tool to store and present information ②tool to operate the processes of educational practices ④tool to navigate teaching and learning activities ⑤the one-stop platform	*Fill into*	*Unrelated to*
P3	①tool to store and present information ②tool to operate the processes of educational practices ③tool to expand teaching and learning spaces	Proactively elaborate	Enhance
P11	①tool to store and present information ②tool to operate the processes of educational practices ③tool to expand teaching and learning spaces	Proactively modify	Enhance
P8	①tool to store and present information ②tool to operate the processes of educational practices ③tool to expand teaching and learning spaces	*Reactively modify*	*Overwhelm*
P2	①tool to store and present information ②tool to operate the processes of educational practices	*Reactively modify*	*Enhance*
P13	①tool to store and present information ②tool to operate the processes of educational practices	*Reactively modify*	*Enhance*
P4	①tool to store and present information ②tool to operate the processes of educational practices	Fill into	Unrelated to
P6	①tool to store and present information	Fill into	Unrelated to

Regarding the first aspect to understand pedagogical design work with Canvas, findings show that all of the participants conceive LMS as the tool to store and present information. Fourteen of them take LMS as the tool to operate the processes of educational practices. Nine of the participants assume LMS as the tool to expand teaching and learning spaces. Six of the participants consider LMS as the navigational tool. Four of the participants recognize LMS as the one-stop platform for integrating sub-tools. Each teacher may hold at least one or, in most of the cases, many conceptions of LMS. Two of the participants endorse all the five conceptions at the most complex level. Eight of them hold three or four conceptions at the moderate level of complexity. The rest four of them simply own one or two conceptions. When it comes to the other two aspects, findings indicate that individual teacher's approach to design and experience with Canvas respectively belongs to only one category.

As shown in Table 5, for the eight out of fourteen participants in this study, their conceptions of LMS are aligned with their approaches to design, and their experiences with Canvas. However, for those participants in italic in the table, there are some dissonances among their conceptions of LMS, approaches to design, and experiences with Canvas. For *participants 10* and *12,* they conceive LMS as various tools, but they chose to fill pre-existing course design into Canvas system and ended up with different experiences. For *participant 8,* s/he also holds several conceptions of LMS. When it comes to approach to design, s/he did not manage to adopt other approach but reactively modify the course design

since Canvas is the only available LMS for her. At last, s/he felt the experience of teaching and learning the course has been disturbed by Canvas use. For *participants 2* and *13*, even though holding relatively simple conceptions of LMS, they reactively modified their pedagogical design when they have Canvas at hand, then achieved the better experience.

4.4.2   Pathways from conceptions, approaches to design, to the experiences

Figure 6 below illustrates all the threads of how teachers develop their pedagogical design with LMS in term of conceptions of LMS, approaches to design, and experiences of enacting the pedagogical design with LMS.
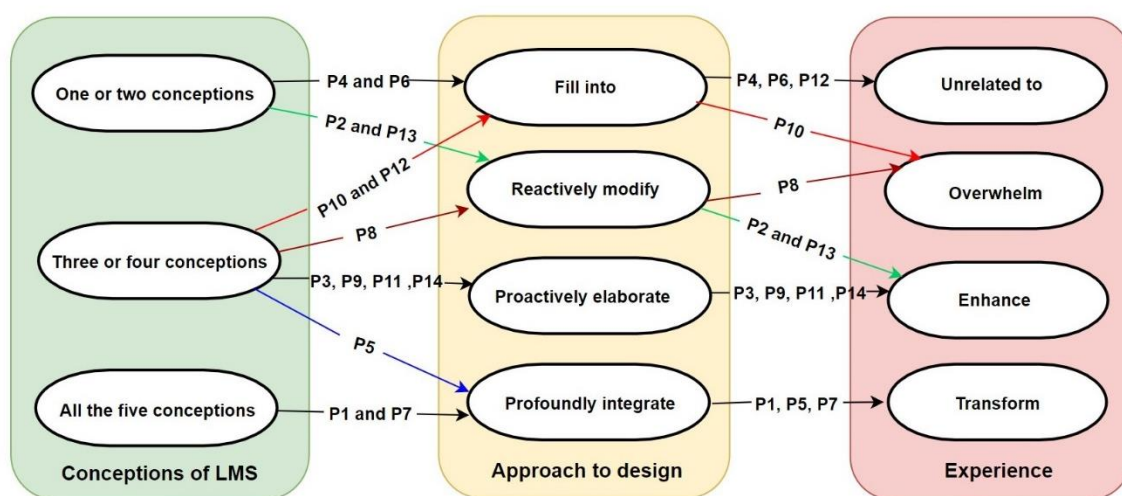
Figure 6. Pathways of teachers' pedagogical design work with LMS

As shown in the figure, nearly two thirds of the participants accomplished their pedagogical design work following a placid path. Among them, the two participants who held the most complex conceptions chose to extensively braid Canvas with their pedagogical design so that they felt teaching and learning of the course has been positively transformed when enacting the pedagogical designs with Canvas. Meanwhile, the other two participants who held the simple level of conceptions felt their teaching and learning experiences were unrelated to the Canvas use. For half of the teachers who held the moderately complex conceptions, they took the initiative to elaborate their pedagogical designs with Canvas for specific purposes, then they assumed teaching and learning has become better since that specifically changed part has been realized through enacting the pedagogical design with Canvas in practice. In the light of the concept of performativity, this can be interpreted that the meaning teachers attach to LMS leads to a corresponding approach to design with it; and that the certain kind of approach to design invites a matching form of experience with LMS.

For those whose conceptions that are not aligned with their approaches to design, on one hand, if they promote their approaches to design, they usually enjoy the upgraded experiences. On the other hand, if they demote their approaches to design, they usually suffer a tainted experiences. For instance, participant 5 elevated Canvas as the center of their course design work (see Chapter 4.2.2), consequently s/he felt the experience of teaching and learning with Canvas has been much better, while participant 10 and 12 did not experience the advancement of teaching and learning with Canvas when they just filled the pre-existing satisfying designs into Canvas system.

For those who developed their pedagogical designs reactively with Canvas environment, their experiences directed into two contrasting pathways. For those teachers holding simple conceptions, they felt the experience of teaching and learning has been promoted through enacting the modified pedagogical design with Canvas. In contrast, teachers who held the moderately complex conceptions felt teaching and learning has been relegated if s/he did not manage to reproduce previous experience with Canvas due to the forced modification in their pedagogical design. It implies that LMS, as the comprehensive digital tool, is no longer subject to its user all the time but also can influence user's actions in a sense. That is, the material structure of LMS seems to occasionally play an active role in teachers' design work, which leads to differentiations of their experiences of teaching and learning with LMS.

5 Discussion

In this chapter, main findings are first presented with respect to conception of LMS, approach to design, and experience of designing and enacting design with LMS, the integrative view of teacher's opinion, action, and experience in pedagogical design work with LMS. Then, the findings are discussed in relation to existing literature and theoretical concepts to explain how this study in many ways advances our understanding of university teachers' design work with LMS. This chapter also presents reflections on methodology and theory, the implications for higher education practice, limitations of the current study, and suggestions for future research.

5.1 The Multiple Conceptions of LMS

In response to the first subquestion of "What are the teachers' conceptions of LMS such as Canvas?", findings show that teachers usually hold multiple conceptions of LMS. From simple to complex, they conceive LMS as: a) tool to *store and present information*, b) tool to *operate the processes of various educational activities*, c) tool to *expand teaching and learning spaces*, d) tool *to navigate teachers and students in progress of the course*, and e) *the one-stop platform that encompasses several sub-tools*. Concurrently, findings from this study illustrate that teachers do not specify Canvas as the digital tool to clarify domain concepts or develop metacognitive skills.

The current study, thus, supports findings of previous studies (Ellis et al., 2009; González, 2009; González, 2010) that, LMS is seen as a tool for information transfer. Prior researches of González (2009, 2010), Lameras, Paraskakis and Levy (2008), and Lameras et al., (2012) suggests that LMS is conceived as a means of learning related interactions while other studies identify LMS as medium for collaborative knowledge-building tasks (Ellis et al., 2009; González, 2010) or individual assessment (González, 2009). Since findings of the present investigation indicate that teachers also recognize LMS as useful digital tool to grade students' exercises and group students in various forms, the current study expands our knowledge by suggesting that teachers take LMS as the tool to operate the processes of overall educational practices. Moreover, Ellis et al., (2009) and Lameras et al., (2012) have found that teachers take LMS as the ways of expanding student learning space in terms of providing active learning opportunities, access to internal and external learning resources. Findings of current study augment their work by identifying out LMS

as ways of expanding teachers' teaching spaces in terms of containing resources that are more diverse and providing sub-tools or affordances that are more convenient.

Meanwhile, the rest of this study's findings regarding conceptions of technology differs from previous studies. The category of conceiving LMS as tool to navigate in teaching and learning progress emerged as outcome of the hybrid thematic analysis. This unexpected category shows how teachers use LMS as navigational tool to visualize the course structure and activities as a 'learning map' for students and how teachers take LMS as navigational tool to locate and steer teaching and student learning activities. The emergence of the new category may be attributed to the developing material structure of Canvas that introduced in Chapter 3. That is, now LMS offers certain affordances or sub-tools, by which teachers can design the layout of the webpages and present the structure of the course, and by which navigation of teaching and learning can be enabled. Evidence in this study also shows that teachers consider LMS as the one-stop hub encompassing various affordances for all possible aspects of the course. It can also be ascribed to the sociomateriality of LMS because LMS is evolving to become more comprehensive and powerful as a whole.

Last, but not least, in contrast to earlier findings, this study reveals that teachers did not conceive LMS as tool to understand domain concepts and develop metacognitive skills, even though prior studies (Lameras, Paraskakis, & Levy, 2008; Lameras et al., 2012) indicate that teachers conceptualize LMS as means for concepts understanding. This discrepancy might be rooted in the questions regarding conception of LMS settled in the interview guide (see Appendix 1). While exploring the empirical context before data collection, I noted that other digital technologies are also provided in parallel with LMS. Thereby, in the interview guide, the space has been secured for participants to discuss the conceptions of LMS with the existence of other technologies, in which some of teachers articulated in current investigation how they conceive of other tailored technologies as tool to apply and clarify concepts in their knowledge domain. Contrary to expectations from theoretical review in this thesis, evidence reveals that teachers do not conceive LMS as tool to develop metacognitive skills. Many of teachers mentioned in the interviews that they have noticed students' needs of procedural and strategic knowledge about learning in their courses. Therefore, teachers began to place explanations and instructions in LMS course environment. However, the teachers did not articulate that they have already specified LMS as the metacognition development tool.

Another finding worth noting is that, with the ascending level of complexity of their conceptions, teachers discuss their conceptions of LMS through giving concrete examples of how they use Canvas in their experiences. That is, for simple conceptions, teachers would express directly what LMS is, then describe what LMS could be in their minds, later explain what LMS actually is through their experiences of using it with students in the hybrid learning environment. Thus, for the conceptions of LMS, it's not only about in what ways teachers conceive LMS as a material artifact but also depends on the role the users designate to it, and finally how users actually teach and learn with it in the practice.

5.2 The Uncertain Approach to Design

The second subquestion in this study is "How do teachers approach their pedagogical designs with Canvas?", which sought to determine in what ways LMS is involved into teachers' pedagogical design. Findings of current study suggest that teachers undertake pedagogical designs with LMS in one out of four qualitative distinguishing ways. That is, when they approach to design, some of the teachers deliberately reconfigure the whole course or elaborate part of the course with Canvas, while others unexpectedly modify pedagogical design because of Canvas or fill pre-existing course design templates into Canvas without considering it.

Evidence in current study shows that Canvas has been integrated into design work at various degrees. This finding is in line with Jahnke and colleagues (2017) and Ellis, Steed and Applebee, (2006) that the integration extent of technology in design work varies from deep and meaningful/fully integrated, to semi-integrated, and to shallow or no integration. Some researchers sought to understand this technology integration approach in design work by framing digital artifacts as tools subject to users. Their findings identified out approaches to design in terms of original pedagogical purposes (Ellis et al., 2009) or underlying learning perspectives (Rienties, Toetenel & Bryman, 2015). Current findings in this research are partly consistent with these prior findings, indicating that, in three out of the four approaches to design, teachers purposely appropriate LMS in their pedagogical design work. However, by making obvious the approach of reactively modifying design, on one hand, the present study completes the description of how teachers appropriate digital tools in design work. On the other hand, this study substantiates the idea that material artifacts such as LMS could be a quasi-actor in design work in a sense that design work is

not purely determined by teachers, rather, it is jointly achieved by humans/teachers and technology/LMS.

In addition, present findings of approach to design confirm and further explain university teachers' uncertain design actions with digital tool that was found in Wilson's (2007) empirical research. Present findings of approach to design suggest that when offered concrete opportunities to use technologies, teachers have many ways to incorporate LMS into pedagogical design. In other words, the uncertainty of design work has been increased by the provision of LMS. When it comes to the current findings that some teachers make do with Canvas instead of accomplishing preplanned design actions, it helps in explaining other previously observed uncertain design actions. Morgan's (2003) study reveals that when teachers take LMS into use, sometimes, they come up with pedagogical ideas by accident. Kali, Goodyear and Markauskaite (2011) found teachers have difficulty in coherently reconciling pedagogical ideas into concrete pedagogical design with technology. Now, the occurance of uncertain design actions can be explained through the fact that LMS could actually be included in design work as an 'actor' more than a tool subject to its users. In this sense, design developments are not purely determined by human actions but also by the sociomateriality of digital tools as the more-than-human element.

5.3 The Detailed Experiences with LMS

The third subquestion in the current study is "What are teachers' experiences of teaching and of students learning with Canvas?", which sets to explore and understand design work though individual teacher's experience. In answer to this subquestion, findings of present research suggest that there are four qualitatively dissimilar categories of experience among the participants in terms of the benefits of using Canvas. That is, teachers feel the teaching and learning in the shared course is a) unrelated to, b) becomes worse with, c) has been better with, or d) have been essentially improved with the use of Canvas.

This study produced results that corroborate with findings of all the previous work on experience of teaching and learning with LMS in different ways. The findings on individual teacher's experience are partly consistent with those of many researchers who report that a number of teachers experience design and teaching with LMS as generally valuable and better than before (Yueh & Hsu, 2001; Lonn & Teasley, 2009). Meanwhile, a part of the findings suggests that experience of teaching and learning is not related to LMS use, which matches findings by Hustand and Arntzen (2013) that LMS is the infrastructure in

university with potential for pedagogy. In line with Weaver, Spratt and Nair's (2008) and Chang's (2008) studies, another category of present findings on individual experience indicates that academic staff gain negative experience. These results also are in accordance with Morgan's (2003) earlier work, which demonstrated that there are both favorable and adverse experiences of using LMS at the same time. By deconstructing teachers' experience with LMS into individual level, the current study provides the possibility to decode teachers' design work with LMS towards an integrative view.

5.4 The Dynamics among Conception, Approach to Design, and Experience

Based on examinations of the status of teachers' conceptions of LMS, approaches to design, and experiences of LMS use, results from cross-participant analysis have shed light on how higher education teachers develop their pedagogical design work with/in LMS. Towards an integrative perspective, findings indicate that, roughly, teachers' conceptions of LMS unfold in their approaches to design, consequently seems to predetermine their final experiences of enacting the pedagogical design. More concretely, in many cases, the multiple conception of LMS teachers hold can inform how sophisticated their approach to design may be, and how positive experience they would gain. Yet, there are dissonances among teachers' thinking of, action with, and experiences with Canvas in pedagogical design work, among which the approach to design represents the pivotal dynamics. It is uncertain that, sometimes, human wills dominate in the approach to design while the sociomateriality of LMS also occasionally interacts with teachers' actions as a salient element of the design work.

Attention has been paid to the interconnections between teachers' thinking of LMS and their design actions in some studies. In line with those of Kali, Goodyear and Markauskaite (2011), who argued that previous experiences are the source for the observed discord between teachers' understandings and actions, findings of the present investigation regarding multiple conceptions and approach to design further explain that previous satisfactory experience may lead teachers to retain their previous course design. Earlier results of longitudinal study (Scott, 2016) suggest that the changes between teachers' beliefs and practices are not one-directional but very contextual. This contextual situation of uncertain fluctuations between teachers' thinking and their action can be explained by the reactively modifying approach that teachers make do with the provision of LMS. That

is, findings of the current study deepen the understanding of design work by making the point that the materiality of LMS also account for the uncertainty between teachers' thinking and their design actions. In addition to results of some prior studies (Steel & Levy, 2009; Steel, 2009) that teachers have difficulties in unfolding their ideas of pedagogy and technologies to their actions of using LMS, the present findings reveal that teachers' design actions may also be inspired by the material affordances of LMS beyond .

When it comes to the interconnections between the finding of approach to design with LMS and findings of teaching and learning experience with LMS, in this study, for eleven out of the fourteen participants, the experience was association with the approach to design. This finding is in agreement with the ones in Steel's (2009) study, which shows that satisfactory technology use practices depend on how teachers realize their thinking of technology during designing. However, the findings of current study further explains that the sophistication of approach primarily predetermines the extent of favorableness of experience. In previous work, Chang (2008) made the point that there is a significant positive relationship between faculty's perceived LMS design and perceived LMS use. Findings on this association between teachers' thinking of LMS and experience of LMS suggest that it seems that conceptions of LMS unfold into approach to design, which consequently influence the experience. Thus, the approach to design could be considered as the pivotal aspect in design work connecting the conceptions of LMS and the experience of enacting pedagogical design with LMS.

As mentioned all above, this empirical study substantiates that human teachers interact with the material LMS to carry out the pedagogical work. The human and the material have both been identified as important elements in the dynamics involving conceptions of LMS, approach to design, and experience of enacting pedagogical design with LMS.

5.5 Methodological and Theoretical Reflections

Investigating pedagogical design work with digital tools by conceiving it as a process of teachers configuring the output for the enactment of teaching and learning is valuable, because it draws on analytical attention to both material and social when examining the phenomenon that teachers develop their course design with LMS. Moreover, looking into teacher's design work with LMS through an integrative perspective provides the in-depth readings of the practices via which we can understand them in order to guide or improve them. Last, by the introduction and use of the concepts of *mediation*, *assemblage*, *bricolage*,

and *performativity*, the analytical framework formulated for the current study was helpful in thoroughly analyzing and interpreting the raw interview data.

Although the current study has offered several insights into teachers pedagogical design work with LMS, it has certain limitations. First, the current study was not designed to examine teachers' approach to design by the research method of observation due to the limited timeframe and data accessibility for a master thesis. Otherwise, the findings regarding approach to design would be more solid. Second, the present study is slightly limited by the questions as formulated in the interview guide. At first, in order to understand teachers' thinking of LMS in naturalistic context and avoid the potential for secondary ordering of the cognitions and biases, participants were not asked straightforwardly what their conceptions of LMS are. It brought about challenges for analysis since participants naturally express what they think of LMS through describing they experiences. Maybe, it is better to settle a question of "what is LMS in your point of view?" at the end of the conception part in interview guide to acquire an evident answer as well. The third limitation is that this study collected data through convenience sampling within a single university context with only the Canvas software. Therefore, no solid generalizations can be made based on this study. Nevertheless, this investigation allows for analytical generalization and discussion of what we can know regarding issues that matter for quality higher education practice.

The empirical analyses in the present study show that the analytical concepts of *mediation*, *assemblage*, *bricolage*, and *performativity* are very useful in furthering understanding of design work with digital tools in its complexity. Through using the concept of *mediation*, the analyses and findings help reveal the kinds of digital mediator LMS could be in higher education teacher's view and that how teachers elaborate a specific part of design for interventions with LMS. Through using the concept of *assemblage*, the current study shows that teachers recognize LMS as the reconstituted powerful platform superior to all the sub-tools it encompasses and they would cooperate with LMS in all possible ways to design their courses. Through using the concept of *bricolage* for analysis, empirical findings show how teachers are invited by LMS to come up with new solution in design practice have substantiated that *bricolage* helpful to understand the temporary and fluid nature of design work with digital tool. Through using the concept of *performativity* in the analysis, findings indicate that teachers tend to perform their thoughts of LMS in their approach to design with LMS and, ultimately, their experiences of enacting the course design with LMS.

5.6 Implications to LMS Stakeholders

This study has generated several practical implications for LMS stakeholders.

The teachers is the first category of stakeholder, since the fruitful experience with digital artifact stems from individual teachers' conceptions of the tool and more importantly the approach to design with the tool. The teachers first need to take the initiative to know more about what LMS could be, then spend more time on pedagogical design work to consider what LMS should be in their course. Moreover, the usefulness of technology highly depends how users use it. Therefore, the teachers might need to give up the idea that an LMS fits all their teaching needs. Instead, teachers are advised to use LMS for teaching and learning as all the ways they want it to be. This study suggests that there is always potential technology (in this case LMS) offers for improving existing design and practice even when teachers might consider their current teaching practice and course environment are good enough. In a word, nowadays, in the technology-enriched society, in order to be an successful teacher, it is necessary to be a good learner beforehand to keep updated with the developing pedagogy and technology so that the advancement of designing and teaching would be realized.

For the department leaders, the use of LMS in teaching and learning could be helpful if engaged and managed properly. It is therefore important to directly identify and inform the teachers the ready-to-use successful examples of LMS integration practice. In addition, it is important to keep them updated, e.g., through training, academic development, workshops, collaborative design work, with the development of pedagogy and technology in the life-long learning society so that teachers could learn from each other.

For the LMS suppliers, since the sociomateriality matters as the more-than-human element in educational practice, the supplier of LMS should interact with users for the iterations of the software to bring more low cognitive-cost affordances according to pedagogy in practice.

Last, for the university as the institution that deploys LMS, they should support the smooth operation of software with stable hardware, rather than disturb the education routine. More important, university should seriously customize LMS as the local users like.

5.7 Suggestions for Future Research

On the current topic of how teachers and learners work with technologies for teaching and learning, this study has opened up also several questions in need of further investigation.

A natural follow-up of this work is to account for how learners actually interpret, negotiate, and enact the pedagogical design with LMS. In other word, further research is needed to better understand how learners interact with LMS or other digital tools to *perform* learning. Still, to maximize the likelihood of effective and efficient teaching and learning, more information on how teachers develop pedagogical design would help us to realize the quality higher education practice. Thus, further work is required to shed light on how teachers interplay with several technologies to accomplish the pedagogical design, but from a broader ecological perspective as Damşa, Nerland and Andreadakis (2019) argued. More accurately, attentions need to be paid to the rationales teachers orchestrate all available resources to co-construct the hybrid learning spaces with learners.

From sociomaterial perspective, we frame pedagogical design as the process and output for performing teaching and learning in a course. Therefore, another possible area of future research would be to identify the productive assemblages of human and more-than-human forces in the pedagogical designs regarding different knowledge domains, in which quality higher education practice occurs. These assemblages are something similar to Polsani's (2003) concept of learning object, which are self-standing and reusable configurations in the hybrid learning environment.

Finally, but equally important, through the lens of sociomaterial perspective, results of this study penetrate the human-centered ontology in higher education practice. Further empirical work is needed to help us better understand the technology-involved education practice.

6 Conclusion

This thesis has sought to deepen the understanding of integration of digital tools for quality teaching and learning in higher education, from the perspective of teachers' pedagogical design work with the endorsed institutional technology—LMS.

In order to examine empirically teachers' conceptions of technology, their work with technology when designing courses and their experiences of using this technology, an empirical study was conducted of 14 teachers who worked with the Canvas software in their teaching. In the present study, data was collected using the stimulated recall interviewing method, in which interviews were carried out with the help of screenshots of teacher's course in Canvas. The analytical framework was built on ideas from sociocultural and sociomaterial theories, and used *mediation*, *assemblage*, *bricolage*, and *performativity* as analytical concepts. Through a thematic analysis, data was analyzed qualitatively.

Findings of this study offer some fresh insights on how university teachers develop their pedagogical design with LMS. The major findings indicate that university teachers may hold multiple conceptions of LMS since they conceive LMS as a range of digital tools. In addition, they purposely or reactively combine LMS with pedagogical design in the course of designing. Further, individual teacher's experience of teaching and student learning might be unrelated to LMS use or influenced by LMS use. Towards an integrative perspective, findings indicate that, in many cases, teacher's approach to design is informed by the complexity of her/his conception of LMSs, which further predetermines the favorableness of her/his experience with LMS. Yet, since teachers can promote or demote the role of Canvas in designing while the materiality of LMS can inspire or hinder teachers' certain design actions. Therefore, the design work is jointly achieved by teachers and their digital tool of LMS while teacher's approach to design with LMS is considered as the pivotal aspect in pedagogical design work.

Overall, for quality teaching and learning, this study brings up the existence and significance of digital tools such as LMS in higher education practice as that are not so much attended to. Based on this study, several practical implications and research suggestions have been proposed. University teachers and department leaders need to proactively know about and critically integrate LMS for better teaching and learning experiences. LMS suppliers and the institution should design and deploy LMS in light of higher education practices. In future investigations of the technology-involved higher education practice, it is recommended to focus on students' experiences of digital tools,

teachers' design rationales of technology-involved course, and the productive technology-involved course design components.

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Appendices

Appendix 1. Interview guide

Background questions

1. How long have you been teaching in higher education institutions?

2. Have you ever attended some pedagogical or teaching training?

3. What are the typical teaching and learning forms in your discipline? For example, lecture, seminar, lab work, field work,

4. How many students are there in the course we are talking about?

5. Have you taught this course before?

Part 1 Conception of teaching and learning with educational technology

1. Have you ever used other digital technology/ies in your teaching besides Canvas? 4.1 How did these enable your teaching?

2. What do you think about the value of digital technology for learning? 2.1 What about Canvas specifically?

3. What do you think about the value of digital technology for teaching? 2.1 What about Canvas specifically?

4. What role does educational technology play in your course?

5. How do you personally consider your use of digital technology for teaching? 5.1 What do you think of teaching with digital technology?

Part 2 Experience of designing the course in Canvas

1. Did you design on your own or design the course with your colleague or student assistant?

2. Can you tell us what you exactly did when you were designing this course (set up the course room in Canvas)? 2.1Where did you start?

3. Did you change your course design when you using Canvas during the course?

4. After using Canvas, does your course design process change somehow? In what ways?

5. In your opinion, what opportunities did Canvas bring to you for the design of your course?

6. In your opinion, what challenges did Canvas bring to you for the design of your course?

4.1 How did you cope with the challenges?

7. In your opinion, what is the most valuable experience of designing the course within Canvas?

8. For this course, how would the ideal course learning environment look like within Canvas?

9. Tailored stimulated recall questions (show screenshots)

Part 3 Experience of using Canvas in this course

1. Would you please tell us about how the course design in Canvas worked for student learning?

2. Would you please tell us about how the course design in Canvas worked for the way you teach?

3. Did you encounter any difficulties while carrying out your course design?

4. Has your teaching changed since you started to use Canvas?

5. In your opinion, has student learning changed since you started to use Canvas?

6. Will you / have you changed your way of using Canvas after this course? If yes, why and how?

7. For this course, are there any differences between using Canvas and not using any digital educational technology at all?

8. How can educational technology help you engage students?

Ending questions

Is there anything that you would like to add before we end this conversation?

*Thank you for your time!

Appendix 2. Initial invitation letters sent by supervisor

Kjære underviser,

Vi kontakter deg fordi du tidligere har deltatt i piloteringen av Canvas læringsplattformen, våren 2018. Vi søker deltakere i et forskningsprosjekt som ønsker å gi oss innsikt i undervisernes erfaringer med pedagogisk bruk av Canvas. I tillegg vil vi se på hvordan undervisere utvikler kurs, som spiller en viktig rolle i læringsplattformen.

To masterstudenter fra Institutt for Pedagogikk skriver sin masteroppgave om dette temaet (se kort beskrivelse av disse prosjektene nedenfor). Masteroppgavene er også en del av et større forskningsprosjekt som handler om undervisernes arbeid med kursutvikling.

Begge studentene ønsker å intervjue undervisere, som har erfaring med bruk av Canvas, og som har utviklet sitt emne, eller læringsaktivitet inne i Canvas. I tillegg ønsker studentene å få et inntrykk av kursoppbyggingen ved å se på hvordan emnet ser ut i Canvas.

Det dreier seg om korte intervjuer, som kan avtales nærmere når det måtte passe deg. Vi inviterer deg, som erfaren Canvas bruker, til å delta i denne studien, for å dele dine kunnskaper og erfaringer. Det er viktig at slik kunnskap samles, og tolkes systematisk. Dette for å kunne bygge bedre forståelse for disse aktivitetene og utfordringene, samt for å utvikle støttestrukturer.

Når du takker ja til å delta, vil studentene ta kontakt med deg for å avtale et passende tidspunkt for intervju. Studentene vil også gi mer informasjon om prosjektet og prosedyrene. Deltakelse meldes fra ved å svare på denne e-posten. Takk på forhånd!

Med vennlig hilsen,
Monica Emhjellen & Ying Li, masterstudenter
Crina Damsa, veileder
crina.damsa@iped.uio.no

Short description of master thesis 2
After the pilot in spring semester of the year of 2018, University of Oslo adopted the learning management system of Canvas to enable smart teaching and active learning. Such implementations not only need hardware and software offered by universities, but also rely on how teachers integrate such educational technology into their teaching practice. Research shows that educational technology integration starts from teachers' ideas about teaching and design of courses. In this study, teachers' thinking about LMS/Canvas and their experience of using and designing courses in Canvas will be explored with the aim of understanding how these influence the design of courses in Canvas, and consequent teaching. This research has potential to provide insights to how LMS/Canvas combine with teachers' work towards integrating technology into their teaching and students' learning activities.

Appendix 3. Follow-up Invitation letters sent by data collectors

Dear [Name],

Thank you for your willingness to participate in research study on the pedagogical design of courses in the Canvas Learning Management platform!

We hope you would agree to the use of English, since one of us does not speak Norwegian. In case you do prefer to use Norwegian, please, let us know and we will find a solution.

We are contacting you in order to organize the data collection for this study. As mentioned in the initial invitation, the study examines your ideas about and experiences with designing your course(s) in Canvas, and the way the course design(s) actually look like. For the former purpose, we wish to interview you; for the latter, we wish to ask your permission to view your course in Canvas.

In order to prepare a focused interview, we would like to view your course design in Canvas environment before the interview date, therefore, we would kindly ask you to allow us access to your course (from an observer role). If you have taught more than one courses within Canvas, please select and share only one course with us. We are interested in how you structure your course in Canvas, how you organized information, and how you employed different functionalities (if the case). The data will be in form of screenshots, and will not contain any information that allows identifying persons.
The interview will last maximum one hour and will be planned at your convenience.

All the data will only be collected upon you providing informed consent. We will provide the informed consent later for your perusal and will bring a hard copy version that you can sign when we meet.

We thank you in advance! Looking forward to your reply.

Best regards,
Monica Emhjellen & Ying Li

Appendix 4. Consent form

Information about the project
'Pedagogical design and use of Canvas'

Thank you for agreeing to participate in the project, 'Pedagogical design and use of Canvas'!

Purpose of the project

This project aims to understand how Learning Management Systems (LMS) such as Canvas are integrated in higher education teachers' work. The scope of the research is narrowed down to how teachers appropriate LMS into their course design and use in the courses. Three research questions will be asked about: a) teachers' conception of teaching and learning with LMS, b) their experience of designing and b) of using LMS. In the context of a larger project on teachers' work with course design, this study is conducted for the purposes of two master theses at the Department of Education.

Who is responsible for the research project?

University of Oslo, Department of Education is the institution responsible for the project.

Why are you being asked to participate?

The study includes teachers who use Canvas for their regular teaching. You participated in the piloting of Canvas in the spring of 2018 or indicated you use Canvas in your course(s).

What does participation involve for you?

If you chose to take part in the project, this will involve that you provide access to screenshots capture of your course design in Canvas and take part in an interview. The interview will last maximum 60 minutes including questions about LMS's value for teaching and learning, opportunities and challenges during designing your course in Canvas, and experience of teaching within Canvas. Your answers will be audio recorded. The screenshots will be captured before the interview. All the private information or anything irrelevant for design in the screenshots will be excluded or pixelated.

Participation is voluntary

Your participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw.

Your personal privacy – how we will store and use your personal data

We will only use your personal data for the purpose(s) specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

Only the two students and their supervisors will have access to the personal data. Your name and contact details will be replaced with a code. The list of names, contact details and respective codes will be stored separately from the rest of the collected data. The data will be stored in encrypted remote desktop of University of Oslo.

What will happen to your personal data at the end of the research project?

The study connected to the master thesis is scheduled to end in June 2019; the research project this study is part of is scheduled to end 31 of December 2020. The personal data, including any digital recordings will be anonymised at that time.

Your rights

So long as you can be identified in the collected data, you have the right to:

- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified
- receive a copy of your personal data (data portability), and
- send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

What gives us the right to process your personal data?

We will process your personal data based on your consent.

Based on an agreement with University of Oslo, NSD – The Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with data protection legislation.

Where can I find out more?

If you have questions about the project, or want to exercise your rights, contact:

- University of Oslo via Crina Damsa, by email: crina.damsa@iped.uio.no
- Our UiO Data Protection Officer: Maren Magnus Voll, by email: personvernombud@uio.no
- NSD – The Norwegian Centre for Research Data AS, by email: (personverntjenester@nsd.no) or by telephone: +47 55 58 21 17.

Yours sincerely,

Students: Monica Emhjellen & Ying Li

Supervisor: Crina Damsa

Consent form

I have received and understood information about the project *Pedagogical design and use of Canvas* and have been given the opportunity to ask questions. I give consent:

- · to participate in an interview
- · to provide access to concluded course in Canvas and the collection of screenshot capture without including student data
- · for this data to be stored after the end of the project for follow-up studies

I give consent for my personal data to be processed until the end date of the project, approx. December 2020.

(Signed by participant, date)

Appendix 5. Ethical Approval from NSD

NSD

Crina Damsa
Postboks 1092 Blindern
0317 OSLO

Vår dato: 19.07.2018   Vår ref: 61510 / 3 / AMS   Deres dato: Deres ref:

Vurdering fra NSD Personvernombudet for forskning § 31

Personvernombudet for forskning viser til meldeskjema mottatt 11.07.2018 for prosjektet:

61510	Co-design for learning in higher education
Behandlingsansvarlig	Universitetet i Oslo, ved institusjonens øverste leder
Daglig ansvarlig	Crina Damsa

Vurdering
Etter gjennomgang av opplysningene i meldeskjemaet og øvrig dokumentasjon finner vi at prosjektet er meldepliktig og at personopplysningene som blir samlet inn i dette prosjektet er regulert av personopplysningsloven § 31. På den neste siden er vår vurdering av prosjektopplegget slik det er meldt til oss. Du kan nå gå i gang med å behandle personopplysninger.

Vilkår for vår anbefaling
Vår anbefaling forutsetter at du gjennomfører prosjektet i tråd med:
•opplysningene gitt i meldeskjemaet og øvrig dokumentasjon
•vår prosjektvurdering, se side 2
•eventuell korrespondanse med oss

Vi forutsetter at du ikke innhenter sensitive personopplysninger.

Meld fra hvis du gjør vesentlige endringer i prosjektet
Dersom prosjektet endrer seg, kan det være nødvendig å sende inn endringsmelding. På våre nettsider finner du svar på hvilke endringer du må melde, samt endringsskjema.

Opplysninger om prosjektet blir lagt ut på våre nettsider og i Meldingsarkivet
Vi har lagt ut opplysninger om prosjektet på nettsidene våre. Alle våre institusjoner har også tilgang til egne prosjekter i Meldingsarkivet.

Vi tar kontakt om status for behandling av personopplysninger ved prosjektslutt
Ved prosjektslutt 31.12.2020 vil vi ta kontakt for å avklare status for behandlingen av personopplysninger.

Dokumentet er elektronisk produsert og godkjent ved NSDs rutiner for elektronisk godkjenning.

Se våre nettsider eller ta kontakt dersom du har spørsmål. Vi ønsker lykke til med prosjektet!

Marianne Høgetveit Myhren

Anne-Mette Somby

Kontaktperson: Anne-Mette Somby tlf: 55 58 24 10 / anne-mette.somby@nsd.no

Vedlegg: Prosjektvurdering

Personvernombudet for forskning

Prosjektvurdering - Kommentar

VURDERING

Den 20. juli trer EUs personvernfordning, samt den nye norske personopplysningsloven, i kraft. Prosjektet ditt er imidlertid vurdert etter dagens personopplysningslov, ettersom prosjektet ble meldt inn før det nye regelverket begynner å gjelde. Etter dagens lovverk har ditt prosjekt behandlingsgrunnlag i samtykke, jf. personopplysningsloven § 8 første ledd, og er vurdert av personvernombudet med hjemmel i personopplysningsloven § 31.

Vi har i tillegg vurdert at informasjonsskrivet og samtykkeskjemaet ditt har noen mangler :
- Navn og kontaktinformasjon til personvernombudet for forskning (NSD) må oppdateres. Se våre nettsider:www.nsd.no
- Vi anbefaler at dere benytter vår nye mal for informasjonsskriv som dere kan finne her:
http://www.nsd.uib.no/personvernombud/hjelp/informasjon_samtykke/index.html

Revidert informasjonsskriv kan sendes til personvernombudet@nsd.no før det tas i bruk.

Dersom dere retter opp feil og benytter ny mal for informasjonsskriv kan dere fylle kravene til et informert samtykke også etter det nye regelverket. Det er derfor vår oppfatning at dere vil ha gyldig behandlingsgrunnlag i utvalgets samtykke når det nye regelverket trer i kraft 20. juli, da i medhold av personvernforordningen artikkel 6 nr. 1, bokstav a.

DATASIKKERHET

Personvernombudet legger til grunn at forsker etterfølger Universitetet i Oslo sine interne rutiner for datasikkerhet.

PROSJEKTSLUTT OG ANONYMISERING

Forventet prosjektslutt er 31.12.2020. Ifølge prosjektmeldingen skal innsamlede opplysninger da anonymiseres. Anonymisering innebærer å bearbeide datamaterialet slik at ingen enkeltpersoner kan gjenkjennes. Det gjøres ved å:
- slette direkte personopplysninger (som navn/koblingsnøkkel)
- slette/omskrive indirekte personopplysninger (identifiserende sammenstilling av bakgrunnsopplysninger som f.eks. bosted/arbeidssted, alder og kjønn)
- slette digitale lydopptak

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