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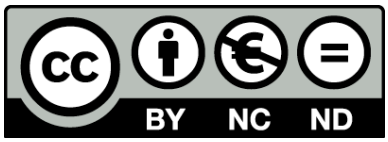
Motivation and Engagement in Digital Learning Environments, at a Post-Secondary Level

Ina Ghita



Motivation and Engagement in Digital Learning Environments, at a Post-Secondary Level

Tesis doctoral

Presentada por: Ina Ghita

Director: José Luis Rodríguez Illera

Facultad de Educación

Departamento de Teoría e Historia de la Educación

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Dedication

To the Giants of many kinds.

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Abstract

The field of digital learning has rapidly evolved during the last seventy years, from initially being mostly concerned with how machines could help humans learn, to now putting the student at the centre of learning and aiming to understand phenomena that impact the success of students. However, there is little research today on how the design of the digital learning environments uses motivation and engagement to shape students' thinking and prepare them for becoming critically thinking, participative, motivated members of society.

Digital students have specific needs and face challenges that have to do with the lack of direct human contact, mediation of communication, asynchronicity, as well as managing their attention and resources during study. The overarching research question of this study was: "What motivates post-secondary digital students to learn and engage with their course, peers, and instructors, in a way that supports critical thinking?".

To answer this question, a mixed methods explanatory sequential design was employed. The data was collected from a professor questionnaire (n=30), a longitudinal study consisting of two student questionnaires (n=73), and interviews, email, telephone and chat conversations with 10 of the students in the sample.

This thesis contributes to bridging the gap between aspects of motivation and engagement in digital learning environments that support critical thinking for post-secondary students, by offering a holistic view of the relationships between these factors, as students saw them. The experimental design allowed for a nuanced view of the experience of digital learning for university students. For educational practitioners, this thesis contributes to integrating the concepts of critical thinking and the practice of dialogue to motivation and engagement studies, moving research away from interventionist studies, into an integrated conceptualization of student experience in digital learning environments, where motivation, engagement and critical thinking are studied together.

Keywords: digital learning; student motivation; student engagement; critical thinking; dialogue; social learning; digital learning environments

Abstract

El campo del aprendizaje digital ha evolucionado rápidamente durante los últimos setenta años, desde inicialmente estar enfocado en cómo las máquinas podrían ayudar a los humanos a aprender, hasta hoy en día poner al estudiante en el centro del aprendizaje, con el objetivo de comprender los fenómenos que afectan su experiencia y éxito. Sin embargo, hoy en día, la investigación sobre como el diseño de los entornos de aprendizaje digital afecta la motivación y el compromiso para moldear el pensamiento de los estudiantes y los prepara para convertirse en miembros de la sociedad dotados de pensamiento crítico, participativos y motivados, es limitada.

Los estudiantes digitales tienen necesidades específicas y enfrentan desafíos que tienen que ver con la falta de contacto humano directo, la mediación de la comunicación, la asincronicidad, así como la gestión de su atención y recursos durante el estudio. La pregunta de investigación general de este estudio ha sido: "¿Qué motiva a los estudiantes digitales postsecundarios a aprender e interactuar con su curso, compañeros, e instructores, de una manera que apoye el pensamiento crítico?".

Para responder a esta pregunta, se ha empleado un diseño secuencial explicativo de métodos mixtos. Los datos se han recolectado a partir de un cuestionario con profesores (n=30), un estudio longitudinal empleando dos cuestionarios con estudiantes digitales (n = 73) y entrevistas, correos electrónicos, conversaciones telefónicas y de chat con 10 de los estudiantes de la muestra.

Esta tesis contribuye a cerrar la brecha entre los aspectos de la motivación y el compromiso en los entornos de aprendizaje digital que apoyan el pensamiento crítico para los estudiantes postsecundarios, al ofrecer una visión holística de las relaciones entre estos factores, tal como los veían los estudiantes. El diseño de la investigación ha permitido una visión más detallada de la experiencia del aprendizaje digital para estudiantes universitarios. Para los profesionales de la educación, esta tesis contribuye a integrar los conceptos de pensamiento crítico y la práctica del diálogo con los estudios de motivación y compromiso, alejando la investigación de los estudios intervencionistas, hacia una conceptualización integrada de la experiencia del estu-

diante en entornos digitales de aprendizaje, donde la motivación, el compromiso y el pensamiento crítico se estudian juntos.

Palabras clave: aprendizaje digital; motivación del estudiante; participación de los estudiantes; pensamiento crítico; diálogo; aprendizaje social; entornos de aprendizaje digital

Abstract

Le domaine de l'apprentissage numérique a rapidement évolué au cours des soixante-dix dernières années, passant d'une préoccupation initiale principalement à la manière dont les machines pourraient aider les humains à apprendre, à maintenant placer l'étudiant au centre de l'apprentissage et visant à comprendre les phénomènes qui ont un impact sur la réussite des étudiants. Cependant, il existe aujourd'hui peu de recherches sur la manière dont la conception des environnements d'apprentissage numériques utilise la motivation et l'engagement pour façonner la pensée des élèves et les préparer à devenir des membres de la société à la pensée critique, participatifs et motivés.

Les étudiants numériques ont des besoins spécifiques et font face à des défis liés au manque de contact humain direct, à la médiation de la communication, à l'asynchronisme, ainsi qu'à la gestion de leur attention et de leurs ressources pendant leurs études. La question de recherche primordiale de cette étude était la suivante: «Qu'est-ce qui motive les étudiants de niveau postsecondaire numériques à apprendre et à s'engager avec leur cours, leurs pairs et leurs instructeurs, d'une manière qui soutient la pensée critique?».

Pour répondre à cette question, une conception séquentielle explicative à méthodes mixtes a été utilisée. Les données ont été collectées à partir d'un questionnaire destiné aux professeurs (n = 30), une étude longitudinale composée de deux questionnaires étudiants (n = 73) et d'entretiens, d'e-mails, de conversations téléphoniques et de chat avec 10 des étudiants de l'échantillon.

Cette thèse contribue à combler le fossé entre les aspects de la motivation et de l'engagement dans les environnements d'apprentissage numériques qui soutiennent la pensée critique des étudiants de niveau postsecondaire, en offrant une vision holistique des relations entre ces facteurs, tels que les étudiants les voyaient. La conception expérimentale a permis une vision nuancée de l'expérience d'apprentissage numérique pour les étudiants universitaires. Pour les praticiens de l'éducation, cette thèse contribue à intégrer les concepts de la pensée critique et de la pratique du dia-

logue aux études de motivation et d'engagement, en éloignant la recherche des études interventionnistes, dans une conceptualisation intégrée de l'expérience des étudiants dans des environnements d'apprentissage numérique, où motivation, engagement et critique la pensée est étudiée ensemble.

Mots-clés : apprentissage numérique ; la motivation des étudiants ; Engagement étudiant ; Esprit critique ; dialogue ; apprentissage social ; environnements d'apprentissage numériques

Chapter 1

Introduction

Once available only to elites, today, traditional academic education resources are still limited by teacher and student time, or the number of available University seats, yet the need for university-level education is continuously growing inside and outside the academic world. Post-graduate level digital learning seems to be the solution, as increasingly more Universities are offering post-secondary digital learning options, where students can access the same curriculum and learning experience as their colleagues who undertake similar studies in traditional environments.

Digital learning increases accessibility to sources for a greater variety of students, it may require fewer instructional resources long-term when the educational content is recorded and reused (Goldberg & McKhann, 2000) and brings with itself tools that allow researchers to visualize, manipulate and analyse data that can be used to detect students who are struggling with the course material, who are at risk of dropping out and who might need additional resources and attention (Wolff, Zdrahal, Nikolov, & Pantucek, 2013).

The Coronavirus pandemic turned digital education into a must-have solution for crisis situations, when face to face social contact can be extremely dangerous. But just because digital technology allows us to communicate synchronously, it does not mean that what works well in traditional environments will have the same effects in digital spaces.

Even though still young, an adolescent, the field of digital education has rapidly evolved, from initially being more concerned with how machines could learn (Turing, 1950) than how machines could help humans learn, to concerns about how humans could learn better (de Jong, 2010) (and thus be more like machines). In time, it evolved to understanding how feelings and moods influenced learning, (Baker, D'Mello, Rodrigo, & Graesser, 2010, Desmarais & Baker, 2012), to improving students computer learning skills, to modern digital learning research, in which the student is at the centre of learning and the focus of research is to understand how phenomena like engagement, learning styles, motivation, time management, social learning, all impact the success of students.

However, there is little research today on how the design of digital learning environments uses motivation and engagement to shape students' thinking and prepare them for becoming critically thinking, participative, motivated members of society. Very few studies approach modern digital learning beyond the tactical, the interventionist, the very specific, very localized, very tool-focused way of looking at the ways post-secondary students engage, are motivated and learn critically in digital learning environments (DLEs).

In digital learning, as we will see in the next chapter, students face learning challenges that significantly impact their chances to successfully complete a digital course. Some of these challenges are also present in face to face learning, but are exacerbated in digital environments, others are specific to digital learners, such as creating real human connection, building trust, building community and a sense of belonging (Carr, 2000, Diaz, 2002, Bocchi, Eastman, & Swift, 2004, Bolliger, 2004b, Holder, 2007a). Other challenges of digital students are the ability to feel "seen" by their instructors and peers, not just a name, or a profile photo. It is immensely more difficult to generate and engage in true dialogue in a digital environment that in a face to face space.

Since digital learning is often more standardized than traditional learning, with fewer synchronous discussions and fewer exchanges altogether between peers and between student and instructor, the danger of learning for the test is even grater

than in face to face environments.

Because digital students tend to have more socioeconomic and time constraints than traditional students (Haythornthwaite, 2007, Journell, 2007, Peña-López, 2010, Kumar & Dawson, 2018), it is important that digital post-secondary students also learn to think critically and that the university education digital students get the same quality of learning as traditional students do.

For students living in the era of fake news, posttruth [1] (McIntyre, 2018) and deep-fakes, in which critical thinking is suppressed and the individual is left at the mercy of thought influencers and leaders who might not have their best interest at heart, critical thinking is an essential tool they need to navigate the world and the democratic societies they live in.

History has taught us again and again what happens when fear and silence take over societies. It has shown us what happens to the individual inside the mass (Le Bon, 2009), its individual force and meaning disappearing as it is taken over by the mass. Yet history has also shown us how only one person can be the giant force behind positive change. We all have a voice and that voice is able to drive positive change for many, and the mind behind that voice needs constant training, constant contact with the realities of others. In the same way that democracy dies in darkness, positive change dies in silence.

In a society in which we are all time-poor, and our patience is short, in a society in which we aim to continuously optimize our efforts in order to increase productivity, dialogue is a luxury. And specifically because true dialogue, as Freire (1972) saw it, is so difficult to achieve in digital learning environments, it is of utmost importance to better understand how it happens, where it happens and whether it actually happens at all.

Motivation, engagement and critical thinking are important, interconnected parts

[1] The concept of post-truth became one of public concern in 2016, when it was named word of the year by the Oxford Dictionary. Post truth relates to an era where critical thinking is suppressed and fact becomes of secondary importance or no importance at all, a circumstance in which objective facts become less influential in shaping public opinion, and they are replaced by appeals to emotion and belief. The prefix "post" gives a sense that truth has been made irrelevant

of the human learning mechanism. In my research, even though there is extensive literature on digital learning environments and motivation, I could not find enough support for the kind of relationship I was interested in understanding better: and that was engagement and motivation in higher education students learning digitally, through the lens of critical thinking. There is very little research on specifically this way of understanding critical thinking, motivation and engagement and the digital environment as a close-tied construct, as opposed to looking at different stand-alone elements of digital learning.

1.0.1 Purpose statement and research questions

The purpose of this study was to better understand what motivates students to learn and engage with the educational content, their peers and their instructor in digital learning environments and how their digital learning environment was supporting them to think critically and engage with others. I also aimed to better understand how students perceived their level of critical thinking in a digital learning environment and whether a student's self reported motivation, level of engagement and critical thinking changed in time, as they progressed through their courses.

This research was focused around one main research question and five sub-questions. The overarching research question was: "What motivates post-secondary digital students to learn and engage with their course, peers and instructors, in a way that supports critical thinking?". I broke this down further, into four sub-questions:

1. What are the opinions of professors teaching in digital learning environments (DLE) about the challenges that digital students face compared to traditional students, and to what extent do they believe their DLE, peers and instructors, can motivate them to think critically?

2. To what extent do digital students report to be motivated and intellectually stimulated?

3. How do they use their DLE: how easy or difficult do they find using it, and which are the features they use most?

4. What are the relationships between motivation, engagement and critical thinking for post-secondary digital students?

5. What are some themes and stories of motivated and critically engaged post-secondary digital students?

The research design of this study was based on Crotty's (1998) framework, the epistemology used to inform this study is constructivism, the main theoretical perspective is critical theory, the research methodology is survey methodology and the methods used are questionnaires and interviews.

This study made use of both quantitative and qualitative methods. The first part of this study included a teacher survey (n=30), aimed at gauging teacher beliefs and assumptions about digital learning, digital students and what motivated them and engages to think critically. The purpose of this study was to complement my limited teaching experience at University level and make sure that I can embed these ideas that come from practice and experience into my study.

The second part of the analysis was composed of two students surveys, one administered at the beginning of the school year (n=44) and the second at the end of the first semester (n=29), to the same participants, students who learn digitally at an official university, enrolled in undergraduate and postgraduate education.

A third part of the study included individual semi-structured interviews with students who had previously completed the questionnaire and had agreed to be contacted for further clarifications.

1.1 Main concepts and topics of the thesis

The main literature and theories that make the conceptual framework of this thesis are centered around the areas of motivation, engagement and critical thinking in relation to learning in digital environments. In conducting the literature review, I considered research from a range of areas, including education, psychology, game studies and game design.

Motivation, engagement and critical thinking are rooted in learning theory.

Learning is the process of knowledge construction (Vos, Van Der Meijden, & Denessen, 2011), built by the learner herself, through practice and reflection. Learning is unpredictable and transformative and it cannot be "designed"(Wenger, 1998). It is an active process, shaped by the learner's experiences and interpretations of the world (Howland, Jonassen, Marra, & Moore, 2003). Learning can be superficial and short term (Bloom, 1968) or deep and involving critical effort (Vos et al., 2011). Learning is authentic when the learner is engaged in a realistic task (Herrington, Reeves, & Oliver, 2009).

Digital learning, also called e-learning or online learning, describes the area of study in education that concerns itself with learning that happens outside the realm of the traditional face-to-face classroom. A digital learning environment (DLE) is "any learning environment where electronic media are used as a component of an instructional delivery system" (J. Keller & Suzuki, 2004).

1.1.1 Motivation, the driver of action

Motivation is an important component of the complex context that empowers a student to learn effectively. To be motivated is to be driven towards an action, and motivation is the invisible force moving us towards an objective, the psychological construct driving an individual's choice of behaviour, the intensity of that behaviour, the latency and persistence of behaviour (Graham & Weiner, 1996).

According to Ryan and Deci (2010), to be motivated is to be moved to perform an action or engage in an activity. The authors distinguished between intrinsic and extrinsic motivation: motivation that comes from within, aligned with individual interest and curiosity and extrinsic motivation, driven by the context in which the individual is situated. If we were to visualize motivation as a pair of vectors, the force vector corresponding to intrinsic motivation would point outwards from the individual to the environment, while the extrinsic force vector would point from the environment towards the individual. There are many theories of motivation in

education, the most popular today being: expectancy theory, the ARCS model, and self-determination theory, all which I present, in more detail, in the next chapter.

1.1.2 Student engagement in DLEs

In education, student engagement refers to the cognitive process, active participation and emotional involvement of an individual during a particular learning task (Pellas, 2014). It is the interaction between the time, effort and other resources students invest in order to enhance their learning (Trowler, 2010).

There are four types of digital learning engagement: intense, collaborative, independent and passive. (Coates, 2007) and three main dimensions: first, the individual dimension of engagement, which is student-centered and concerned with individual learning, second, the process dimension, concerned with structures and processes that lead to student engagement, such as representation and feedback and third, the identity dimension, concerned with the ways in which students may feel a sense of belonging (Trowler, 2010).

An important part of the literature regarding engagement in DLEs borrows from the areas of engagement in video-games and gamification. One of the reasons why users exert such tremendous levels of engagement with these environments is that they manage to satisfy their needs of autonomy, competence and relatedness (Deci & Ryan, 1985). Ryan, Rigby, and Przybylski (2006).

While game-based learning is extremely useful in creating digital learning experiences that motivate and engage users, for the scope of this thesis I wanted to look outside the realm of video-game inspired digital learning and look at the ways in which digital learning environments can motivate and engage students to support their critical thinking. Being concerned with the ways in which humanities help drive the habits of the mind necessary for thriving and participating in democratic societies in my past work (Ghita, 2016), I have used Deweyan inquiry as a framework for better understanding motivation and engagement in digital environments.

Dewey (1997, 1916b, 1964, 2003), regarded today as one of the most prominent

scholars in educational reform, had very progressive ideas about education that were going against the popular educational ideas of the era. Dewey believed that students who interacted with the environment in order to learn were more successful that student who did not have the same learning by doing experience

1.1.3 Critical thinking and critical pedagogy

In this thesis, I conceptualized critical thinking in a constructivist approach (Laurillard et al., 2013). Critical thinking is related to help-seeking, which is a valuable learning strategy that helps graduate students studying in digital learning environments to successfully achieve their learning goals (Dunn, Rakes, & Rakes, 2014). Critical thinking is the sum of all mental processes, strategies and representations people use to solve problems, make decisions, and learn new concepts (Sternberg, 1986). It is the "capacity to work with complex ideas whereby a person can make effective provision of evidence to justify a reasonable judgement" (Moon, 2007).

The father of critical pedagogy, Freire defined critical thinking as the "manner of thinking which continually revises itself"(Freire, 1971). He saw it as a tool for self-determination and civic engagement, a way of thinking that recognizes reality as a transformative process, rather than a static construct. Freire, particularly in his book, Pedagogy of the Oppressed (Freire, 2018), stressed the importance of the presence of true dialogue in education. Freire believed that education should reflect and promote the democratic ideals of participation, for both students and teachers (Kester & Booth, 2010). He believed that any human being, no matter how "ignorant", was capable of looking at the world critically, in a dialogical encounter with others. Through this process, the old paternalistic teacher-student relationship could be overcome.

Critical pedagogy gives education the task to offer students the tools and habits of the mind necessary for thinking critically and for actively and constantly questioning and negotiating between theory, practice and the beliefs of the society they live in.

1.2 Thesis scope

The purpose of this study was to better understand what motivates students to learn and engage with the educational content, their peers and their instructor in digital learning environments and how their digital learning environment was supporting them to think critically and engage with others.

The population I studied were university students learning digitally at two public universities in Barcelona, Spain, from the start of the academic year to the end of their second trimester. A secondary population of study was comprised of university professors who taught digitally, at universities from Europe, North America and South America.

Under the lens of critical theory, I was interested to better understand how digitally-based and digitally-enhanced university education would affect students' critical thinking, how it was engaging them and whether these engagements were motivating them to learn.

While the complex concept of power in education was outside the scope of this thesis, I believe that indeed technology is not neutral, and that DLEs, with their pre-defined and often rigid structures, deeply affect and shape the learning experience.

1.3 Thesis outline

This dissertation is organized according to the following structure:

Chapter 2 presents the conceptual framework of this study, describing the theoretical lenses guiding this research and creating the foundation for this holistic study of motivation, engagement and critical thinking in DLEs. The chapter outlines the main literature and theories in the areas of motivation, engagement and critical thinking in relation to learning in digital environments. It defines and gives a succinct overview of learning, digital learning, as well as the relationships between learning and teaching and instructional design. In this chapter, I explore the areas of motivation in education and synthesize the main concepts of motivation in

DLEs. I briefly present the main concepts and theories used in this research to conceptualize engagement and present considerations for engagement in DLEs. I identify the foundations conceptualizing critical thinking and dialogue and examine critical thinking in DLEs. A final section brings together the relationship between motivation, engagement and critical thinking in DLEs.

Chapter 3 describes the methodology and theoretical consideration for data collection and analysis. The first section states the investigated problem and the purpose of research, as well as the main research questions of the study. A second part of the chapter presents the research framework and the reasons behind using a mixed methods research design and the research paradigm. Third, I describe the data collection instruments used in this study, while in the fourth section I describe the data collection process, the validity and reliability of the instruments as well as the ethical considerations of the study.

In chapter 4, I report the findings of the study based on the quantitative and qualitative analysis of the data I have generated from the research, which consisted of a quantitative analysis of one professor questionnaire and two student questionnaires applied to the same sample, at the beginning and end of an academic trimester, and the qualitative analysis of the open-ended questions in the student questionnaires, as well as semi-structured student interviews.

Chapter 5 presents the conclusions of this study and brings forward final conclusions and reflections on the relationships between the main phenomena described in this study, discusses limitations and suggests new lines of research for the area of study.

Chapter 2

Introducción

Una vez disponibles solo para las élites, hoy en día, los recursos de educación académica tradicionales todavía están limitados por el tiempo de los maestros y los estudiantes, o el número de plazas universitarias disponibles. Sin embargo, la necesidad de educación a nivel universitario está creciendo continuamente dentro y fuera del mundo académico. El aprendizaje digital en el ámbito de posgrado parece ser la solución, ya que cada vez más universidades ofrecen opciones de aprendizaje digital postsecundario, donde los estudiantes pueden acceder al mismo plan de estudios y experiencia de aprendizaje que sus colegas que realizan estudios similares en entornos tradicionales.

El aprendizaje digital aumenta la accesibilidad a las fuentes para una mayor variedad de estudiantes, puede requerir menos recursos educativos a largo plazo cuando el contenido educativo se graba y se reutiliza (Goldberg & McKhann, 2000) y trae consigo herramientas que permiten a los investigadores visualizar, manipular y analizar datos que se puede utilizar para detectar a los estudiantes que tienen dificultades con el material del curso, que corren el riesgo de abandonar y que pueden necesitar recursos y atención adicionales (Wolff et al., 2013).

La pandemia del coronavirus ha convertido la educación digital en una solución imprescindible para situaciones de crisis, cuando el contacto social cara a cara puede ser extremadamente peligroso. Pero el hecho de que la tecnología digital nos permita

comunicarnos sincrónicamente, no significa que lo que funciona bien en entornos tradicionales tenga los mismos efectos en los espacios digitales.

Aunque todavía es joven, un adolescente, el campo de la educación digital ha evolucionado rápidamente, de estar inicialmente más enfocado en cómo las máquinas podrían aprender (Turing, 1950), después em cómo las máquinas podrían ayudar a los humanos a aprender, a preocupaciones sobre cómo los humanos podrían aprender mejor (de Jong, 2010) (y por lo tanto ser más como máquinas). Hoy en día los investigadores del campo sitùan al estudiante en el centro del aprendizaje y quieren comprender cómo los sentimientos y estados de ánimo afectan el aprendizaje (Baker et al., 2010, Desmarais & Baker, 2012), cómo fenómenos como el compromiso, los estilos de aprendizaje, la motivación, la gestión del tiempo, el aprendizaje social, todos impactan el éxito de los estudiantes.

Sin embargo, hoy en día hay poca investigación sobre cómo el diseño de los entornos de aprendizaje digital utiliza la motivación y el compromiso para moldear el pensamiento de los estudiantes y prepararlos para convertirse en miembros de la sociedad dotados de pensamiento crítico, participativos y motivados. Muy pocos estudios abordan el aprendizaje digital moderno más allá de lo táctico, el intervencionista, la forma muy específica, muy localizada y muy centrada en las herramientas de ver las formas en que los estudiantes postsecundarios se involucran, están motivados y aprenden críticamente en entornos de aprendizaje digital (EAD).

En el aprendizaje digital, como veremos en el próximo capítulo, los estudiantes enfrentan desafíos de aprendizaje que impactan significativamente sus posibilidades de completar con éxito un curso digital. Algunos de estos desafíos también están presentes en el aprendizaje cara a cara, pero se agravan en los entornos digitales, otros son específicos para los estudiantes digitales, como crear una conexión humana real, generar confianza, construir una comunidad y un sentido de pertenencia (Carr, 2000 , Diaz, 2002, Bocchi et al., 2004, Bolliger, 2004b, Holder, 2007a). Otros desafíos de los estudiantes digitales son la capacidad de sentirse "vistos" por sus instructores y compañeros, no solo por un nombre o una foto de perfil. Es inmensamente más difícil generar y entablar un verdadero diálogo en un entorno digital que en un

espacio cara a cara.

Dado que el aprendizaje digital es a menudo más estandarizado que el aprendizaje tradicional, habrá menos conversaciones sincrónicas y menos intercambios entre compañeros de clase y entre alumno e instructor, el peligro de aprender para la prueba es aún mayor que en los entornos cara a cara.

Debido a que los estudiantes digitales tienden a tener más limitaciones socioeconómicas y de tiempo que los estudiantes tradicionales (Haythornthwaite, 2007, ?, ?, Peña-López, 2010, Kumar & Dawson, 2018), es importante que los estudiantes postsecundarios digitales también aprendan pensar críticamente y que los estudiantes digitales de educación universitaria obtengan la misma calidad de aprendizaje que los estudiantes tradicionales.

Para los estudiantes que viven en la era de las noticias falsas, la postverdad y las falsificaciones profundas, en la que se suprime el pensamiento crítico y el individuo queda a merced de los influyentes del pensamiento y los líderes que pueden no tener su mejor interés en el corazón, el pensamiento crítico es una herramienta esencial para navegar el mundo y ser parte activa de las sociedades democráticas en las que viven.

La historia nos ha enseñado una y otra vez lo que sucede cuando el miedo y el silencio se apoderan de las sociedades. Nos ha mostrado lo que le sucede al individuo cuando (Le Bon, 2009) su fuerza individual y su significado desaparecen, al estar asumidos por la masa. Sin embargo, la historia también nos ha mostrado cómo solo una persona puede ser la fuerza gigante detrás del cambio positivo. Todos tenemos una voz y esa voz puede impulsar un cambio positivo para muchos. La mente detrás de esa voz necesita un entrenamiento constante, un contacto constante con las realidades de los demás. De la misma manera que la democracia muere en la oscuridad, el cambio positivo muere en el silencio.

En una sociedad en la que todos somos pobres de tiempo y nuestra paciencia es corta, en una sociedad en la que nuestro objetivo es optimizar continuamente nuestros esfuerzos para aumentar la productividad, el diálogo es un lujo. Y específicamente

porque el verdadero diálogo, en la concepción de Freire (1972), es tan difícil de lograr en entornos de aprendizaje digital, es de suma importancia comprender mejor cómo sucede, dónde ocurre y si realmente sucede.

La motivación, el compromiso y el pensamiento crítico son partes importantes e interconectadas del mecanismo de aprendizaje humano. En mi investigación, a pesar de que existe una extensa literatura sobre los entornos de aprendizaje digital y la motivación, no pude encontrar suficiente apoyo para el tipo de relación que estaba interesada en comprender mejor: el compromiso y la motivación en los estudiantes de educación superior que aprenden digitalmente, a través del lente del pensamiento crítico. Hay muy poca investigación específicamente sobre esta forma de entender el pensamiento crítico, la motivación y el compromiso y el entorno digital como una construcción estrechamente vinculada, en lugar de mirar diferentes elementos independientes del aprendizaje digital.

2.0.1 Declaración de propósito y preguntas de investigación

El propósito de este estudio fue comprender mejor qué motiva a los estudiantes a aprender e involucrarse con el contenido educativo, sus compañeros y su instructor en entornos de aprendizaje digital y cómo su entorno de aprendizaje digital los estaba apoyando para pensar críticamente e interactuar con los demás. También pretendía comprender mejor cómo los estudiantes percibían su nivel de pensamiento crítico en un entorno de aprendizaje digital y si la motivación, el nivel de compromiso y el pensamiento crítico autoinformados de un estudiante cambiaban con el tiempo, a medida que avanzaban en sus cursos.

Esta investigación se ha centrado en torno a una pregunta principal de investigación y cinco subpreguntas. La pregunta de investigación general es: "¿Qué motiva a los estudiantes digitales postsecundarios a aprender e interactuar con su curso, compañeros e instructores, de una manera que apoye el pensamiento crítico?". He desglosado la pregunta aún más, en cuatro subpreguntas:

1. ¿Cuáles son las opiniones de los profesores que enseñan en entornos de apren-

dizaje digital sobre los desafíos que enfrentan los estudiantes digitales en comparación con los estudiantes tradicionales, y en qué medida creen que sus EAD, compañeros e instructores pueden motivarlos a pensar críticamente?

2. ¿En qué medida los estudiantes digitales informan estar motivados y estimulados intelectualmente?

3. ¿Cómo usan su EAD? ¿Qué tan fácil o difícil les resulta usarlo y cuáles son las funciones que más usan?

4. ¿Cuáles son las relaciones entre la motivación, el compromiso y el pensamiento crítico para los estudiantes digitales postsecundarios?

5. ¿Cuáles son algunos temas e historias de estudiantes digitales postsecundarios motivados y comprometidos de forma crítica?

El diseño de investigación de este estudio se hizo con base en el marco de (1998) de Crotty, la epistemología utilizada para informar este estudio es el constructivismo, la perspectiva teórica principal es la teoría crítica, la metodología de investigación es la metodología de encuestas y los métodos utilizados son cuestionarios y entrevistas.

Este estudio ha utilizado métodos tanto cuantitativos como cualitativos. La primera parte de este estudio ha incluido una encuesta a profesores (n = 30), dirigida a medir las creencias y suposiciones de los profesores sobre el aprendizaje digital, los estudiantes digitales y lo que los motiva y compromete a pensar críticamente. El propósito de este primer estudio ha sido complementar mi limitada experiencia docente a nivel universitario y asegurarme de que puedo incorporar estas ideas, que provienen de la práctica y la experiencia, en mi estudio.

La segunda parte del análisis ha estado compuesta por dos encuestas a estudiantes, una administrada al inicio del año escolar (n = 44) y la segunda al final del primer semestre (n = 29), a los mismos participantes, estudiantes que aprender digitalmente en una universidad oficial, matriculados en cursos de pregrado y posgrado.

Una tercera parte del estudio ha consistido en entrevistas individuales semiestructuradas con estudiantes que habían completado previamente el cuestionario y habían aceptado ser contactados para obtener más aclaraciones.

2.1 Principales conceptos y temas de la tesis

La principal literatura y teorías que forman el marco conceptual de esta tesis se centran en las áreas de motivación, compromiso (engagement) y pensamiento crítico en relación con el aprendizaje en entornos digitales. Al realizar la revisión de la literatura, he considerado la investigación de una variedad de áreas, incluyendo las areas de la educación, psicología, los estudios de juegos y el diseño de juegos.

La motivación, el compromiso y el pensamiento crítico están arraigados en la teoría del aprendizaje.

El aprendizaje es el proceso de construcción del conocimiento (Vos et al., 2011), construido por el propio alumno, a través de la práctica y la reflexión. El aprendizaje es impredecible y transformador y no se puede "diseñar" (Wenger, 1998). Es un proceso activo, moldeado por las experiencias e interpretaciones del mundo del alumno (Howland et al., 2003). El aprendizaje puede ser superficial y de corto plazo (Bloom, 1968) o profundo e implicar un esfuerzo crítico (Vos et al., 2011). El aprendizaje es auténtico cuando el alumno participa en una tarea realista (Herrington et al., 2009).

El aprendizaje digital, también llamado e-learning o aprendizaje en línea, describe el área de estudio en educación que se ocupa del aprendizaje que ocurre fuera del ámbito del aula presencial tradicional. Un entorno de aprendizaje digital (EAD) es “cualquier entorno de aprendizaje donde los medios electrónicos se utilizan como un componente de un sistema de impartición de instrucción (J. Keller & Suzuki, 2004).

2.1.1 Motivación, el motor de la acción

La motivación es un componente importante del contexto complejo que permite al estudiante aprender de manera efectiva. Estar motivado es ser impulsado hacia una

acción, y la motivación es la fuerza invisible que nos mueve hacia un objetivo, el constructo psicológico que impulsa la elección del comportamiento de un individuo, la intensidad de ese comportamiento, la latencia y persistencia del comportamiento (Graham & Weiner, 1996).

Según Ryan y Deci (2010), estar motivado es estar en movimiento para realizar una acción o participar en una actividad. Los autores distinguieron entre motivación intrínseca y extrínseca: la motivación que viene desde adentro, alineada con el interés y la curiosidad individual y la motivación extrínseca, impulsada por el contexto en el que se encuentra el individuo. Si tuviéramos que visualizar la motivación como un par de vectores, el vector de fuerza correspondiente a la motivación intrínseca apuntaría hacia afuera desde el individuo hacia el ambiente, mientras que el vector de fuerza extrínseca apuntaría desde el ambiente hacia el individuo. Existen muchas teorías de la motivación en la educación, siendo las más populares en la actualidad: la teoría de la expectativa, el modelo ARCS y la teoría de la autodeterminación, todas las cuales presento, con más detalle, en el próximo capítulo.

2.1.2 Participación de los estudiantes en los EAD

En educación, el compromiso del estudiante se refiere al proceso cognitivo, la participación activa y el involucramiento emocional de un individuo durante una tarea de aprendizaje particular (Pellas, 2014). Es la interacción entre el tiempo, el esfuerzo y otros recursos que los estudiantes invierten para mejorar su aprendizaje (Trowler, 2010).

Hay cuatro tipos de participación en el aprendizaje digital: intenso, colaborativo, independiente y pasivo. (Coates, 2007) y tres dimensiones principales: primero, la dimensión individual del compromiso, que se centra en el alumno y se preocupa por el aprendizaje individual; segundo, la dimensión del proceso, que se ocupa de las estructuras y procesos que conducen al compromiso del alumno, como la representación y retroalimentación, y tercero, la dimensión de identidad, relacionada con las formas en que los estudiantes pueden sentir un sentido de pertenencia (Trowler, 2010)

Una parte importante de la literatura sobre la participación en los EAD se basa en las áreas de participación en los videojuegos y gamificación. Una de las razones por las que los usuarios ejercen niveles tan tremendos de participación en estos entornos es que logran satisfacer sus necesidades de autonomía, competencia y afinidad (Deci & Ryan, 1985). Ryan et al. (2006). En entornos virtuales, la presencia es la ilusión de no mediación (Lombard & Ditton, 1997).

Si bien el aprendizaje basado en juegos es extremadamente útil para crear experiencias de aprendizaje digital que motivan e involucran a los usuarios, para el alcance de esta tesis, quería mirar fuera del ámbito del aprendizaje digital inspirado en los videojuegos y ver las formas en que los entornos de aprendizaje digital pueden motivar e involucrar a los estudiantes de una manera que apoye su pensamiento crítico. Preocupado por las formas en que las humanidades ayudan a impulsar los hábitos mentales necesarios para prosperar y participar en sociedades democráticas en mi anterior trabajo de master (Ghita, 2016), he utilizado la investigación de Dewey como un marco para comprender mejor la motivación y el compromiso en entornos digitales.

Dewey (1997, 1916b, 1964, 2003), considerado hoy como uno de los filósofos más destacados de la reforma educativa, tenía ideas muy progresistas sobre la educación que iban en contra las ideas educativas populares de la época. Dewey creía que los estudiantes que interactuaban con el entorno para aprender tenían más éxito que los estudiantes que no tenían el mismo aprendizaje al realizar la experiencia.

2.1.3 Pensamiento crítico y pedagogía crítica

En esta tesis, he conceptualizado el pensamiento crítico en un enfoque constructivista (Laurillard et al., 2013). El pensamiento crítico está relacionado con la búsqueda de ayuda, que es una valiosa estrategia de aprendizaje que ayuda a los estudiantes graduados que estudian en entornos de aprendizaje digital a alcanzar con éxito sus objetivos de aprendizaje (Dunn et al., 2014). El pensamiento crítico es la suma de todos los procesos, estrategias y representaciones mentales que la gente usa para resolver problemas, tomar decisiones y aprender nuevos conceptos

(Sternberg, 1986). Es la "capacidad de trabajar con ideas complejas mediante la cual una persona puede proporcionar pruebas de manera efectiva para justificar un juicio razonable" (Moon, 2007).

El padre de la pedagogía crítica, Freire ha definido el pensamiento crítico como la "manera de pensar que se revisa a sí misma continuamente" (Freire, 1971). Lo veía como el pensamiento crítico como una herramienta para la autodeterminación y el compromiso cívico, una forma de pensar que reconoce la realidad como un proceso transformador, y no una construcción estática. Freire, particularmente en su libro, Pedagogía del oprimido (Freire, 2018), ha destacado la importancia de la presencia del verdadero diálogo en la educación.

Freire creía que la educación debería reflejar y promover los ideales democráticos de participación, tanto para estudiantes como para profesores (Kester & Booth, 2010). Creía que cualquier ser humano, por "ignorante" que fuera, era capaz de mirar el mundo de manera crítica, en un encuentro dialógico con los demás. Mediante este proceso se podría superar la antigua relación paternalista profesor-alumno. La pedagogía crítica le otorga a la educación la tarea de ofrecer a los estudiantes las herramientas y hábitos mentales necesarios para pensar críticamente y para cuestionar y negociar activa y constantemente entre la teoría, la práctica y las creencias de la sociedad en la que viven.

2.2 Alcance de la tesis

El propósito de este estudio ha sido comprender mejor qué motiva a los estudiantes a aprender e involucrarse con el contenido educativo, sus compañeros y su instructor en entornos de aprendizaje digital y cómo su entorno de aprendizaje digital los estaba apoyando para pensar críticamente e interactuar con los demás.

La población que he estudiado ha sido compuesta por estudiantes universitarios que aprenden digitalmente en dos universidades públicas de Barcelona, España, desde el inicio del año académico hasta el final de su segundo trimestre. Una población de estudio secundaria ha estabdo compuesta por profesores universitarios que impartían

clases de forma digital, en universidades de Europa, América del Norte y América del Sur.

Bajo el lente de la teoría crítica, estaba interesada en comprender mejor cómo la educación universitaria digital podría afectar el pensamiento crítico de los estudiantes, cómo los atraía y si estos compromisos los motivaban a aprender.

Si bien el concepto complejo de poder en la educación está fuera del alcance de esta tesis, creo que de hecho la tecnología no es neutral y que los EAD, con sus estructuras predefinidas y a menudo rígidas, afectan profundamente y dan forma a la experiencia de aprendizaje.

2.3 Resumen de la tesis

Esta disertación está organizada según la siguiente estructura:

El Capítulo 2 presenta el marco conceptual de este estudio, describiendo los lentes teóricos que guían esta investigación y creando las bases para este estudio holístico de la motivación, el compromiso y el pensamiento crítico en los EAD. El capítulo describe la principal literatura y teorías en las áreas de motivación, compromiso y pensamiento crítico en relación con el aprendizaje en entornos digitales. Define y ofrece una descripción sucinta del aprendizaje, el aprendizaje digital, así como las relaciones entre el aprendizaje y la enseñanza y el diseño instruccional. En este capítulo, exploro las áreas de motivación en la educación y sintetizo los principales conceptos de motivación en los EAD. Presento brevemente los principales conceptos y teorías utilizados en esta investigación para conceptualizar el compromiso y presentar las consideraciones para el compromiso en los EAD. Identifico los fundamentos que conceptualizan el pensamiento crítico y el diálogo y examino el pensamiento crítico en los EAD. Una sección final reúne la relación entre motivación, compromiso y pensamiento crítico en los EAD.

El capítulo 3 describe la metodología y la consideración teórica para la recopilación y el análisis de datos. La primera sección establece el problema investigado y el propósito de la investigación, así como las principales preguntas de investigación

del estudio. Una segunda parte del capítulo presenta el marco de investigación y las razones detrás del uso de un diseño de investigación de métodos mixtos y el paradigma de investigación. En tercer lugar, describo los instrumentos de recolección de datos utilizados en este estudio, mientras que en la cuarta sección describo el proceso de recolección de datos, la validez y confiabilidad de los instrumentos, así como las consideraciones éticas del estudio.

En el capítulo 4, informo los hallazgos del estudio con base en el análisis cuantitativo y cualitativo de los datos que he generado a partir de la investigación, que consistió en un análisis cuantitativo de un cuestionario de profesor y dos cuestionarios de estudiantes aplicados a la misma muestra, en el inicio y final de un trimestre académico, y el análisis cualitativo de las preguntas abiertas en los cuestionarios estudiantiles, así como entrevistas semiestructuradas a los estudiantes.

El Capítulo 5 presenta las conclusiones de este estudio y aporto conclusiones finales y reflexiones sobre las relaciones entre los principales fenómenos descritos en este estudio, describe las limitaciones y sugiere nuevas líneas de investigación para el área de estudio.

Chapter 3

Theoretical foundation

This chapter identifies and synthesizes the main literature and theories that make the conceptual framework of this thesis. The review covers the areas of motivation, engagement and critical thinking in relation to learning in digital environments.

In conducting the literature review, I considered research from a range of areas, including education, psychology, game studies and game design. The study of all these areas required the examination of five large bodies of literature. It was necessary thus to be selective and to focus on the most relevant areas of research.

This chapter is organized around five main sections, the first exploring the main concepts and theories of learning, with a focus on digital learning. In this section I review different types of learning, a short history of learning research, as well as the relationships between learning, teaching and instructional design.

The second section explores motivation in education, synthesizes the main theories of education used in this thesis, and reflects on motivation in DLEs.

A third section defines engagement, briefly reviews the main concepts and theories used in this research and presents considerations for engagement in DLEs.

A fourth section identifies the foundations conceptualizing critical thinking, presents and reflect on the importance of dialogue, and examines critical thinking in DLEs.

A final section brings together the relationship between motivation, engagement and critical thinking in DLEs.

3.1 Human learning

Since all sections regarding motivation, engagement and critical thinking are rooted in learning theory, I will first define learning and explore its main characteristics, then situate this study within the learning theory that informs this thesis. I will then describe some aspects of digital learning that make it different from face to face learning which will delineate the main concerns of this thesis.

3.1.1 Definitions of learning

There are many conceptions of learning: learning as a biochemical activity in the brain, as a change in behaviour, as information processing. Learning is defined as remembering and recalling, it requires thinking skills and knowledge construction and drives conceptual and contextual changes by "tuning perceptions to environmental affordances" (Howland et al., 2003). Social constructivists see learning as social negotiation, arguing that meaning making is rarely accomplished individually; that it is in fact a process of dialogue and conversation and that it is inherently social (Duffy & Cunningham, 1996).

From a constructivist point of view, learning is defined as the process of knowledge construction, with an emphasis on active and self-regulated learning (Vos et al., 2011). Constructivists believe one cannot convey understanding – it can only be constructed by the learner herself, through activity (R. Martens, Bastiaens, & Kirschner, 2007a). "Learning cannot be designed, ultimately it belongs to the realm of experience and practice" (Wenger, 1998).

Learning is unpredictable and transformative. It is an active process, shaped by the learner's experiences and interpretations of the world (Howland et al., 2003). Benjamin Bloom (1968) was the first to theorize learning on a five point scale that qualified learning from superficial (copying, memorizing) to complex or deep learn-

ing (analysis, synthesis and creation). At the lowest level of the scale of learning is remembering information, followed by comprehension, the ability to grasp the meaning of what is remembered; application, the ability to use what was learned in a new and concrete setting; analysis, the ability to identify, select and infer from information; synthesis, the ability to solve conflicts in newly acquired information and merging it into a coherent whole; and last but not least, evaluation, the ability to judge a set of information for a specific purpose.

Researchers distinguish between surface learning, where content is often memorized mechanically, with little critical effort, and deep learning, which involves a critical analysis and a process of integrating new ideas (Vos et al., 2011). For authentic learning to occur the learner "must be engaged in an inventive and realistic task that provides opportunities for the complex, collaborative activities" (Herrington et al., 2009).

Learning can also be categorized by control and learning direction (C. Reigeluth, 1999). Classified by control, learning can skew towards instructor control or student control, and in terms of learning direction, it can be either topic-centric, problem-focused, interdisciplinary or context-focused. To ensure student success, the instructor can act as a collaborator or as an interventionist. In the collaborator role, students keep ownership of learning and content and issues are discussed with teachers, while in the interventionist role, encouraged by the instructor, students spend little time discussing and thinking critically about the educational content and have been shown to use ownership and interest in the topic at hand. In guided inquiry, the instructor provides the problem and directs students towards the materials necessary to solve it, yet the teacher might not be the only expert in the teaching process (Drexler, 2010). Students might use networked learning to tap into the knowledge of a network of specialists and research a topic by overlaying the information they receive and creating new connection and new relationships, which might make learning more engaging.

When classified by number of learners involved in the process, learning can be individual, in pairs, in teams (of three to six learners) or in groups (comprised of

seven-plus members). In collaborative learning, the content of what is to be learned needs to be heuristic and not procedural (C. M. Reigeluth & Nelson, 1997) and does not work very well when the content needs to be memorized. The context of learning is of crucial importance, as it needs to support collaboration (it should have its own values). Students need to take responsibility of their own learning and the instructor needs to feel comfortable with having less control. One of the advantages of collaborative learning and group activities is that they have been found to have positive effects on students' interest, engagement and motivation (Drexler, 2010).

Learning can be based on narrative, it can be numeric, basic (related to survival), aesthetic (learning through art), participative (learning by doing), or social (group learning).

"Learning is the engine of practice and practice is the history of that learning", said Wenger (1998). Digital learning, also called e-learning or online learning describes the area of study in education that concerns itself with learning that happens outside the realm of the traditional face-to-face classroom. There are sub-areas of study where digital tools are used to complement or support face to face study, such as blended learning, hybrid learning, mobile learning. These sub-areas are outside the scope of this text.

Sometimes described as "new learning", digital learning is situated as the point of confluence between constructivist theory and digital learning (R. Martens, Bastiaens, & Kirschner, 2007b). Some examples of new learning are independent learning, active learning, self-directed learning, observation-based education, simulations, web-based learning. A digital learning environment is "any learning environment where electronic media are used as a component of an instructional delivery system (J. Keller & Suzuki, 2004).

3.1.2 A short history of human learning

In the 60s', behaviourists conceptualized learning as conductual and associative and driven by conditioning, in part because most of the learning-related experimental

research was done with animal subjects. Human learning particularly is different from animal learning in that it is sustained by cognitive, socio-cultural and neuropsychological models. For a long time theories and beliefs about human learning were made on evidence-based research on animal learning, not aware that humans and animals learn in different ways. Animals don't learn from physical changes in their environment, but from the information that these changes communicate to them in relation to improving their chances to survive and reproduce. At the same time, difficult to measure constructs, such as feelings, thoughts, ideas, were also initially excluded from research, in an effort to make psychology a more rigorous science.

A new period followed, in the 70s, called by researchers of the era, "the behavioural glaciation", which studied memory, perception, attention, language, but not learning itself. Until the '80s, thus, learning was still seen from a behavioural lens. At this time, some now classical learning theories like those of Gestalt, Piaget's theory of cognitive development and Vygotsky's socio-cultural theory of human learning came to light.

Jean Piaget, born in 1896, in Switzerland and the father of constructivist epistemology, was interesting in finding out the ways in which true knowledge develops. Piaget believed that education was the the relationship between the growing individual, and the social and moral values that the educator initiates in her. He believed that available knowledge is already constructed and codified in language and embedded in our moral and social systems(Piaget, 1964). For Piaget learning required mediation based on norms, while teachers transmit knowledge by lowering barriers and incrementing opportunities for the learner. He observed that sometimes good teaching can produce bad learning and realized that another element, complex learning, or equilibration, was required. For complex learning to occur, he believe that there was a need for creativity from the learner's part and of effective teaching that can unlock internal transformations (Palmer, Bresler, & Cooper, 2001). Piaget believed that group learning should be the standard of classroom learning (Piaget, 1997).

Lev Semyonovich Vygotsky, one of the most important Russian psychologists of the twentieth century, born in the same year as Piaget, analyzed the social origins of mental processes. He believed that the mental functioning of the individual can only be understood by examining her social and cultural context. Vygotsky argued that mental processes occur not only within the individual, but also between individuals or groups, in inter-subjective processes (Palmer et al., 2001). Psychological development depended thus, as much on social forces as inner resources. Vygotsky thought that psychological development and instruction were socially embedded, and that, in opposition to behaviourists who saw thought as a version of sub-vocal speech, there is relationship between thought and language as a phenomenon of culture. He believed that the mind evolves everyday to reflect the social reality around it.

Piaget and Vygotsky linked the concept of learning to the search for meaning and understanding. They started looking at the nucleus of cognitive change as the conscious reflection of one's action.

It was in the 80s that Kurt Koffka, one of the co-founders (together with Wolfgang Köhler and Max Wertheimer) of the Gestalt school of psychology, introduced the idea of learning as a holistic process, a "change in ability", and not an isolated behaviour or event (Koffka, 2013).

Gestalt theory (Koffka, 2013), which created the bases of modern studies of perception, suggested that the whole is greater than its individual parts, while Piaget argued that children create mental models of the world that are continuously developed as the child interacts with the environment, and Vygotsky described learning as a social process and considered social interaction to have a fundamental role in the development of cognition, considering that all learning is mediated by processes and representations.

The beginning of the '90s brought a resurgence of behaviourist ideas when scholars started layering on top of behaviour creation, conditioning, reinforcement, new concepts related to information processing, attention, memory and problem-solving.

The two schools of thinking disagreed in their understanding of the way learning

happens: behaviourists believed learning happened associatively, while Gestalt, Piaget, and Vygotsky argued that learning happens as a result of a process of reflection, meta-cognition and dialogue aimed at knowledge-making. Moreover, Vygotsky believed that speech is not merely a vehicle for expression, but an act of creating the learning process, that intellectual development occurs first between 2 individuals in a social context, before it is internalized within the individual.

Stimulus and response model theorists believed that the same psychological laws of learning were applied similarly to all beings in which physical laws apply to them. Behaviourists believed that what was learned in a specific context is the exact reflection of the changes in the stimuli that take part in that same context. All new learning (behavioural changes) thus required new conditioning efforts. According to behaviourists, reflection had three stages: the first comprised of the return to the experience, and recounting the most impactful features of the experience, the second was attenting to the feelings, be them negative or positive about the experience and reconciliating them, and the third was re-evaluating the experience and integrating the newly acquired knowledge within an individual's personal conceptual framework (Boud, Keogh, & Walker, 1985).

During the mid 20th century, in full birth and early development of computers, a new way of looking at learning was developed: that of learning in the way a computational machine would. This included a mechanized view of the mind: analytical, logical, rational, self-centred and did not see learning as being a transformational process, where a subject can change as a result of learning.

Today, human learning is seen as a constructivist process. Learning takes place by processing information extracted from external and internal stimuli, which gives place to representations that adapt to the environment.

3.1.3 Types and ways of learning

The system of human learning is complex. Various types of learning can be understood as hierarchical, and they are organized according to two principles: first, that

the lower levels of learning restrict upper levels of learning and second, that upper levels of learning may organize, but don't replace or eliminate primary learning types. Different areas of study of the mind offer different insights into how we learn and what may affect learning. Neuroscientists map the physical brain and look at how the energy and the information move throughout the neural networks that our brain is made of.

Donald Hebb (1949) found evidence in the hippocampus, the part of the brain that plays an important role in the consolidation of short and long term and spatial memory, that "neurons that fire together, wire together", meaning that neurons that fire at the same time as a response to a thought or an experience, can strengthen existing synapses, the connections between cells, or build entirely new ones (Cooper, 2005). This does not mean, however, that the mind is only an information processor. The human mind is more like a virtual reality simulator that generates maps of representations of its environment, in real-time, in continuous, external-stimuli-influenced-reiterations.

Neurochemistry scientists, on the other hand, look at the way external substances, such as alcohol can change our mental processes and our moods, but also at how activities such as reading a good book or listening to a good joke, can make changes in the substances and the percentages in which these substances are found in the brain.

Mithen(1996) suggests that the mind is similar to an old cathedral: it has evolved in the same way a cathedral might evolve historically: the first part that is built is a small chapel, then a more complex structure on top of that, and more sophisticated, sumptuous layers later. The oldest part, which represents our oldest brain, is represented by the amygdala. This part is the most ancient and the most primitive part of our brain, responsible for our basic fears and needs, and for most of the implicit learning we do. The most awe-striking part of the "cathedral" represents our newest brain, the frontal lobes. They are responsible for most of the explicit learning we do and of integrating everything.

We differentiate between explicit and implicit learning, by looking at how clear the learning process in itself is. We refer to explicit learning when the learner can speak about what has been learned with clarity, and to implicit learning when the learner cannot describe what they have learned and how. Indeed, they may not be aware a learning process took place. Learning happens implicitly and explicitly at the same time (Pozo Municio, 2014).

Implicit learning is genetically older in the brain and can be localized in the amygdala. It happens earlier in life than explicit learning, tends to be associative (babies learn almost exclusively implicitly), it uses less processing energy than explicit learning and happens faster. Skinner (1957) tried to prove that language is yet another conductive behavior, to which purpose he had raised primates in human environments. He had very little success. Chomsky (2013), on the other hand, stated that children can speak and perform other verbal productions that they have never been exposed to before because they are born with an apparatus that helps them learn languages - and that this does not depend on the environment.

Explicit learning, on the other hand, is resource-heavy; it requires concentration, motivation, and effort. It is serial and constructive. What is already known needs to be layered and organized on top of new learning.

Implicit learning is universal, embodied and describes knowing how to do, while explicit learning is focused and specialized, symbolic and declarative; it is knowing how to say. Implicit learning is dedicated to making predictions and controlling situations, at detecting patterns and generalizing, while explicit learning is focused on explaining relationships between things, and is good at detecting exceptions. If the implicit system is conservative and looks for routine, the explicit system is innovative and aims at changing structures. The explicit system learns by doubting and challenging the status quo, while the implicit prefers certainty, and is better at surveying positives and unwillingly excluding negatives.

From a motivational point of view (and we will discuss further in this chapter the relationships between learning and motivation), implicit learning is incidental, au-

tomatic and non-controllable, it requires little effort and motivation to sustain it, while explicit learning is intentional and requires conscious control, lots of effort, and motivation.

Implicit and explicit learning is not the only learning-related duality. Evans (2010), who suggests a duality of heuristic versus analytical, reviewed other dualities suggested by researchers. According to Kahneman's fast and slow thinking, system one, the so-called fast one, is the system more likely to jump to conclusions without facts, and system two is the logical, measured one (Kahneman, 2011). Epstein's (1994) duality consists of experiential versus rational learning. Many other researchers position learning as a duality, such as associative and rule-based; intuitive and analytical; unconscious and conscious; automatic and controlled and so on.

There are at least three traits of human cultures that are very different from animals: cultural accumulation, the construction of cultural systems of representations (writings, paintings etc), and the social organization of learning (social institutions: family, clan, school); only humans intentionally teach each other without a direct gain.

Knowledge requires object, attitude and representational agency. In this sense, representational suppression is useful for turning new information into a generalizable piece of knowledge, knowledge which can be represented explicitly as theories in action (still not completely aware of them), explicit theories still not completely explainable and fully explainable, explicit theories.

We learn in different ways, from the less to the most complex forms: we learn by growing and by explicit association, by naturalizing knowledge and adapting to environments, by understanding and last, but not least, we learn strategically. Formal learning can be artisanal, technical, academic and experiential. When we learn, we may learn to understand, or learn to build, or learn to copy. Monereo and Pozo (2008) talk about digital natives and digital immigrants and the way their minds are different, going on to saying that technological natives have a virtual mind, while their precursors have a lettered mind. The researchers argue that the

new ways of learning can lead to new communicational pathologies, such as the superficiality of wanting social media “likes” or “followers”.

The culture of learning, in the West and East, is also different. The West, in its Socratic tradition, values asking questions, being personal, respect for the person and what they stand for, believes in trial and error and is driven by the want to innovate and to acquire knowledge, while the East, in the Confucian tradition, values getting answers and the group, the collective. In the East, the culture of learning has a deep respect for what is known and is focused on keeping traditions, with the final goal of achieving harmony and group-level success.

3.1.4 Social learning

Bandura (1977) had conceptualized social learing as individual learning that takes place in a social context and is thus influenced by social and moral rules.

More modern concepts of social learning define it as an active participation in the practices of social communities and constructing identities in relation with these communities (Lave, 1988, Wenger, 1998). Participation in a group shapes not just what we do, but who we are and how we interpret what we do. At the same time social learning has the dimensions of collaborating to learn and learning to collaborate, both which can become hurdles for digital students (Rodríguez Illera, 2001).

Lave (1988) argued: "Knolwledge does not consist of coherent, clean-cut islands, whose boundaries exist independently of individuals".

That is not to say that creating groups and enhancing collaboration automatically leads to social learning. Far from the truth, argues Rodríguez Illera (2001); the role of the instructor, now redefined, is more important than ever in creating strategies to help and engage students. For real social learning to occur, tranformational change needs to go beyond the individual and become situated within wider communities of practice (Reed et al., 2010).

Social learning is not to be confused with the methodologies that facilitate social learning, such as stakeholder participation, in which individuals, groups and organizations take an active role in decision-making that affect them (Reed et al., 2010). Nor should it be confused with "groupthink", the " mode of thinking that people engage in when they are deeply involved in a cohesive in-group, when the members' strivings for unanimity override their motivation to realistically appraise alternative courses of action" (Janis, 1989). In groupthink, members sharing a strong solidarity desire to maintain relationships within the group, so strong that they prioritize the harmony of the group over every new decision they need to take.

Learning can be located in many places inside and outside the body: within our brains and neural networks (Hebb, 1949), in our bodies, in routines, dialogue (Freire, 2018) and symbols (Blackler, 1995). "Neurons that fire together, wire together" is the famous phrase coined by neuropsychologist Donald Hebb (1949) to describe how pathways in the brain are formed and reinforced through repetition. In other words the way we think and what we think changes our brain, and in return our brain gets used to the way we think and promotes already-existing thinking habits to new ones. Embodied cognition theory argues that the motor system, our entire bodies, influence our cognition (Shapiro, 2019). Freire (2018) believed that people become critically literate and truly aware of their own lives through dialogue and collective reflection (I come back to dialogue and Freire's ideas in the following sections of this chapter).On the other hand, Wildemeersch (2007) believed that good citizenship can be learned through positive experiences of active involvement within society.

3.1.5 Learning in communities of practice

Some institutions tend to assume that learning is an individual process and that collaborating equates cheating (Wenger, 1998).

Social learning is based on four premises: that humans are social beings, that knowledge is competence in respect to valued enterprises, that knowing is participating in valued enterprises and active engagement in the world, and finally, that learning produces meaning (Wenger, 1998). Wenger sees learning from four different angles:

learning as doing (influencing practice), learning as becoming (shaping identity), learning as experience (creating meaning) and learning as belonging (to a community).

Communities of practice are shared histories of learning. The existence of a community of practice does not depend on a fixed membership. Members may go in and out, as long as membership changes progressively enough to allow for sustained generational encounters, newcomers can be integrated into the community(Wenger, 1998).

A community of practice exists because people are engaged in actions whose meaning they negotiate with each other. A neighbourhood is a community but not usually a community of practice. Itself, practice is not an object, it is an emergent structure that persists by being both perturbable and resilient. Practice is not culture, activity, or structure and it is not stable, rather it combines continuity and discontinuity(Wenger, 1998). However, the nature of social practice can explain relations between human action and social/cultural systems at the level of "everyday" activities, which are a more powerful source of socialization than intentional pedagogy (Lave, 1988).

In digital learning, the lack of face to face contact, also leads to the loss nonverbal elements that create meaning and connection, such as inflexion, gestures, body language, leaving all meaning-making to the interpretation of the written text (Rodríguez Illera et al., 2007).

3.2 Digital learning

3.2.1 Beginnings of digital learning

In the 60s and 70s, human-computer interaction shifted from being concerned primarily with the cognitive constraints of the user and the theory of cognitive overload to being more interested in understanding affective experiences, feelings, moods and how they influenced learning (Baker et al., 2010, Desmarais & Baker, 2012). Ac-

cording to cognitive load theory, the cognitive capacity of a user is limited, thus if a learning task requires too much capacity, learning will be hampered (de Jong, 2010). While this direction has become obsolete, emotions have been found to systematically affect knowledge and vice-versa (Baker et al., 2010).

Later, in the beginning of the 90s', research regarding digital learning was aimed at identifying and comparing students' computer skills. In the following years, other characteristic stood out as having an impact on the success of digital learning, such as student engagement, student learning style, self-motivation and time management (Holder, 2007b).

3.2.2 Characteristics and challenges of digital learners

Today we know that learning in a digital learning environment is different, in some aspects, from learning in the lived-in world, in direct contact with peers and instructors, in a geographically localized place.

While digital students tend to be successful and persistent, tend to be problem solvers (Howell, Williams, & Lindsay, 2003) and independent learners (R. L. Martens, Gulikers, & Bastiaens, 2004, R. Martens et al., 2007b), who habitually employ critical thinking skills (Holder, 2007a), digital learners have needs that are not essential for face to face learners, regarding feelings of isolation and self-direction (Bocchi et al., 2004). Digital learners tend to be insecure about succeeding, and have other demands that conflict with learning, such as scheduling issues, money and long-term commitment challenges and constraints (Holder, 2007) that places them at a higher risk of dropping out, compared with learners in traditional learning environments (Carr, 2000, Diaz, 2002). In digital learning, student abandon tends to be higher as learners feel isolated and interaction is low (Bolliger, 2004a).

Although there are many generational differences in the way digital technology is used, digital students, especially younger ones face another challenge: the myth of the digital native. Their instructors believe that since they were born in a world surrounded and driven by technology, they must also be information-skilled, which

is not always the case (Kirschner & De Bruyckere, 2017). This belief, affirm the authors, only makes teachers assume that students have skills they don't really have, thus failing to address what could be technology-related barriers. This is something I have also seen in the interviews with students learning digitally, and I present this in detail in the results and discussion chapters that follow.

Virtual learning environments can be synchronous or asynchronous. In synchronous virtual learning environments, students participate in the instruction process at the same time as the teacher (and sometimes at the same time as other students), usually through video or audio-conferencing technology. In asynchronous classrooms, students learn in their own time, and at a different time than their classmates. MOOCs fall into this category, as well as many distance learning University programs.

One difference between physical and virtual classrooms has to do with the physical space where learning happens. In a virtual classroom, students might be more prone to external distractions and interruptions, while in the face-to-face classroom, priority is given to instruction and distractions and interruptions are reduced or eliminated.

Students learning digitally also need to learn the codes, norms and rules of the digital world in order to be integrated in the classroom and society at large (Rodríguez Illera & Escofet Roig, 2005). Some students prefer face to face activities to online interactions and they can be reluctant to participate in online threaded conversations and debates (Henderson, 2011, Kemp & Grieve, 2014).

In terms of the virtual environment, students can be more or less comfortable with the technology used to create the learning environment. Students may consider the online environment disruptive and feel uncomfortable when observed by a large number of users connected online (Dyke, Harding, & Liddon, 2008), they might be reluctant to participate in online threaded conversations (Heide & Henderson, 2001) or they might prefer face-to-face activities to online interactions (Kemp & Grieve, 2014). In an experimental study using a virtual class in Second Life, Pellas (2014) showed that students' self-esteem and computer self-efficacy had an important

effect on student's engagement with the learning experience, both cognitively and behaviourally.

Another characteristic of virtual environments is that the communication is mediated through the computer, which can create additional noise in the coding and decoding process, making virtual classroom interactions potentially more prone to misunderstandings. Shannon's classical (1949) model of communication consists of five elements: the source of information, the transmitter, which encodes the message into signals, a channel, to which signals are adapted for transmission, a receiver, which decodes the message from the signal; and a destination, where the message arrives. A sixth element, noise, is the dysfunctional factor and it can be any interference with the message, or any distraction the decoder might experience. However, when mindfully designed for enriching and motivated learning, digital learning environments can play an important role in supporting a student's motivation to learn: for example, using digital tools to deliver content at a level that adapts with the learner, or delivering a type of content in a format that has proven more engaging or that resulted in better learning metrics (J. M. Keller, 2008). Supporting students' perception of value of learning in digital environments, is more complex and requires continuous reinforcement (Brophy, 2008).

The perception of value also depends on the level of University education. Undergraduate students, even though they report lower levels of critical thinking than graduate students, and report to procrastinating more, tend to give a higher value to learning and report wanting to continue adding online courses to their learning repertoire (Artino Jr & Stephens, 2009).

In face-to-face classrooms, students often experience a sense of community, they see themselves as part of the same group, while in virtual classrooms, students and instructors report precisely a loss of connectedness and sense of community (Johnson & Brescia Jr., 2006, Liu, Horton, Olmanson, & Toprac, 2011).

In a study aimed at finding the differences in sense of community and perceived learning between 279 university students enrolled in either a fully online, or a face-

to-face on-campus course (Liu et al., 2011), researchers found that while there were no differences in perceived learning between online and on-campus groups, online students felt a weaker sense of connectedness than on-campus students who attended face-to-face classes. A meta-analysis of 231 studies focused on the effects of using digital technology-assisted and computer-based assessments in post-secondary settings, suggested that technologies supporting cognitive processes, which directly aid students in learning, produce significantly better results than technologies used to merely present or deliver content (Schmid et al., 2009).

Learning is a complex endeavour that necessitates a synergy of sustained cognitive, behavioural, and affective engagement (Reeve & Sharkawy, n.d.). Fryer and Bovee (2016) and Fryer, Bovee, and Nakao (2014) addressed the issue of low e-learning completion rates by investigating what was not motivating students to learn and further exploring amotivation as one of the extreme points on the motivation continuum. They found that the lack of understanding the value of the learning (task value) as was the perception of lack of ability of students in the course area (in this case second-language learning in a compulsory university course). They also found that students who were not motivated at the beginning of a year-long course became even less motivated over a four-month period (Fryer et al., 2014), while students who did not perceive deficits in ability and effort beliefs and task valuation tended not affected throughout the course. The task value component is related to the perceived relevance of the learning experience for the student and the need for autonomy, which is one of the three components of self-determination theory, along with relatedness and competence. Some researchers, such as Brophy (2008) consider that teachers have the responsibility to explain to students the value of learning.

The work of researchers Fryer et al. (2014), as well as Fryer and Bovee (2016) and Fryer (2013), in which effort, ability and task valuation deficits are believed to be valid in modelling and improving e-learning motivation, was based on the Academic Amotivation Inventory (Legault, Green-Demers, & Pelletier, 2006), where amotivation is represented by four dimensions: effort, ability, task valuation, and task characteristics. The authors view motivation according to Ryan and Deci's (2010)

self-determination theory, where motivation is modelled on as continuum, from least to most motivating, going from amotivation (or lack of motivation), extrinsic motivation and intrinsic motivation.

3.2.3 Characteristics of DLEs

A DLE is a type of learning environment where the processes of teaching and learning are made possible with the help of digital technology. It contains at least one learner and a concept of space or setting in which the learner will act using digital tools and potentially interact with others (Wilson, 1995). We distinguish between the concepts of "teaching" and "learning" as follows: teaching denotes control and direction, while learning refers to a flexible focus of learning, thus defining a digital learning environment as "a place where learning is fostered and supported", and where "learners may work together and support each other as they use a variety of tools and information resources in their pursuit of learning goals and problem-solving activities" (Wilson, 1995).

There are a broad variety of digital environments, from learning management systems (LMS), sometimes called virtual learning systems , that are specifically designed for learning, such as Moodle, Blackboard, Desire to Learn or Infrastructure Canvas, to broader content management systems, social networks and other systems that can be used for learning or complement learning. As more and more learners are learning online, and governments and elected officials are encouraging the development of digital learning, instructors and researchers should also consider the covert values, beliefs and assumptions that any learning technology may encompass (Veletsianos, 2016).

As discussed in the previous section of this chapter, learning in a digital environment is different from learning in a face-to-face environment, digital learners expressing needs different than students in traditional learning environments. The fact that drop-out rates in digital learning tends to be 10-20% higher than in-person learning (Carr, 2000, Diaz, 2002), suggests that there is room for improvement in terms of engaging and motivating digital learners.

Digital learning environments can be synchronous and asynchronous. They should both be able to engage tutors and students in two-way conversations between student and instructor, as well as students and their peers.

Two types of synchronous learning environments are audio and video conferencing. Audio-conferencing digital learning systems are based on providing an auditive presentation, supported by a visual support which becomes the main focus during lectures and tutorials (Sadik, n.d.). This visual support can help students by grounding them in the activity, while the information presented on the screen can help with information assimilation, can help promote reflection (McConnell & Sharples, 1983).

Video-conferencing includes both a presentational and a discursive medium; in this way, it can be similar to a lecture, yet the environment does not encourage student questions beyond technical issues. Computer-mediated environments are the only teleconferencing mediums that have the ability to simulate synchronicity while being completely asynchronous (Laurillard et al., 2013).

Collaborative learning (or learning though discussion and learning from peers) is an important aspect of modern digital learning environments, however, researchers argue that discussion between peers helps students identify what they don't know, but not what they are supposed to know. On the other hand, collaboration promotes discussion, which in term promotes critical thinking. "Without the element of debate and discussion around academic ideas, universities will become training camps, unable to do more than expose their students to what there is to be known and to rehearse them in the ability to reproduce them (Laurillard, 2002). The researcher suggests that creative programming can be used in a way that would make it possible for the program to collect and analyse student mistakes that will then help in identifying patterns in the types of mistakes the student makes and be able to suggest a specific kind of reinforcement work. Machine learning technology makes this idea possible, but there is a lack of research on the topic of machine learning being used in the production of digital learning environments.

Students solve problems in the context of the lecture, of the syllabus, the grad-

ing scheme, the instructor's preference, whether they are solving them in a digital learning environment or a traditional one. As the social, organizational and political contexts all affect student learning, educators have to make sure that the digital educational environment they use is compatible with their pedagogical intentions.

Some contextual factors that affect the quality of student learning are student preparation, integration within the whole course or educational path, student values, instructor support, assessment, interaction design, logistics and resources available. First, in terms of preparation, students will benefit from having a clear understanding of the importance of the topic, its relationship with other topics in the course and what they already know, as well as being aware of the learning objectives and knowing how to approach learning.

Second, for retention to be expected, learning has to be embedded into what students already know, Laurillard (2002) argues.

Third, student epistemological values (the conception of how we come to know) must be considered. Learning that addresses the nature of the subject, its relevance, the students' commitment and relationship with the subject, as well as providing opportunities for students to choose their methods of research, are all characteristics associated with deep learning (Ramsden, 2003).

Fourth, pedagogical support provides opportunities for students to explore the subject in a variety of ways.

Fifth, assessment, which is a challenge in digital learning environments, and whether it is perceived as fair, also affect learning. The work might be collaborative, but assessment should be individual. When peer assessment is used, the student must trust that the peer has the knowledge to asses another student correctly, otherwise assessment can be perceived as invalid by the student. Sixth, interaction design has a strong effect on what students might perceive the can and cannot do. The environment can perform certain cognitive processes for the user, such as allowing zooming only on a specific area or allowing the user to only move in one direction of the content, which can influence students in the way they interact with and analyze

the content.

Last but not least, academic logistics, such as scheduling, contact hours and access to resources, all affect student learning in digital learning environments.

What kind of implications do these factors have on the design of educational environments? Laurillard (2002) argued that students should have access to control features that are discursive (they have to ability to access and interpret content), adaptive, interactive and reflective. The researcher argues that many of these features are not found in digital educational programs and that without them the student is impaired in controlling the learning.

There is an abundance of freely available curricula and information in form institutional repositories, such as the MIT OpenCourseWare, textbooks, and instructional video on platforms such YouTube, yet, as Veletsianos (2016)) notes, "Instruction is not content delivery".

The assumption that information is sufficient, and that instruction is unnecessary is incorrect. Students will not simply abstract meaning from the learning environment without support (Herrington et al., 2009).

The design of learning experiences is key to the development of learning technologies and the success of digital learning (Veletsianos, 2016) in creating experiences that are meaningful and have a lasting positive impact on students (Wilson & Parrish, 2011). Technologies need to be used as cognitive tools for learning rather than alternative content delivery vehicles, which makes the challenge in designing digital learning environments that promote critical thinking not just a technological challenge, but a conceptual one.

3.2.4 Learning and Teaching, a paradigm shift

In the last decades, educational researchers and philosophers have shifted their focus from investigating direct teaching to the promotion of active learning in educational environments (Dewey, 1997, Piaget, 1972, Vigotsky, 1978, ?, ?). Instead, teaching

has started to be investigated through the prism of mediated learning, as it allows students to acquire knowledge of someone else's way of experiencing the world(Laurillard, 2002, Laurillard, 2008, Laurillard et al., 2013).

Teaching is a process that has been defined and understood in very different ways throughout history. Objectivists defined teaching as a process where knowledge was imparted to the student by the teacher, who was the master of the subject. For objectivist educators, the final goal of teaching was the ability of the student to successfully apply the principles and techniques learned to her professional practice. The objectivist school of thinking saw analysis, representation, and reordering of content as proof of successful teaching (Jonassen, 1996).

As we saw in the previous section of this chapter, from a constructivist point of view, learning is defined as the process of knowledge construction through individual action. Educational constructivists like John Dewey rejected the idea of teaching as transmitted knowledge and dedicated most of his career to advocating for the creative engagement of the learner with the subject matter(Dewey, 1997, 1916b, 1964, 2003). His view was shared by Vygotsky (1978) and Piaget (1964, 1972).

Contemporary researchers, such as Laurillard (2002, 2008, 2013) also reject the idea of teaching as imparting knowledge and instead suggest that the aim of teaching is to make student learning possible. Teaching, the researcher says, "is a rhetorical activity, seeking to persuade students of an alternative/elaborate way of looking at a world they already know (Laurillard et al., 2013)". Any teaching strategy has to address conceptions of the topic at hand, encourage the development of representational skills and epistemological development.

Laurillard, rejecting the idea of teaching as imparting knowledge and learning as the result of imparted knowledge, argued that academic learning is only important if it can be further used. Like a set of tools, academic learning should be understood and used in context. She further explores what academic learning is not: even though abstract concepts are taught with the help of examples and contextualized problems, academic knowledge needs to be abstracted, so that is can become generalizable.

Another definition of learning Laurillard suggests is that of learning as a way of experiencing the world (Laurillard, 2002). While this definition can describe everyday knowledge, there are few complex concepts that could be learned by direct experience, and they are in fact, learned and developed through analytical procedures in a particular social context. Thus, a more precise characterization of academic learning, Laurillard suggests, is that academic knowledge is situated in our experience of our experience of the world. From this point of view, academic learning can be described as a way of allowing students to explore someone else's way of experiencing the world.

Teaching, Laurillard argued, is the rhetorical activity of seeking to persuade students of an alternate and elaborate way of looking at a world they already know. Learning, in this case, is the ability of the student to organize and structure new and old content into a coherent whole that can be further used to create new arguments, theories and improve upon the knowledge acquired.

"Learning and teaching are not inherently linked. Much learning takes place without teaching and indeed much teaching takes place without learning" said Wenger(1998). Educational design is not simply the delivery of a curriculum. Students need places of engagement, materials and experiences with which to build an image of the world and themselves, ways of having an effect in the world and making their actions matter(Wenger, 1998).

3.2.5 Instructional design: elements of authentic learning in DLEs

To understand how digital learning environments can be better designed to motivate students to learn, we will look at the main theories of instructional design today, how they have changed and the main directions of research in this sub-field. While this section does not attempt to be exhaustive, it will later allow us to discuss the findings of this study.

Instructional theories today are oriented towards practice and attempts to orient

educators in using the best educational methods in each context. In this way, instructional design theories are prescriptive and restrictive for educators. Instructional design theories include learning theories, or how knowledge is created, and how learning should be experienced, as well as curriculum theory . In the last three centuries, we have moved from a pre-industrial society when the heart of knowledge was the family, to the industrial era, where knowledge was contained in processes and bureaucracy, to today's era, the era of information. In today's era the main mass learning design is standardization.

There are four key pedagogical considerations for digital learning environments: choosing the course content, designing instructional methods, offering practice examples and providing a space for feedback (Clark & Mayer, 2008).

In their book, "A practical guide to authentic e-learning", professors Herrington, Reeves and Oliver (2009) list nine elements of authentic learning, as well as the potential features that could be included in the design of digital learning environments that promote authentic learning: authentic tasks provided in authentic contexts, access to experts and multiple points of view, collaborative instruction, reflection, articulation, coaching and authentic assessment.

Authentic contexts in digital learning environments are designed in a way that preserves the complexity of real-life situations and offers rich situational affordances. Authentic tasks and activities help students detect relevant from irrelevant information or reframe ill-written tasks and rewrite them in ways that are more meaningful and better explain the result of their work.

Digital learning environments that offer students opportunities to sharing the narratives and personal stories also tend to support authentic learning.

A digital learning environment that supports collaboration includes group work and finds meaningful ways to promote group achievement. Reflection can be promoted by organizing materials in a non-linear way as to promote discovery and rediscovery or by allowing students to compare themselves with experts or collaborating in group reflections.

To promote articulation, complex tasks should be incorporated in ways that support inherent (as opposed to promoted) ways for students to communicate their ideas. Spaces for public presentations and defending of personal arguments can also support articulation. Collaborative learning and co-creation of learning, as well as instructor coaching in critical times, paired with authentic and individual assessment (as opposed to standardized assessment) that is integrated seamlessly with the learning activities, also support authentic learning.

3.3 Motivation in Digital Learning Environments

In this section, I am going to situate offer a definition of motivation, give an overview of the most popular theories of motivation in education and delineate some main directions in university level motivation research.

3.3.1 Definitions of motivation

Motivation is an important component of the complex context that empowers a student to learn effectively. To be motivated is to be driven towards an action. Motivation is the invisible force moving us towards an objective, the psychological construct driving an individual's choice of behaviour, the intensity of that behaviour, the latency and persistence of behaviour (Graham & Weiner, 1996). In other words, it deeply shapes the way in which students navigate towards academic achievement.

According to Ryan and Deci (2010), to be motivated is to be moved to perform an action or engage in an activity. The authors distinguished between intrinsic and extrinsic motivation: motivation that comes from within, aligned with individual interest and curiosity and extrinsic motivation, driven by the context in which the individual is situated. If we were to visualize motivation as a pair of vectors, the force vector corresponding to intrinsic motivation would point outwards from the individual to the environment, while the extrinsic force vector would point from the environment towards the individual.

Individuals are intrinsically motivated when they engage in an activity for the pure

enjoyment of the activity itself and are extrinsically motivated when they engage in activities that lead to an outcome that can be found outside this area of "pure enjoyment".

For many decades, educational psychology was dominated by reinforcement theories of motivation (Stipek et al., 1996) and behaviourists suggested that rewards promote learning. Thorndike (1898)first observed the relationships between stimulus and response, followed by Pavlov (1927), who was the first to explore classical conditioning, where two stimuli are present and observed at the same time: the conditioned and the unconditioned stimuli. Skinner (2019) later developed conditioning theory, where a response was followed by a reinforcing stimulus. Following reinforcement theories, there were the so-called, "need theories": Maslov (1943), who identified and ordered the most important human needs on a scale going from physiological and safety needs to the needs of being part of a group, to needs of esteem and self-actualization. Reeve and Sharkawy (2005) later revised this theory, describing three types of needs: physiological, psychological (needs of autonomy, competence, relatedness) and social needs.

Dewey (1997, 1916b, 1964, 2003), regarded today as one of the most prominent scholars in educational reform, had very progressive ideas about education that were going against the popular educational ideas of the era. Dewey believed that students who interacted with the environment in order to learn were more successful that student who did not have the same learning by doing experience

3.3.2 Theories of motivation in education

There are many theories of motivation in education, the most popular today being: expectancy theory, the ARCS model, and self-determination theory.

Expectancy-value theory of motivation

We know that motivation promotes learning(Gottfried, 1985, Lepper, Corpus, & Iyengar, 2005) and we can view motivation as a psychological construct driving an individual's choice of behaviour, intensity of behaviour, latency and persistence of

behaviour (Graham & Weiner, 1996). One of the predominant theories of achieving motivation is expectancy theory, theory which suggests that motivation increases with the expectation of reaching a goal and the goal's value (Graham & Weiner, 1996, Liu et al., 2011). Expectancy is an individual's self-evaluation of their ability to succeed. It is similar to the ability to self-perceived competence (Harter, 1992) and self-efficacy (Bandura & McClelland, 1977, Bandura, 1989, Bandura, 2010).Expectancy and self-efficacy, while different in theory, are indistinguishable in practice (Liu et al., 2011).

Social cognitive theory was developed by Albert Bandura, based on his previous social learning theory in which Bandura states that new behaviour can be acquired through the observation and imitation of others. For Bandura, the environment, specific behaviours and cognition are the main factors that influence development. Learning, however, can occur without a change in behaviour, in the same way as a change in behaviour does not guarantee learning (Bandura & McClelland, 1977, Bandura, 1989, Bandura, 2010).

The ARCS theory of motivation

The ARCS model of motivational design theories was created by John Keller (1987), who believed there are four pillars of promoting and sustaining motivation in education: attention, relevance, confidence and satisfaction. He later (Keller, 2008) (J. M. Keller, 2008) added a fifth pillar, self-regulation, which he considered relevant for helping students overcome obstacles and persist towards their goals. The ARCS model was grounded on expectancy-value theory, which suggests that people are motivated to engage in an activity if they perceive the activity to be linked with personal needs (to be of value) and if there is expectancy to succeed (Wigfield & Eccles, 2000).

Building attention has two goals: one is building curiosity and the other sustaining engagement. Keller believed attention can be gained in two ways: by using surprise or uncertainly to gain interest (perceptual arousal) and by posing challenging questions or problems or mysteries to be solved (inquiry arousal). Some methods

educators might use to gain learner's attention might be active participation (such as role-play or any learning-by-doing activity), variability of methods and formats for educational content delivery, humour, incongruity and conflict (devil's advocate approach), the use of specific examples and driving inquiry by posing problems to solve. Attention is thus created by building curiosity and sustaining active engagement. Berlyne ()berlyne1965structure and Kopp (1982) also noticed early on that introducing mystery, or an event that creates conflict or incongruity, supports attention.

To make educational content relevant, educators can situate the new learning within their existing skill-set, establish a present and future worth, allow learners choice in presenting and organizing their work. Learning goals can be intrinsic or extrinsic, but a stronger motivation is achieved when the learner is self-determined (Deci & Ryan, 1985). The quality of relevance of learning is also referred to as authentic learning experience in the literature of educational motivation (Duffy, Lowyck, Jonassen, & Welsh, 1993). Relevance can be build in education by taking in consideration the prior experience of students and how the new learning builds on that past knowledge, by showcasing or modelling present and future worth and by giving students the ability to choose part or their learning (autonomy).

Relevance is closely connected with task value, which can be described as the sum of attainment value of the task, the utility value (extrinsic motivation) and the intrinsic value (how fun the task is to perform), minus the cost value of all the above (Schunk & Zimmerman, 2007). Task value, as well as the expectation to succeed, determine the persistence of the student and quality of effort put into the task(Atkinson, 1964).

Students are more motivated when they believe they can succeed and achieve their goals.

Confidence in learner's own abilities can be built by designing educational challenges around success that is meaningful, by providing objectives and prerequisites, sharing evaluative criteria, providing feedback and giving learners some control over their learning process. It can be achieved by helping learners build positive expectancies.

Confidence incorporates constructs such as self-efficacy (Bandura & McClelland, 1977), attribution of achievement (Weiner, 1979) and self-determination. Self-efficacy refers to the individual belief that one is able to execute the tasks that lead to producing a specific goal (Bandura & McClelland, 1977, Bandura, 1989, Bandura, 1989). In education, it reflects the ability of the learner to self-manage and exert control over one's actions, motivation, and social environment. Bernard Weiner's (1979) attribution theory looks at the ways in which individuals interpret their role and their actions in their achievements and failures, and how this affects their thinking and future behaviours. He identified that ability, effort, task difficulty and luck were the most important factors in the attribution of achievement.

Confident individuals tend to believe that they can achieve goals, while unconfident ones tend to worry about failing and want to impress others (J. M. Keller, 1987). At the same time, motivation increases with the expectation of reaching a goal and the goal's value (Graham & Weiner, 1996, Liberman & Förster, 2008).

To be motivating, learning should offer some satisfaction, which can come from a sense of achievement, rewards or praise. The main function of satisfaction is developing continuous motivation for learners. Satisfaction is shaped by positive and negative outcomes, rewards and consequences.

Self-regulation helps learners protect their intentions from contextual or internal threats, and helps maintain a goal-oriented behaviour by overcoming discouragement and attrition, a problem commonly observed in digital learning. To understand how individuals translate motivation to action, Kuhl (1987) looked at how the power of will (volition) influenced human action and distinguished between selection motivation and enactment or realization motivation. Motivational and volition processes are interconnected and attempt to explain how individuals choose and execute on their goals.

Self-determination theory

Ryan and Deci (1985, 2010) framed the self-determination theory of motivation in terms of social and environmental factors that may either facilitate or undermine

motivation. The researchers believed that the degree of motivation to engage in an activity is thus facilitated or undermined by whether three basic psychological needs are met: autonomy, competence, and relatedness.

Autonomy is defined as the universal urge of an individual to be a causal agent of one's life, competence is defined by the ability to control the outcome of an activity and experience mastery, while relatedness is defined as the universal need to interact and be connected to others.

Intrinsic motivation places motivation within the individual and the task itself (Ormrod, 2010). When an individual is intrinsically motivated, doing the task itself is sufficient motivation for performing the task (Wlodkowski, 1978, Brewer & Burgess, 2005). Csikzentmihaly 1990 introduced the idea of flow, which situates task motivation in both the activity itself and the space and time this activity takes places. Flow is a sort of portal in an individual's physical context, where everything else outside the main task becomes secondary. People who experience flow become unaware about anything else outside the task they are working on. They often talk about losing the notion of time, or forgetting to eat and the intense satisfaction perceived while on-task. An individual in "flow" concentrates on a task without thinking about success or failure, but still aware of the goal of the task at hand. People in flow are intrinsically motivated (Csikszentmihalyi, 1990,Csikszentmihalyi, 1997).

Other aspects of intrinsic motivation in instruction are challenge, curiosity and fantasy. Thomas Malone (1981) looked at the ways in which motivation is build in computer games and suggested that intrinsic motivation could be build in instruction by creating challenges for learners, challenges that are neither too easy nor too difficult, and that could be personally meaningful or created by the instructor to keep the learner engaged. Fantasy, in Malone's research with computer games is the mental image the player has when interacting to the environment. The more coherent the environment is to the instruction goals, the more meaningful the learning task can appear. Curiosity is another important aspect of motivating player to accomplish their goals. It can be sensory, influenced by game aesthetics: look and

feel of the game, sounds, consistency and coherence of the environment they play in, or cognitive, when the player can learn throughout the playing experience.

Intrinsic motivation is also influenced by cost, the negative aspect of engaging in an activity and achieving a goal, which is relative to the other opportunities that have to be discarded in order for the goal to be achieved (Liu et al., 2011, Eccles & Wigfield, 2002).

Extrinsic motivation is driven by the use of rewards and incentives to stimulate an individual in completing a task (Brewer & Burgess, 2005). In education, students are extrinsically motivated (as well as punished) with the use of grades. Intrinsic and extrinsic motivation are situated on a continuum, where intrinsic motivation is on one end of the continuum, and where the force to drive an individual to act is stronger, and extrinsic motivation is situated in the middle of this continuum, showing much less driving force in performing an action. When students engage with their instructors and peers because they see value in their learning experience, they engage because they are intrinsically motivated (Zimmerman, Bandura, & Martinez-Pons, 1992).

At the opposite end of the motivation continuum, we situate amotivation, or the lack of motivation. Individuals are amotivated when they don't perceive a relationship between an action and a specific result or when the value of the result is considered low. To be amotivated is to completely lack interest in a specific action or task.

3.3.3 Interest and interestingness

Interest is a cognitive and affective motivational variable, defined as the psychological state of an individual engaged with particular content and the motivation to return to it (Hidi & Renninger, 2006, Renninger & Hidi, 2011).

There are three aspects of interest: personal interest, interestingness and interest as the psychological state of an individual interacting in a specific context. While personal interest is intrinsic in nature (Krapp, 2002), interestingness is the power of a theme, subject or activity to attract attention and cut through communication

noise. Interestingness can be created by novelty, surprise, complexity or ambiguity. There are also certain themes that are usually perceived as interesting, such as death or sex (Schunk & Zimmerman, 2007).

Themes and topics that are inherently interesting for most people, tend to be is similar to themes and topics that are considered in journalism newsworthy. As a journalist, we were taught to report on news that were current (it's only news if it's new), that were close to our readers either geographically or culturally, that included some conflict or controversy, of general human interest (heroes and villains) and relevant (it helped individuals use the information provided to make a decision).

Modern motivation theorists, such as Ryan and Deci, believe interest has a very important role in intrinsically motivated behaviour. People naturally approach topics and activities they are genuinely interested in. Yet interest is not at all a novel concept. In his essay "Interest and Effort in Education"(1913), Dewey, describes interest as a vital educational factor. He believed that the educational content that worked best in making an impact in students' schooling was the content derived from the students' genuine interest. Dewey described a genuinely interesting situation as one in which students experience focus and are able to execute agency.

Interest is dynamic, with two main phases: in one the interest is triggered, the other, maintained. Interest can be fleeting, but it could also develop into more-developed interest. It occurs with respect to a particular class of objects or ideas, has cognitive and affective components that co-occur, it develops in close relationship with the environment and has neurological basis, as it can become hard-wired into our brains (Renninger & Bachrach, 2015). A component of interest is knowledge and understanding of the subject (Ainley, Hidi, & Berndorff, 2002).

While researchers agree that interest is located in the interaction between person and object (Rathunde & Csikszentmihalyi, 1993, Mcphail, Pierson, Freeman, Goodman, & Ayappa, 2000) and that it has an associated value element, interest and engagement are not synonymous and have generally been explored in different ways in academia. Engagement includes interest, participation and the self-regulation

required to sustain it. Interest can be cognitive, affective or behavioural.

There are two types of interest, individual, in which a student may experience an enduring predisposition to engage with an object, and situational, which is derived out of the engagement between a person and the immediate context around this person. Mitchell (1993) describes two facets of situational interest: catch facets, which are helpful in stimulating interest but are not able to sustain it, and hold facets, which are able to empower students and drive long term engagement. For example, the use of iPads in class, working in groups, as well as the use of puzzles are able to function as catch facets of educational situational interest, while meaningful interactions, value of learning, and insightful personalized feedback, can function as hold facets of situational interest.

Erika Daniels, a professor who had taught students at all levels, from kindergarten, to middle school, up to college, noticed how motivation and interest in learning seemed to drop as students became older and the curriculum became more rigid (Daniels, 2010). Kindergatden and middle school students were curious and excited about the discoveries they made at school every day, while older students, such as college students, would be passive and disinterest in class, feeling that the curriculum had little to do with their own interests and had little space to bring their own interests into the classroom.

For the older students who were extrinsically motivated, and performed well, in accordance with self-determination theory, Daniels (2010) believed that students were looking for clear and specific instruction from their teachers who were defining academic success, so that they would know what they need to accomplish (autonomy). Daniels believed students needed knowledge that their teachers care about them and the subject at hand, and that they were committed to the class (relatedness). Last but not least, students needed to believe that they were capable of successfully performing the task which they were challenged with (competence).

Daniels was not alone in her beliefs, which are built on the principles of constructivism. Jean Piaget, the Swiss psychologist who introduced the theory of cognitive

development, and whose ideas influenced European and North American education in the 70s and the 80s, making institutional education more student-centric, also looked at the ways in which children develop intellectually though their childhood and what drives their growth, and found that students developed best in a classroom with interaction (Piaget, 1964). He also believed that instructors and parents could build on children's inherent curiosity to create an interest and enthusiasm about disciplines such as mathematics, with playful interactions.

3.3.4 Motivation in digital learning environments

We know that motivation promotes learning(Gottfried, 1985, Lepper et al., 2005) and also that there is a positive correlation between motivation and educational achievement (Deci, Ryan, & Guay, 2013). Sustaining student motivation is more difficult for instructors in digital learning environments, because most of the learning takes place independently, at a distance (Keller, 2004). In digital learning, drop-outs are higher than face to face learning, learners tend to feel isolated, and interactivity is low (M. G. Moore & Kearsley, 1996). Digital learners tend to passively consume content and spend little time to reflect or use their newly acquired knowledge constructively.

Yet digital mediums offer potentially infinite options for improvement and creating motivational contexts, so how can we adapt motivation theory principles to build better digital learning environments for students? Can a computer program act as a one to one teacher?

Educational systems that motivate students, conversational interfaces and chatbots

Many researchers believe that technology can assist in further developing the tools instructors use in face to face educational contexts. Keller (2008) advocated for the use of motivationally-adaptive computer-assisted instruction systems (CCAI), systems that would be able to learn from students as they progress in their educational program and anticipate their learning needs.

In a meta-analysis of 50 controlled evaluations of computer tutoring systems, Kulik and Fletcher (2016) saw that students who received intelligent tutoring support outperformed students who did not receive this support in 92% of cases (46 of the 50 studies analysed) and concluded that intelligent tutoring systems can be very effective instructional tools.

Keller (2008) had mentioned motivational objects, independent challenge-like pieces of information that could be used alone or in context, which appears to be following a similar conceptual path as other educational researchers who study instructional computer games to create better and more motivating digital environments. Keller (J. M. Keller, 2008) mentioned animated pedagogical agents, which would be able to assist students with their learning by delivering cognitively and affectively-focused motivational messages. At the time, the animated pedagogical agent idea would have made us think of the loved by many and loathed by even more, Clippy, the Microsoft Office Assistant that would pop announced and would offer users advice as they worked. Clippy was born in 1997 and retired ten years later. Today, thirteen years later, the first thing that comes to mind are conversational interfaces, such as chatbots.

The main advantage of using chatbots in digital learning is the ability to support a student through dialogue. Using natural language helps students use their cognitive resources on the task, rather than the communication medium.

There is a branch of educational research that is working on improving these interfaces, taking them from being simple query searchers within a database, to complex tools that feed from educational content databases, but also learn from their users via explicit user data, such as feedback and implicit user data, such as bounce rate, search queries, time spent on page. Education-focused conversational agents have been created to perform a wide range of jobs, such as tutoring, quizz and question-answering, conversational practice for language learning, dialogues to promote reflective thinking. Conversational agents can be simple avatars of fully embodied systems, able to show emotion and gestures, their output can be simple text or synthetic voice (Kerry, Ellis, & Bull, 2008).

Lundqvist, Pursey and Williams (2013) developed a chatbot that could make changes in their information database and expand their knowledge through conversation. The chatbot they built, a survey bot, was employed to collect feedback from users using their University's BackBoard system and then organizes this feedback in the pre-designed information categories.

Another approach is to use quiz chatbots that could perform as guides for students. Pereira (2016) argued that smartphone-base, ubiquitous chatbots, which make use of machine learning and natural language processing features could become useful teaching assistants, able to answer questions and propose personalized answers for students. According to Pereira's test of the chatbot in a 15 weeks long postgraduate computer science course, the majority of students responding to the survey (n=23) thought that using bots for practice tests were a good idea and that it could help engage more with the studied subject.

The educational environment as a partner in learning

To act as a one to one teacher, the computer program would need to be able to do everything a human instructor does, such as specifying and contextualizing the learning objective, interpret student performance on specific tasks and be able to provide personalized feedback. The system should understand the performance of the task within the larger learning objective and support the student with a subsequent task, based on the performance of the student in the previous and also the other related tasks. In an ideal world, by identifying patterns of consumption of educational content, engagement and task achievement, a system could potentially be able to quickly, go a step further and identify patterns in type of content and time on task and whether they correlate with achievement and proceed in adapting the instructional environment to the student's achievement patterns. It could also correct student;s learning behaviours to achieve better results.

A possible scenario, for example, would be that a computer system would detect in the first few lessons that the student prefers to watch the video content of the course, but actually performs better when they engage with the written content.

It could provide this kind of "consumption" feedback to the student and make a suggestion or attempt to explain the phenomenon. This kind of feedback is very common in mobile systems such as fitness apps, but also on desktop applications, such as email. Today, Microsoft Outlook 365 provides users with feedback on their email reading patterns in relationship with their work productivity and would send personal, private feedback, such as "You are checking your email every twenty minutes. Our research shows that interruptions slow the pace of your work. Every time you get of task, you need around ten minutes to get back in the task to be able to continue. We suggest trying checking your email every two hours. " And then it might suggest a simple task: "Schedule uninterrupted work time here."

Laurillard (Laurillard et al., 2013) had a different vision. She considers of great importance, not only to program tutoring systems to predict mistakes and offer new questions to wrong answers to support the student in finding the correct answer, but that the system should be designed in such a way that the student should be able to negotiate the correct answer with the tutoring program, for example ask additional questions to which the system could potentially answer. This idea is very powerful, because if implies that computer systems could help, not only motivate and keep students engaged by adapting the learning environment to the student, but it could also help students reflect on their learning and challenge their instructor, which is something we will discuss again in the last section of this chapter, dedicated to digital learning environments and the ways in which they can support critical thinking for university students.

Laurillard (Laurillard, 2002, Laurillard, 2008, Laurillard et al., 2013) argued that one important characteristic of digital learning environments is that they should be designed in a way that allows students to express what they think, as they learn. They should be discursive in the way that the content is accessed, they should be adaptive when offering a next task, they should be interactive and offer feedback as well as reflective and have a questioning strategy.

Similarly, Wilson (1995) argued that effective instruction requires student initiative and choice and that a digital learning environment should give students ample room

and tools to explore the content by themselves, as well as the ability to set their own goals.

While I agree with Laurillard that digital learning environments should be adaptive, I don't think they should just try to reinterpret, with digital media, what is currently, being done in face to face instruction, but rather we should look at what are the available resources of a digital learning environment, mine and test these resources, which takes us to the next section of this chapter, instructional design theories.

3.3.5 Motivation in DLEs

Bekele (2010) investigated methodological issues for digital learning environment in higher education and wanted to better understand how digital learning environments impact student motivation and how motivation was measured. He performed a qualitative review of the literature in motivation in digital learning environments published between 1995 and 2007. His analysis indicated that studies in this area use at least one of the following main behaviour indicators to explain motivation: task choice, cognitive effort, persistence (or time spent on task) and achievement and that research of motivation in digital learning environments was dominated by survey and experimental designs. His opinion was that purely quantitative designs might not bring a holistic understanding of the topic and that a complementary use of quantitative and qualitative research tools might offer researchers a more nuanced view. In this research, I have used quantitative and qualitative research methods for the same reason: to better understand the pattern and trends I have noticed in the quantitative survey. I discuss this in detail in the methodology chapter.

3.4 Engagement

3.4.1 Definitions and conceptualization of engagement

Trowler(2010) defined student engagement as "the interaction between the time, effort and other relevant resources invested by both students and their institutions intended to optimise the student experience and enhance the learning outcomes and

development of students and the performance, and reputation of the institution". The opposite of engagement is alienation (Mann, 2001), but instead of engaged, students may also experience inertia, apathy, disillusion, as well as the engagement of other pursuits (K. Krause, 2005).

Laurel (Laurel, 1991) likened the concept of engagement to the concept of suspension of disbelief. This term was first used in early 19th century by poet Samuel Taylor Coleridge, who referred to the reader's response to poetry, and has since been used to describe the complicity and participation of the individual with art in general. The same is valid for education, where the student must willingly enter the territory of representation, while still thinking of the abstract concepts that informs it.

Student engagement has also been defined as "participation in educationally effective practices, both inside and outside the classroom, which leads to a range of measurable outcomes" (Kuh, 2007).

In education, student engagement refers to the cognitive process, active participation and emotional involvement of an individual in during a particular learning task (Pellas, 2014).

Cognitive effort refers to the determined attempt of students to incorporate newly acquired knowledge into their existing knowledge base, and mediate and solve the internal conflicts and problems that surge as an effect of this process. Emotional involvement includes the attitudes of the student towards learning and its value, which is deeply connected to the student's intrinsic motivation to learn. Engagement is a prerequisite to learning; the depth of engagement correlating to the depth of learning (Harper, Carini, Bridges, & Hayek, 2004).

We can distinguish between three dimensions of student engagement: behavioural, emotional and cognitive. Students who are behaviourally engaged comply with behavioural classroom requirements, such as attendance and don't present any disruptive behaviours. When engaging emotionally, as well, student experience interest and enjoyment and a sense of belonging. Cognitively invested students are engaged in their learning, want to go beyond requirements and welcome challenge (Fredricks,

Blumenfeld, & Paris, 2004).

Coates (2007) who surveyed 1000 students, in four disciplines at four institutions to better understand the level of academic and social engagement of starting digital-learning students, defined four types of digital learning engagement: intense, collaborative, independent and passive. Students who engaged intensely had a high level of engagement with the course material, the instructor and their peers. Students who engaged collaboratively preferred social learning, such as group activities and discussion to independent learning, while students who engaged independently, were highly motivated academically, but preferred independent work to social interactions. Those who engaged passively showed low levels of activities on all areas: engaging with the course, instructor or their peers. He conceptualized engagement as "a broad construct intended to encompass salient academic as well as certain non-academic aspects of the student experience" (Coates, 2007).

Student engagement has three main dimensions: first, the individual dimension of engagement, with is student-centered and concerned with individual learning, second, the process dimension, concerned with structures and processes that lead to student engagement, such as representation and feedback, and third, the identity dimension, concerned with the ways in which students may feel a sense of belonging (Trowler, 2010). Identification as part of a group can be achieved through engagement, imagination or alignment (Wenger, 1998).

Engagement is "the active involvement in mutual processes of negotiation of meaning" (Wenger, 1998). Engagement is located at the conjunction of the origin of the negotiation of meaning, the formation of trajectories within communities and at the centre of all unfolding of histories of practice (Wenger, 1998).

3.4.2 More engaging DLEs

There are support factors of student engagement that are common to both face to face and digital learning, such as interaction with the instructor and peers, the feeling of belonging to a community, cognitive effort and problem solving, and student

motivation (Lee, Song, & Hong, 2019).

In face to face learning, participation and task performance are taken into consideration when assessing a student's engagement, while in digital learning, students are also in charge of planning and managing their own learning and carving time and space for effective learning, which can sometimes make peer engagement difficult or make it seem time-consuming and less relevant than the course material itself. However, collaborative learning has a strong positive impact on learning success and on motivation, as well as critical thinking.

An important part of the literature regarding engagement in DLEs borrows from the areas of engagement in video-games, and engagement and gamification.

Massively multiplayer online games are a niche of video games that are designed to support a large variety of players simultaneously in the same virtual world. These environments connect players and enable them to compete or cooperate, and explore.

One of the reasons why users exert such tremendous levels of engagement which these environments is that they manage to satisfy their needs of autonomy, competence and relatedness (Deci & Ryan, 1985). Ryan et al. (2006) argued that players' enjoyment are closely related to their feelings of autonomy and competence and that relatedness emerges as an important satisfaction that promotes presence, game enjoyment and future play. The authors defined presence as the psychological state that allows players to situate themselves inside the game when playing. In virtual environments, presence is the illusion of no mediation (Lombard & Ditton, 1997). Virtual environments can be made to promote higher levels of presence through story lines, graphic environments and intuitive controls.

Another important aspect of game design is accommodating for a variety of player styles. Bartle (1996) classified video game players into four types, depending on whether they are interested in interacting "on" or "with" other players and the virtual environment: a) killers, who are interested in interacting on other players; b) socializers, who are interested in interacting with other players; c) achievers, who look to interact on the environment; and d) explorers, who are interested in inter-

acting with and manipulating the virtual game world.

For Rigby and Przybylski (2009), the key to the pull of video games sits within the concept of the learner hero, where each player is the hero of the story and the play experience appears to be rendered specifically for each player, personalized depending on the actions she takes in the environment.

The learner hero has everything he needs to succeed and blazes new trails in search of adventure (thus satisfying needs of autonomy), he continuously master challenges (achieving a feeling of competence) and acts in relationships with others, in general for the betterment of the community (satisfying needs of relatedness).

The existing educational technology fails to capture the dynamism of game worlds, instead working with non-interactive media that fails to convey to learners a sense of agency and relevance (Rigby & Przybylski, 2009).

3.5 Critical Thinking

Sternberg (1986) defined critical thinking as the sum of the mental processes, strategies and representations people use to solve problems, make decisions, and learn new concepts.

What is thinking? Magolda (1992), who interviewed 101 students, men and women in a five year, longitudinal study, explored how the "ways of knowing" developed for these students throughout their academic career. Based on this research, Magolda defined four different developmental levels of thinking: basic or absolute thinking, where students have a black and white view of the world, transitional thinking, where student start accepting that there is always some sort of uncertainty in the knowledge they are acquiring, independent thinking, when they are able to reach their own conclusions, and contextual thinking, where they understand that perspective can be affected by context.

Moon (2007) defined critical thinking as the "capacity to work with complex ideas whereby a person can make effective provision of evidence to justify a reasonable

judgement. The evidence and therefore the judgement, will pay appropriate attention to context". Critical thinking is an umbrella term that can be used for a complex and sophisticated set of thinking skills.

Historically, there were two points of view of critical thinking: some researchers argued that critical thinking implies having generic thinking skills (Ennis & Norris, 1990, Swartz & Perkins, 2016)and others believing that critical thinking was subject specific (McPeck, 1990, T. Moore, 2004).

In this thesis, we conceptualized critical thinking in a constructivist approach (Laurillard et al., 2013). Critical thinking is related to help-seeking, which is a valuable learning strategy that helps graduate students studying in digital learning environments successfully achieve their learning goals (Dunn et al., 2014). Compared to undergraduate students, graduate students tend to report higher levels of critical thinking and procrastinate less than undergraduate students(Artino Jr & Stephens, 2009).

What helps students think critically? Learning about critical thinking itself can be stimulating and engaging (Carmichael & Farrell, 2012). Argument mapping has also been shown to help students increase their critical thinking skills (Dwyer, Hogan, & Stewart, 2012).

Peer feedback has been shown to have a positive impact on critical thinking skills, which can in turn increase students' levels of confidence in discussing their ideas in a digital learning environment, and increase student motivation (Ekahitanond, 2013). Moreover, as Magolda (1992) discovered, "the ability to develop a distinctive voice stems from defining learning as a constructing meaning jointly with others".

Motivation, attention, and interactivity contribute to the students' critical thinking skills (Al-Samarraie, Teo, & Abbas, 2013). The success of supporting critical thinking by using digital tools in digital learning environments, depends on students' developmental levels, their previous experience with digital learning and technology in general, as well as their level of engagement(Carmichael & Farrell, 2012).

In a study with 758 college students learning in a traditional environment, Garcia

and Pintrich (1992) found that students' evaluations of instructor effectiveness were not significantly related to critical thinking.

3.5.1 Dialogue

Freire believed that any human being, no matter how "ignorant", was capable of looking at the world critically, in a dialogical encounter with others. Through this process, the old paternalistic teacher-student relationship could be overcome. Critical pedagogy gives education the task to offer students the tools and habits of the mind necessary for thinking critically and for actively and constantly questioning and negotiating between theory, practice and the beliefs of the society they live in. Critical pedagogy contrasts with what Freire referred to as "banking education", in which students memorize mechanically what the teacher tells them; they become "containers" to be filled by the teacher. In banking education, communication is one way only, from teacher to students, in a process that turns humans into automatons.

Freire argued that in an education where the purpose is to domesticate rather than liberate, knowing means being able to receive information and to stock the "deposits made by others". In this conception of education, the educator, who is the sole source of knowledge and who possess complete knowledge, the one "who knows" transfers it to the students, "who do not know". He defined critical thinking as the "manner of thinking which continually revises itself"(Freire, 1971). He saw it as a tool for self-determination and civic engagement, a way of thinking that recognizes reality as a transformative process, rather than a static construct.

Freire believed that the institution of the school is an instrument of social control and argued that "education cannot be neutral"(Freire, 2018). Education is the social praxis that can either domesticate or liberate men and women, thus in dependent societies, education is the expression and the instrument if the alienation of individuals.

Paulo Freire, particularly in his book, Pedagogy of the Oppressed (Freire, 2018), stressed the importance of the presence of true dialogue in education. Freire believed

that education should reflect and promote the democratic ideals of participation, for both students and teachers(Kester & Booth, 2010). Dialogue has a central role in an education aimed at liberation and not at oppression.

The dialectic position of Freire is situated between modernity and postmodernity (Giroux, 1998). Freire rejected European modernity and its eurocentric lens, as its aims to "emancipate" people from other continents and saw colonization as deeply dehumanizing, destructive of cultures and responsible for social exclusion (Giroux, 2004).

Freire believed that dialogue enables us to participate in the continuous construction and transformation of the world. It enables us to see society as a process instead of a given set of rules and static subjects. It offers us a way to show to others the world we see . For Freire, human subjectivity is a central part of the socioculturally structured world.

Dialogue, Freire believed, allows us to “apprehend the deeper meaning of facts and at the same time to strip them of their disguises”(Freire, 1972). It is through dialogue that we discover what we yet don’t know. We engage in dialogue because we recognize the social and not merely the individual character of the process of knowing. We transform the world through dialogue. Authentic thinking, believes Freire, doesn’t take place in isolation, but in communication with others. “Only through communication can human life hold meaning” (Freire, 2018).

Dialogue cannot be a method because it includes both action and reflection and involves theorizing about the experiences shared in the process of dialogue. Every such process is unique and unrepeatable in the same way in which learning as a transformative process is unique for every person, and thus impossible to predict or shape strictly.

For true dialogue to happen, Freire believed that dialogue needs an environment of acceptance and tolerance. He argued that dialogue cannot exist without humility, it cannot exist without hope and faith in humankind, and its power to create and recreate for positive social change. If life in society becomes a topic of discussion, we

are then able to rethink who we are and what we do. Freire challenges us to interact with each other, share our diverse points of view and knowledge of the world and create new knowledge and new, better, societies.

3.5.2 Critical Thinking in Digital Learning Environments

Saade (2012) investigated where critical thinking occurred in a web-based course, specifically the effect of specific learning modules on students' critical thinking, by using a survey at the end of the semester. The course included static resources and interactive components. One of their main research questions was whether students understand the definition of critical thinking and asked students to answer this question themselves. The definition of critical thinking was very schematic: "Inference, reasoning, evaluation, explanation, interpretation" and did not frame critical thinking as a transformative process.

In this study, I have phrased the definition of critical thinking in a simplified way in the quantitative survey and have asked students to offer their own definitions in the semi-structured interviews. The method used was survey (n=490) to a single course, administered at the end of the semester. The average age was 22.7 years. Students reported that activities (assignments, projects, quiz) had contributed more to their critical thinking than static resources. Activities that had students engaged in solving a problem (Hake, 1998) calls interactive engagement, which allows students conceptual understanding through interaction.

3.6 Relationships between motivation, engagement and critical thinking in DLEs

Although both motivation and critical thinking are areas of deep interest for educational researchers, there is little research available on the relationships between motivation and critical thinking in a digital learning environment. I have found the same to be true for critical thinking and engagement in DLEs.

In a study with 758 college students learning in a traditional environment, Garcia

and Pintrich (1992) found that critical thinking, intrinsic goal orientation, rehearsal, elaboration, and meta-cognitive self-regulatory strategies were positively correlated with one another. Collaborative learning and challenging course work were also positively related to critical thinking. The researchers found domain differences, thus found intrinsic goal orientation to be a significant, positive predictor of critical thinking for biology students and those studying social sciences, but not for those studying English. The authors argued that the nature of the subject matter, the tasks students are given, the type of material involved in the classroom, rather than actual learning experience may be what most closely links to students' critical thinking. These domain differences in terms of motivation and cognition varying depending of domain are supported by stodolsky1988subject, (1988) and Stodolsky, Salk, and Glaessner(1991)

In a study of 470 Pshychology university students, studying in a traditional learning environment, Valenzuela, Nieto, Saiz, et al. (2011) found that motivation, conceptualized as a value/expectancy construct correlated significantly with student motivation. In another study involving 101 English language students in a traditional learning environment, Fahim and Hajimaghsoodi (2014) also found a positive and significant relationship between motivation and critical thinking.

In a study in a blended classroom Wichadee (2014) found that student motivation correlated with engagement with the DLE. Even though the relationship between motivation and critical thinking was part of the theoretical framework, no relationship between motivation and critical thinking was explored in the results, apart from the observation that there were more instances of critical thinking in messages from females than in those from males.

Roberts and Dyer (2005) looked at the relationship between self-efficacy, motivation and critical thinking disposition and achievement and attitudes toward learning, in a digital learning environment. Achievement and attitudes were the dependent variables, while self-efficacy, motivation and critical thinking were independent variables. When examining the results of the canonical correlation analysis, a moderate correlation was observed between motivation and critical thinking disposition. Crit-

ical thinking dispositions are approaches to life that contribute to critical thinking (Facione, 1990).

In a study in a blended classroom Wichadee (2014) found that student motivation correlated with engagement with the DLE.

As we have seen in a previous section of this chapter, motivation can be a prerequisite for student engagement and they both have an impact on learning success. Student retention and student motivation are also linked to engagement (Beer, Clark, Jones, et al., 2010),

Hussain, Zhu, Zhang, and Abidi (2018) used machine learning algorithms to identify low-engagement students in a social science course at the Open University to assess the effect of engagement on student performance. They found that better-performing students were more engaged than lower-performing students. Students who were less engaged had a greater chance of dropping out of their courses or failing subsequent assessments (Hussain et al., 2018).

Gedera, Williams, and Wright(2015) found that student motivation and engagement were affected by the tools used in a DLE. The interactivity of these tools allowed for participation with created a feeling of belonging to the learning community. Students felt supported and motivated in this community.

In web-based systems, it is difficult for an instructor to determine the engagement levels of individual students because the students are not physically present(K. Krause, 2005, K.-L. Krause & Coates, 2008).

Bonafini, Chae, Park, and Jablokow (2017) found that the number of posts submitted in a discussion forum and the number of videos watched during a course were positively related to student achievement in the MOOC they studied. Similarly Atherton et al. (2017) found that the use of course materials and student scores were positively correlated, and that students who accessed online course content in their DLE more often achieved better results on their exams.

Studies have shown correlations between engagement and improvements in critical

thinking(Endo & Harpel, 1982, Gellin, 2003, Kuh, 2003 Carini, Kuh, & Klein, 2006).

Digital students need to feel that they are engaging in real human interactions that will enable them to improve their knowledge and learning outcomes, and the presence of an educator can be a key factor in student engagement (Cho & Tobias, 2016). Several other studies found that strong educator presence along with quality course content to be essential elements in online courses that successfully facilitate student engagement and learning (R. L. Moore, 2014, Swan & Shih, 2005. Instructor presence can be achieved in DLEs through regular and proactive communication with students, feedback and a critical discourse (Gray & DiLoreto, 2016).

In summary, while there are many studies available regarding motivation in digital learning environment for University students, as well as on engagement in digital learning environments and also critical thinking in digital learning environments, there is very limited research that considers all three aspects together and have a holistic approach rather than an interventionist one. All research points that indeed there are close relationships between student motivation, engagement and critical thinking, in DLEs, at a post-secondary level. This exploration is also the main topic of this thesis. In the following chapters I present the methodology i employed to attempt to explore these relationships, as well as this study's findings.

3.7 Chapter summary

This chapter presented the conceptual framework of this study, describing the theoretical lenses guiding this research and creating the foundation for this holistic study of motivation, engagement and critical thinking in DLEs. The chapter outlined the main literature and theories in the areas of motivation, engagement and critical thinking in relation to learning in digital environments. I defined and gave a succinct overview of learning, digital learning,as well as the relationships between learning and teaching and instructional design. I explored the areas of motivation in education and synthesized the main concepts of motivation in DLEs. I briefly

presented the main concepts and theories used in this research to conceptualize engagement and presented considerations for engagement in DLEs. I've identified the foundations conceptualizing critical thinking and dialogue and examined critical thinking in DLEs. A final section brought together the relationship between motivation, engagement and critical thinking in DLEs. In the next chapter, I outline the research methodology and explain the rationale for the research design used in this study.

Chapter 4

Research outline and methodological considerations

In the last chapter, I brought forward the conceptual framework of this study, describing the theoretical foundation guiding this research. I have outlined the main literature and theories in the areas of motivation, engagement and critical thinking in relation to learning in digital environments.

To get a more complex understanding of motivation, engagement and critical thinking in digital learning environments, the research for this thesis employed a mixed methods study, conducting an instructor survey, followed by two student surveys administered in a time distance of three months (a school trimester) and followed by semi-structured interviews with students. In this section, I build an argument for the rationale behind using a mixed method approach and describe the different sources of data.

This chapter outlines the methodology and theoretical consideration for data collection and analysis. The first section states the investigated problem and the purpose of research, as well as the main research questions of the study. A second part of the chapter presents the research framework and the reasons behind using a mixed methods research design and the research paradigm. Third, I describe the data collection instruments used in this study, while in the fourth section I describe the

data collection process, the validity and reliability of the instruments as well as the ethical considerations of the study.

4.1 Research outline

This section describes the central ideas of the study, connecting them with the problem as outlined in the literature review, it states the intent of the study and the specific research questions behind it.

4.1.1 Problem statement

In digital learning, as we have seen in the previous chapters, students face learning challenges that significantly impact their chances to successfully complete a digital course, challenges that are present in face to face learning, but are exacerbated in digital environments.

One of these challenges is making them feel that they are part of a group sharing the same principles and goals. Students often report feelings of isolation and a difficulty to engage with their peers in a meaningful way (Carr, 2000, Diaz, 2002, Bocchi et al., 2004, Bolliger, 2004b, Holder, 2007a). On the other hand, learning with others helps students feel more motivated, engaged and think more critically(Miller & Dollard, 1941, Bandura & McClelland, 1977).

Another challenge is to make students in digital environments feel that their individual presence in the course is important; that they, as individuals, are important and are "seen" by the professor and their colleagues. In digital learning environments, more often than not, students, colleagues and instructors don't see each other, or rather where only the instructor is seen, in a one way communication scheme that is more reminiscent of mass communication rather than an environment for exchange and growth.

A third common challenge is to encourage students to think critically and to be deeply engaged with the curriculum and the ideas shared through it. Debate and discussion is more natural to us in face to face environments, while a digital en-

vironment can make threaded conversations feel artificial and not more than an assignment to check off a long list of low engagement tasks.

Meaningful engagement with the curriculum, the learning platform, peers and instructors can help students overcome these challenges. We know that motivated students are successful students, and that the learning environment can increase student motivation, when basic psychological needs, such as autonomy, competence and relatedness are satisfied (Deci & Ryan, 2010). Thus, we need to understand the ways in which digital learning environments support students in satisfying these needs.

Critical thinking is not only a necessary habit of the mind for individuals living in democratic societies, in an era of fake news and post-truth, but also an essential requirement for human learning. Explicit human learning, the trait that differentiates us from other animals who mainly learn implicitly (Pozo Municio, 2014), requires us to understand in order to learn. Critical thinking and engagement are very closely related, as for an individual to be thinking critically they need to be engaging and challenging existing ideas, ask questions, and have an interest in answering them. Interest is a cognitive and affective motivational variable, defined as the psychological state of an individual engaged with particular content and the motivation to return to it (Hidi & Renninger, 2006, Renninger & Hidi, 2011).

Motivation, engagement and critical thinking are important, interconnected parts of the human learning mechanism.

In my research, even though there is extensive literature on digital learning environments and motivation, I could not find enough support for the kind of variable I was interested in understanding better: engagement and motivation in higher education students learning digitally, through the lens of critical thinking. There is very little research on specifically this way of understanding critical thinking, motivation and engagement and the digital environment as a close-tied construct, as opposed to different stand-alone elements of digital learning.

My observation, by reviewing the literature, was that existing research was either

focused on very specific alterations of the course content to include critical thinking components, or interventions that used engaging techniques in the instructional and environment design, with the objective of supporting students' success, but there were few studies that tried to understand and explain holistically how these concepts work together in digital environments to support students in not just learning facts, but creating meaningful connections with other and learning how to think for themselves.

4.1.2 Purpose statement

The purpose of this study was to better understand what motivates students to learn and engage with the educational content, their peers and their instructor in digital learning environments and how their digital learning environment was supporting them to think critically and engage with others. I also aimed at better understanding how students perceive their level of critical thinking in a digital learning environment and whether a student's self reported motivation, level of engagement and critical thinking changed in time, as they progressed through their courses.

4.1.3 Research questions

This research is focused around one main research question and five sub-questions.

Main research question:

What motivates post-secondary digital students to learn and engage with their course, peers and instructors, in a way that supports critical thinking?

Sub-questions

1. What are the opinions of professors teaching in digital learning environments about the challenges that digital students face compared to traditional students, and to what extent do they believe their DLE, peers and instructors, can motivate them to think critically?

2. To what extent do digital students report to be motivated and intellectually stimulated?

3. How do they use their DLE: how easy or difficult do they find using it, and which are the features they use most?

4. What are the relationships between motivation, engagement and critical thinking for post-secondary digital students?

5. What are some themes and stories of motivated and critically engaged post-secondary digital students?

4.1.4 Research Framework

The research for this thesis employed a mixed methods study, conducting an instructor survey, followed by two student surveys administered in a time distance of three months (a school trimester) and followed by semi-structured interviews with students. In this section, I build an argument for the rationale behind using a mixed method approach, I describe the different sources of data and identify the role of the researcher in all parts of the study.

Research design

The research design used in this study is an explanatory sequential design (Creswell, 2013), as follows: quantitative data is collected and analyzed, producing quantitative results. Following the analysis, I determined the quantitative results to be further explained. With these considerations in mind, qualitative data was collected and analyzed, producing qualitative results. Finally, qualitative data was used to interpret and explain quantitative results.

4.1.5 Rationale for mixed methods research design

The rationale for using mixed methods in this study was to have access to precise numbers and statistics that allowed a better view of the group as a whole, to identify patterns related to the research questions, and help me identify profiles to interview

Methodology	**Purpose**	**Outputs**	**Characteristics**
Survey	Gathering larger scale data that allows for generalization Gathering data in a way that allow it to be manipulates statistically	Opinions Scores Outcomes Conditions Ratings	Looks to describe and explain phenomena, for a wider population Gathers numerical data Uses questionnaire data
Case study	To portray, analyze and interpret the unique and complex realities of university students through accessible accounts Data is not generalizable but can uncover previously hidden phenomena	Rich, individual situations and accounts Bounded phenomena at individual, group and community level	Looks to understand phenomena in a holistic, empathic, subjective way Gathers in depth, detailed data, in this case through interviews and one to one conversations. Subjective, descriptive, interpretive and inferential analysis

Figure 1: Elements of research design. Adapted for this study from Cohen et al.,2017

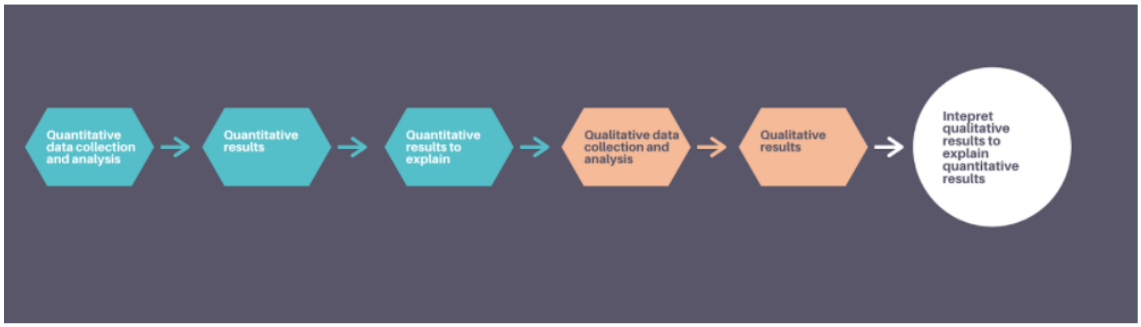

Figure 2: Research design. Adapted for this study from Creswell (2013)

in the second phase of the research, where I could get personal stories and rich examples to help me better understand how individual students perceived their digital education. According to Creswell (2013) a mixed methods study is suitable when qualitative research or quantitative research is insufficient to fully understand the problem.

I wanted to see what kind of patterns, related to motivation, engagement and critical thinking I could find in a larger group studying an online course and then understand why they happened and how students felt about them within their learning journey. The research design was highly structured and planned before the research started, so that the questionnaires could be sent at the beginning and the end of the semester. Before sending it, the questionnaire was validated and, preceding the creation of the instrument, a teacher questionnaire was administered to University professors who teach digitally to gauge their opinions on the topic of this thesis. The survey sparked some conversations with professors who left constructive comments in the open-ended slots of the questionnaire, which further improved the student instrument.

After having validated, with the questionnaire, that indeed students seem to not see critical thinking as part of their learning process and that their reported motivation was low when they reported high engagement to their course material, a second, qualitative phase was used to better understand this contradiction, why this phenomenon happened, what caused it for the students I interviewed, which has helped transform an abstract idea into real, information-rich examples and see beyond the initial observations.

Time	**Previous to students' academic year**	**Start of academic year (month 1)**	**End of first trimester (after 3 months)**	**Mid of the second trimester (after 5 months)**
Professors	Questionnaire and discussions			
Students		Questionnaire 1	Questionnaire 2	Interviews

Figure 3: Research planning matrix

4.1.6 Quantitative method considerations

The quantitative paradigm is based on "an inquiry into a social or human problem based on testing a theory composed of variables, measured with numbers and analysed with statistical procedures, in order to determine whether the predictive generalizations of the theory holds true" (Creswell, 2013). The advantage of using quantitative research techniques is that they allow for precise comparisons and generalizing findings. However, they cannot capture complexity over time, and they are difficult to apply outside controlled environments.

In quantitative research, often researchers know in advance what they are looking for, they have clearly defined questions to which objective answers are sought. Descriptive research involves collecting data in order to test hypotheses or answer questions regarding the participants of a study. Data exists in forms of numbers and statistics.

In this study, two questionnaires are used to discover those digital environment features or activities that are most often listed as motivating and engaging University-level digital learners to learn in a critical way. In one questionnaire I explore the point of view of instructors who give classes via digital environments and in the second, that of students currently enrolled in digital courses. The data is collected

through surveys and the sampling method used is non-probability sampling for the instructor questionnaire. For the student questionnaire, the method of sampling being used is probability sampling, specifically simple random sampling. Participants receiving the questionnaire are students currently enrolled in a University-level digital course. An effort has been made to include a variety of student backgrounds and levels of study.

In order to keep data free from systematic errors, I have paid attention to achieve reliability (to be consistent in procedures and reactions of participants) and validity (ensuring that the instrument measures what it intended to measure).

4.1.7 Qualitative method considerations

Qualitative research is oriented on process and how things work, with the purposes of describing, exploring and understanding social and cultural phenomena (McMillan & Schumacher, 2006). In qualitative research, it is recognized that social phenomena exist in the mind and in the situated world and that there are patterns that can be recognized in the way individuals interact with and transform social institutions, structures, practices and customs. In qualitative research, the researcher places themself in the context of the data and seeks to understand the participants. The researcher listens with attention and empathy, without judging and without seeking predetermined variables or hypotheses.

Qualitative research allows the researcher to analyze data inductively; it affords rich narrative descriptions and has an emergent design.

According to Schutt (2011), qualitative data analysis identifies important categories in the data, as well as patterns and relationships, through the process of discovery. There are often no predefined measures or hypotheses. In other cases, hypotheses can emerge from the findings before, during or after the analysis, as qualitative research is circular and holistic (Fernández Collado, Baptista Lucio, & Hernández Sampieri, 2014).

The aim of this thesis was to better understand the whole context of the specific

technologies being used in digital learning environments, how instructors and students use them, and how students perceive them, which is why I have not defined variables at the beginning of this study, but rather analysed the data to identify patterns. I believe, as Patton (2002) does, that qualitative analysis transforms data into findings and that no formula exists for that transformation. In the qualitative analysis process, the participants speak with their own voice and tell personal stories, they are multi-dimensional people, and not just numbers. By prioritizing the participant's point of view and listening to understand, the qualitative researcher can describe in more detail what he observes, which can give authenticity to his report.

Qualitative data analysis deals with data that is text, rather than numbers (Check & Schutt, 2011). The "text" that qualitative researchers analyse can be a series of transcripts or interviews, photography or other type of media. In this study I have considered as "text" semi-structured interviews with students currently enrolled in University-level digital learning courses. The interviews were aimed at helping me better understand how students perceive their levels of motivation and engagement with the coursework and how they use their digital learning environment. In qualitative work, theory is used at every step of the research process; theory influences the questions we ask and how we interpret the data we are analysing (Janesick, 2015).

The theories which will act as lenses in this study are: Dewey's educational theory in which critical inquiry has a central place (1916a), for whom learning is an intensely social activity that engages the whole individual and the entire society, as well as Ryan and Deci's self-determination theory of motivation(Deci & Ryan, 2010). According to Ryan and Deci, to be motivated is to be moved to perform an action or engage in an activity. Ryan and Deci distinguished between intrinsic and extrinsic motivation: individuals are intrinsically motivated when they engage in an activity for only the pure enjoyment of the activity itself; and are extrinsically motivated when they engage in activities for a separate outcome. Self-determination theory was framed in terms of social and environmental (contextual) factors that may either

facilitate or undermine motivation.

Ryan and Deci (2010) believed that the degree of motivation to engage in an activity is thus facilitated or undermined by whether three basic psychological needs are met: a) autonomy, defined in this paper as the universal urge of an individual to be causal agent of his life, b) competence, defined by a means to control the outcome of an activity and experience mastery, and c) relatedness, the universal need to interact and be connected to others. Even though motivation comes from within an individual, it can be influenced by contextual factors. Teachers might not directly motivate a student to learn, but they can create learning environments that motivate students by creating a sense of autonomy, control and competence for students, and creating a feeling of connectedness within the classroom.

4.1.8 Complementarity of the two types of research

Can two different types of research, quantitative and qualitative research, be used in the same research without creating paradigmatic contradictions in the concept of reality, the relationship with the studied phenomena and the neutral/subjective dichotomy between the two research lenses?

They can, if the researcher has a clear idea of how these different visions can interpose and when and designing research accordingly. In this design, I have looked at the concept of reality in the study, neutrality versus subjectivity, deductive/inductive logic, personal position of the researcher, theory building and literature review, sample, data and data collection, purpose of data collection and analysis output. This research has been done in phases, with the first quantitative phase designed to extract facts from the sample and create a broad, high level view of it. Once the first phase was finished, a second, qualitative phase started, in which I changed from my impartial, neutral hat to my emphatic, ready to listen to and get to know the students I have interviewed. Following, I detail how I reconciled the most important paradigmatic contradictions in this study.

4.1.9 Concept of reality and objectivity/subjectivity

In quantitative investigations, the variables are predefined based on the existing literature and the researcher seeks to confirm, infirm, or explain changes in these variables, within a single reality concept (hard facts). In contrast, the qualitative researcher's data are opinions, emotions or artefacts (rich facts) that require more effort to understand and interpret and a circular and holistic process.

Quantitative research aims at extracting facts from the world, while qualitative research assumes that there may be multiple realities and aims at understanding them. This gives qualitative research more richness in terms of the opinions and feelings of the participants and allows them to tell stories, which can make it easier for the external reader to understand individual realities, than statistical data, which is often dry and impersonal and tends to speak about a "generic" member of the group, a constructed profile or persona, that represents the group.

To reconcile these two perspectives, the study was conducted in phases, a neutral phase, when the survey data was collected and the researcher did not know any of the participants (the questionnaires were sent out by the students' instructors); and a second, subjective phase, in which the researcher started creating relationships with the participants who participated in the questionnaires and who agreed to be contacted for further clarifications.

4.1.10 Selection of the research paradigm: a constructivist approach

A paradigm is a system of ideas, values and beliefs about the real world which defines reality and what is to be considered a fact (ontology), the relationship between the researcher and the knowledge she can acquire (epistemology) and the specific ways in which the researcher approaches the discovery of evidence (methodology). Every aspect of this study is guided by a constructivist paradigm. Reality is thus viewed in this study as not a singular reality, but rather a multitude of socially interrelated realities. Constructivism is based on the epistemological premise that reality

is not simply extracted from the world, but rather, in the act of understanding, the researcher gives meaning to reality. Methodology tends to be qualitative and acknowledges the subjective relationship between the researcher and the subject. From a constructivist point of view, learning is defined as the process of knowledge construction, with an emphasis on active and self-regulated learning (Shuell & Farber, 2001). Learning is an active process (Driscoll, 1994). Constructivism is based on the idea that knowledge is constructed by the learner through activity (R. Martens et al., 2007a), in an individual manner that is influenced by the interpretations of the learner's experience of the world (Duffy & Cunningham, 1996).

This research attempted to better understand the motivation, engagement and critical thinking within their learning journey in a digital environment. It aimed at constructing knowledge on this complex and interrelated phenomena from the point of view and experiences of students enrolled in university-level courses. While I used a quantitative methodology to identify self-reported behavioural patterns, since the main objective was to understand how students made sense of their digital learning experience, the methodology I used to extract meaning was qualitative.

4.1.11 Selection of the research strategy

The first part of this study included a teacher survey, aimed at gauging teacher beliefs and assumptions about digital learning, digital students and what motivated them and engaged them to think critically. The purpose of this survey was to complement my limited teaching experience at University level and make sure that I can embed these ideas that come from practice and experience into this study.

The second part of the study is composed of two students surveys, one administered at the beginning of the school year and the second at the end of the first semester, to the same participants: students who learn digitally at an official University, enrolled in undergraduate and postgraduate education.

The purpose of these surveys was to identify and describe the characteristics of digital learning environments that best motivate and engage students to complete course

assignments, interact with instructors and other students to successfully complete their courses.

A second aim was to see whether students' self reported motivation, effort and critical thinking had changed throughout the course and in which way. The two surveys also included some open-ended questions along the close-ended ones, which were designed to collect rich information that would further help me identify patterns in the student's answers and to identify profiles that I could further interview.

The third part of the study included individual semi-structured interviews with students who had previously completed the questionnaire and had agreed to be contacted for further clarifications. Based on the questionnaire I have identified two profiles among students (considered here non-expert participants) who perceived themselves at one of the two extremes: not at all motivated and engaged and highly motivated and engaged.

4.1.12 Survey research, definitions and characteristics

Survey research "involves the collection of information from a sample of individuals through their responses to questions" and it is "often the only means available for developing a representative picture of the attitudes and characteristics of a large population" (Check & Schutt, 2011). It is used to describe human behaviour and is a common research method used in social sciences due to its efficiency, versatility and generalizability (Straits, 2005).

Surveys can be used to broaden our understanding of very diverse educational issues. They allow for many variables to be measured without high increases in time and cost.

Survey research can be quantitative (closed ended questions, likert scales) or qualitative (open ended questions) or can have a mixed method approach which makes use of both research strategies. Survey questions are answered as part of a questionnaire.

Questionnaires can be structured (when they include pre-coded answers, in a clear

structure) or unstructured (including open-ended questions). The number of questions, appearance, sequence and clarity of questions all have an impact on how they are interpreted and answered. In the questionnaire used in this study, the three part structure was communicated to the student in the beginning of the questionnaire and before each section, in order to better situate the participant. Each section was comprised of 3 to 5 close-ended questions , followed by open-ended questions, at the end of each section. These were designed to be an additional space for participants to make observations and clarify answers, as well as to offer answers or comment on those important questions they feel they were not asked about.

Questionnaires, advantages and limitations

Questionnaires are a time and resource efficient tool for data collection. Once it has been quantified, they allow data to be compared and contrasted with other similar data. In this study, the data was contrasted and compared by collecting the same data, from the same participants, with a three months difference.

One of the advantages of internet-based questionnaire research is the ability to reach participants who might not have the time to fill in an ad-hoc questionnaire. They also allow for respondent anonymity, which can help reduce self-censorship for participants who might be worried how their opinions might affect, in the case of this study, their relationship with their instructor and peers.

Additionally, as data is collected and exported into a table, the researcher can conduct preliminary analysis while waiting for the full set of data to be collected.

One limitation of questionnaire research is the distance between the researcher and the participant and specifically in online questionnaires there is the threat of loss of visibility over sampling, depending where the questionnaire is accessible and who can add data. In this study, the access to the online questionnaire was given to students, in the context of their class, by their professor, thus I was able to have full visibility over the sample.

There is a risk of bias in the survey responses and in self-reported data in gen-

eral.Participant answers collected in questionnaires might not be completely true, sometimes because the participant wants to please the researcher and answers what they think they should answer, or other reasons that lead participants to giving untruthful answers.

Other limitations of questionnaires have to do with the distance between the participant and the researcher at the time of data collection (the researcher cannot ask additional clarifying questions to the participants, so the questions must be very clearly stated), as well as at the moment of interpretation and analysis (the researcher does not have access the nuances and context of the answers).

Two of the main methodological limitations of this study are the relatively small sample size and the fact that the data is self-reported. In order to reduce some of the most common biases in self-reported data and minimize the effects of selective memory, I have collected the same data at three month distance, sending the first survey at the beginning of the first trimester and the second one, at the end of the trimester.

The rationale for using this approach is based on these characteristics of questionnaires. In summary, their effectiveness in social sciences for researching attitudes and behaviour, their cost and time efficiency, ability to reach participants who are otherwise busy, in a time of their convenience, as well as the ability to collect data on numerous variables, at different moments in time, which adds to their comparability and generalizability.

4.1.13 The Interview, definitions and characteristics

Interviews are not just a data collection procedure, but an interpersonal encounter, an exchange of inner views. Interviews allow researchers and participants to discuss world views and share the lenses through which they see the world. Interviews are neither fully subjective, not objective, they are inter-subjective (Cohen, Manion, & Morrison, 2017).

Interviews are not just ordinary conversations, they have a purpose. An interview

Consideration	Interview	Questionnaire
Data collection	interviewer	Questionnaire and medium (internet, individuals collecting answer if face to face)
Ability to personalize	Extensive	Limited
Ability to explore issues in depth	Extensive	Limited
Number of respondents that can be reached, typically	Limited	Extensive
Return rate	Good	Poor
Sources of error	Interviewer, coding, sample	Instrument, sample
Reliability overall	Limited	Fair

Figure 4: Interview and questionnaire considerations, adapted from Tuckman and Harper (2012)

may aim to understand or evaluate a person, an event or a situation, or a change in time, it may be used to evaluate hypotheses, to gather data. In an interview, one part will be seeking information, while the other will be the source.

Compared to questionnaires, interviews have some advantages. They can do what surveys cannot, which is, exploring issues in depth and personalizing the questions to the interviewee.

The disadvantages are that the number of respondents that can be typically reached are limited, that to the sample and coding, the interviewer herself can become a source or error, and that reliability overall tends to be more limited than questionnaires.

The main rationale for using interviews in this study is that interviews help bring to light otherwise very difficult to uncover underlying assumptions, or otherwise intangible phenomena, like how motivated students feel in their digital learning environment and whether they are thinking critically as a result of their learning

journey.

In summary, the goal of the first phase, the quantitative part of the research was to identify, describe and validate the existence of phenomena, while the second, qualitative phase was aimed at describing, understanding and interpreting these phenomena, through the personal experiences of the participants.

A deductive logic was applied to the phase one, questionnaire, and inductive logic was used for the second, interview phase. In the first phase, I went from the general to the specific and identified patterns, while in the second phase, I went from specific cases and questions to creating a new point of view and theory about the reasons behind the described phenomena.

4.2 Units of analysis

4.2.1 Sample and sample population

In quantitative research, the objective of study is to study a smaller group in order to collect data that can be generalized to the population, while qualitative research does not aim at generalizing the data collected to the population, but seeks to understand individual truths and realities. In sampling for quantitative research many participants are needed in order to be able to generalize the findings, while qualitative research requires much smaller samples, which will be intensely analyzed.

This thesis is aimed at better understanding the beliefs and behaviours of students and I have considered my own limited teaching experience at University level a limitation of this study, reason for which, previous to creating the student survey, I have surveyed 30 University professors from Spain, Canada, The United States, The United Kingdom, France, Norway and Colombia, with the purpose of capturing their attitudes and opinions in regard to what could be helpful in driving critical thinking and motivating digital students to interact with others and their learning environment in meaningful ways. The analysis of this survey data was meant to ascertain these opinions and attitudes for a small sample, not to test a theory or

attempt a comparison between student and professor beliefs.

The study population in this thesis is represented by university students in the areas of humanities and social sciences, currently enrolled in official academic courses, where the predominant learning environment is digital.

The sample used in this study is made of students enrolled in the courses of five professors of the University of Barcelona and one from The Open University of Catalonia, students in the areas of humanities and social sciences, whose predominant environment of the study was digital. All the participating students were enrolled in University education, including undergraduate (first, second and third years students) and postgraduate (master and PhD) students. 44 students responded to the first survey and 29 to the second.

This sample does not aim to be generalized to the entire digital learning student population across the world, but rather is aimed at investigating in depth the sample group and understanding the underlying causes of the researched phenomena.

4.2.2 The nature of data and instrumentation

The quantitative part of this research deals with numerical data, while the qualitative part includes free answers to open-ended questions, interview data, email and chat conversations. The quantitative phase of the research uses an instrument created based on previous research in the field and discussions with professors teaching online University students, the instrument is tested and validated for reliability (I give more details about this below). The qualitative research phase, which was initially thought out to consist of only student semi-structured interviews, has actually included many more data points that came from my conversations and follow-up with the participants throughout the study. All the interviewed participants have generously allowed me to continue to follow up on additional questions or clarifications during the research phase, which gave me a rich view of them, not only as participants, but as individuals, with individual stories, goals and challenges.

4.2.3 Role and position of the researcher

While it would be difficult to claim full objectivity, even in quantitative research, in the first phase, the researcher aimed at being fully impartial and neutral in the description and interpretation of data, and entering, phase two, specifically "changed hats" to become emphatic and have meaningful dialogues with the participants.

4.3 Data collection strategies

4.3.1 Instrument 1: professor questionnaire

Previous to creating the student survey, I have surveyed professors with experience in teaching digitally, with the purpose of capturing their attitudes and opinions on what drives critical thinking and motivates digital students to interact with others and their learning environment in meaningful ways. The analysis of this survey data was meant to identify these opinions and attitudes for a group of professors, not attempt a comparison between student and professor beliefs.

For this study, I have used snowball sampling, because I wanted to get as many voices and points of view possible. Snowball sampling consists of two phases. The first phase requires identifying potential subjects in the population, in this case, professors who had experience teaching online. The second entails asking those first subjects to help recruit more participants. I have reached out to some of my former University professors and asked them to recommend other professors in their field who would be interested in helping this study. The questionnaire included a question asking participants to recommend a colleague, which many did. When I started seeing that recommended new participants were mentioned more than once I proceeded to opening the sample and emailed 80 more professors from top universities in Europe, which I found via the universities' websites. I looked for professors who used keywords in their bio such as e-learning and virtual learning, digital learning. Those few professors who completed the questionnaire, recommended more colleagues.

The questionnaire was organized into three sections: 1) digital learning, 2) digital learning environments: design and tools, digital learning environments and critical thinking and 3) participants' background 5.

4.3.2 Instrument 2: student questionnaire

The purpose of a research survey is to produce quantitative descriptions of some aspects of the study population (Pinsonneault & Kraemer, 1993). The survey analysis consists in identifying relationships between study variables or in extending findings, descriptively, about a specific population. Survey research requires a standardized data collection and standardized information. Information is collected from a sample of the population and it is collected in a way that would make findings generalizable about the population. In the generalization of data from sample to population, there is always an error, which is indirectly proportional with the sample size and is influenced by the sampling method. One of the purposes of this study was to describe the self-reported habits, attitudes, and opinions occurring to University students in the humanities and social sciences, in regard to their engagement with the digital environment in which their learning was taking place, the motivation they felt towards their learning, and their perception of whether their course was helping them employ and improve critical thinking skills or not.

The second purpose of this survey research was aimed at better understanding whether there were any relationships between the students' beliefs about succeeding, their motivation to study, their beliefs regarding critical thinking and the specific features of their learning environments, such as private peer conversations groups, forums or synchronous tutor videoconferencing.

A third purpose of the survey research was directed at a better understanding of the ways in which their attitudes and self-reported behaviours changed from the beginning of a trimester to the end of the trimester, reason for which the surveys were sent out at the beginning of the academic year and in December and January, at the end of the first academic trimester.

Factors	Items	Type of item
Digital teaching experience	Do you have experience teaching University-level courses in a digital environment? (We define a digital learning environment (DLE) here as the multitude of digital resources (computers, software, storage, software, and systems) used to enable or manage learning. A learning management system (LMS) is a software application or web-based technology used to plan, implement, and assess a specific learning process.)	Multiple choice
Digital learners beliefs	How do you feel about the following statement: "Digital learners taking University-level courses have more personal/financial challenges that decrease their success rate than face-to-face/on campus learners"	Likert scale
Motivation	How do you feel about the following statement: "Digital learners taking University-level courses are more intrinsically motivated than face-to-face/on campus learners"	Likert scale
Motivation	How do you feel about the following statement: "The success of digital learners taking University-level courses depends on the other classmates and the existence of learning groups"	Likert scale
Motivation	How do you feel about the following statement: "The success of digital learners taking University-level courses depends on the instructor's ability to motivate and engage them"	Likert scale
Critical thinking	What do you think instructors can do to motivate students in DLE to learn in a critical way?	Open-ended
LMS use teaching experience	Have you previously used a DLE to teach University-level courses? (We define a digital learning environment (DLE) here as the multitude of digital resources (computers, software, storage, software, and systems) used to enable or manage learning.)	Multiple choice
LMS use teaching experience	Do you have any experience teaching with any of the LMS below?	Multiple choice
Teaching with LMS	How do you feel about the following statement: "Some LMS are better than others in terms of motivating and engaging University-level learners" (A learning management system (LMS) is a software application or web-based technology used to plan, implement, and assess a specific learning process.)	Likert scale
Teaching with LMS	How do you feel about the following statement: "The success of digital learners taking University-level courses depends on the instructional design and DLE/LMS used"	Likert scale
Critical thinking	How do you feel about the following statement: "Whether digital learners taking University-level courses learn critically depends on instructional design and DLE/LMS used"	Likert scale
Engagement	How do you feel about the following statement: "Digital learners taking University-level courses are more motivated if the DLE/LMS used manages to engage them"	Likert scale
Engagement	How do you feel about the following statement: "Digital learners taking University-level courses are more motivated if the instructor manages to engage them"	Likert scale
Critical thinking	How do you feel about the following statement: "Digital learners taking University-level courses are less likely to think critically than face-to-face/campus learners"	Likert scale

Figure 5: Professor questionnaire

The survey was organized into four sections: 1) motivation to study 2) learning progress, 3) the digital environment participants studied in, and 4) their background. From a conceptual point of view, the items were organized around three themes: motivation, engagement with the digital environment and critical thinking 6.

4.3.3 Instrument 3: student interviews

Melles (2005) notes that "qualitative interviewing places emphasis on obtaining authentic data about respondent's subjective worlds through establishing rapport and empathy using strategies of researcher sensitivity with participants".

Interviews are some of the most popular data collection strategies in qualitative research (Creswell & Creswell, 2017). Interviews can be face to face, or technology mediated via conferencing and chat software such as Skype or WhatsApp (for synchronous interviews) and email (for asynchronous interviews). They can be part of a focus group or can be one to one. Interviews are popular because they include conversation, which is natural. However, they require patience, empathy and interviewing skills: allowing the participant to speak freely as opposed to giving the answer in a question, rephrasing when it is apparent that the participant had misunderstood the question, or coming back to an earlier question at the end of the interview, to reinforce the answer.

Some of the limitations of interviews are: participants are not able to express what they think or feel in a way that would allow the researcher to fully understand their point of view (Griffee, 2005). In addition, some researchers, such as Melles (2005) argue that researchers should practice active interviewing, a practice in which the researcher is aware that the meaning in interviews is co-constructed between the participant and the researcher. In this practice the researcher is actively aware of the social, biographical, cultural background of both interviewer and interviewee. Interviewees might want to share their ideas and inner world, but speaking and doing are very different activities and researchers should be aware of the performative characteristic of interviews.

Factors	Items	Type of item
Motivation	How motivated do you feel right now to successfully finish this course?	Multiple choice
	How do you feel about the following statement right now?: "I have all the skills required to successfully complete this course"	Likert scale
	How do you feel about the following statement right now?: "I am putting in sufficient effort to successfully complete this course"	Likert scale
	How do you feel about the following statement right now?: "I believe this course to be very valuable for my future studies or career"	Likert scale
	What has recently motivated you to pursue the successful completion of this course?	Open-ended
	What do you think you would need to be more successful in this course?	Open-ended
Engagement with the learning environment	How do you feel about the following statement right now?: "The digital platform we use in this course is easy to use"	Likert scale
	Is your course using any of the LMS below?	Multiple choice
	Does your LMS have any of the features below?	Multiple choice
	Have you used any of the features below, in your course, in the last two weeks?	Multiple choice
Critical thinking	How do you feel about the following statement right now?: "I find this this course is intellectually stimulating"	Likert scale
	We define critical thinking as the process of analysis, evaluation, inference and interpretation of resources and activities. How much do you feel the course content is helping you in your development of critical thinking?	Multiple choice
	How much do you feel the instructor is helping you in your development of critical thinking? (We define critical thinking as the process of analysis, evaluation, inference and interpretation of resources and activities.)	Multiple choice
	How much do you feel your peers are helping you in your development of critical thinking? (We define critical thinking as the process of analysis, evaluation, inference and interpretation of resources and activities.)	Multiple choice
	Is there anything else helping you think critically about your course content right now? What is it?	Open-ended
	Is there anything stopping you from thinking critically about your course content right now? What is it?	Open-ended

Figure 6: Student questionnaire

Ethical issues In technology mediated interviews are considerate in the same manner as face to face interviews: participants are asked to give consent to record and use the content of the interview for the scope of research, the researcher ensures participant anonymity and are given clear instructions about their right to stop the interview at any time or of not answering any question they would rather not answer.

In both student questionnaires I have asked participants whether they would be available to offer more information and context about their answers and asked them to leave a contact email address if they were interested in being contacted by me. I have selected the interview participants from this list of student volunteers.

Between the end of the first trimester, when the second questionnaire was completed and March, I have conducted 10 student interviews. In March, the Coronavirus pandemic and the imposed quarantine completely changed the social context of all population, and students specifically. The implications of moving all education online, meant that beyond the access to courses and their digital environments, students could now not access university services such as face to face counseling, access to libraries, and more.

In the next few months, the uncertainty around the situation, the general anxiety, and the move to remote work has had an immense impact on learning and how digital learning is perceived. For many of the participants, beyond digital learning, their jobs either became remote, which meant that students who were parents had their challenges to study increased exponentially, or were made redundant, which created further complexities in their personal lives. For others, especially during the months of total isolation, all their social connection became dependent on the Internet and digital tools. All these changes have created a very different social landscape than when I first started the study and after March, the reason for which I decided to stop at the 10 interviews I have done pre-pandemic. It would be interesting to further study the differences between the two eras, but this is outside the scope of this thesis. I further comment on this in the discussion section of this thesis.

The interviews were aimed at better understanding the feelings and personal experi-

ence of those students who participated in the questionnaire and had said they were very motivated, as well as those who said they were not motivated in their digital course. I also wanted to deeper understand how students see critical thinking and what value they give it as part of their learning.

The interview consisted of 8 structured questions, administered in the same order and with the same wording, supported by personalized, clarifying questions. After I had introduced myself and told participants a bit about me, who I am and why I am conducting this research, the interview started with a warm up question, asking participants to tell me why they chose to study in a digital learning environment in the first place. The rest of the questions addressed the following issues: a) user experience issues, the way they used their learning environment on a weekly basis, the features they enjoyed the most and the least, b) motivation related issues, whether their learning environment motivated them and if they were feeling motivated to study, in general, and why, c) critical thinking, how they would define it and whether their digital learning environment was supporting them to think critically. Last but not least, the last question, asked participants to imagine an ideal world where everything was possible and describe the ideal digital learning environment that would help them feel motivated and engage with their learning, as well as think critically

4.3.4 Complementary instruments: email and WhatsApp

After the second questionnaire, I have kept an email correspondence with the participants from the study who had left a contact address and had agreed to be contacted by me with further questions. This information, together with the WhatsApp chats (instrument which I included at the specific request of the participants) shared before and after the scheduled interviews, have helped me get a more holistic picture of who the interviewees were, how they talked, what their challenges were, things that would have not otherwise surfaced in the interviews.

In one case, for example, a student was constantly on the train and could not attend our scheduled interview. This student had a full-time job, worked until late and had

a long commute, and spoke Spanish (the local language) with difficulty. These aspects of the student's life gave more meaning and connected to their interview.

4.4 Validity and reliability

Validity of research refers to the ability to demonstrate that the instrument measures what it is intended to measure. A piece of research is valid if the researcher is able to make and defend the logical link between data and proposition, as well as between data and conclusions (Cohen et al., 2017). In order for research to be valid, a researcher must endure, not only that the instrument measures what it claims to measure, but that the interpretation of data is correct. Shadish, Cook and Campbell (2002) note that different kinds of validity concern different aspects of research. The ability to generalize data is affected by construct validity: "the validity of inferences made about the nature and manifestations of theoretical factors" and external validity, in regard to sampling. Other types of validity are statistical conclusion validity: "the use of appropriate statistics to determine, for example, correlation between intervention and outcome" and internal validity: "the validity of inferred and found relationships between elements of the research design and outcomes" Shadish, Cook and Campbell (2002, p. 37).

Quantitative research requires controllability, replicability, consistency, predictability and an impartial point of view of the researcher. Validity also depends on the validity of the statistical tool used and the conclusions acquired. In the quantitative part of this research, I aimed for controllability and replicability of data, consistency and predictability, the randomization of samples as much as possible, for objectivity and observability.

The survey was validated in a two-step process to ensure the dependability of the questions. The first group to validate whether the questions successfully captured the topic consisted of 6 University Professors from the University of Barcelona, The Open University of Catalonia and Pompeu Fabra University (Universitat Pompeu Fabra). As a result of the feedback received, the survey was modified to include defi-

nitions of the constructs used in the survey (such as "learning management system", "digital learning environment" and "critical thinking") to reduce the possibility of confusing participants and increase the validity of the survey. The validation of the survey then continued with a second group, composed of University students learning in a predominantly digital learning environment, who also assessed the survey questions. The data was collected by using an online survey service and the answers were added to a spreadsheet.

In qualitative research, data are socially and culturally saturated and the researcher is part of the researched world and also the research tool. The principal source of data is collected in a natural setting. The key criteria for validity are credibility, transferability, dependability and confirmability(Lincoln & Guba, 1986, Ary, Jacobs, Irvine, & Walker, 2018, cited in Cohen et al., 2017).

In this research, the qualitative data was analysed inductively. I aimed for a holistic understanding of the stories the students in this study shared and I strived for seeing and reporting the phenomena described through their eyes. I focused on understanding their processes of thought, of use of the learning environment, rather than simply reporting their actions. I understood that meaning and intention were essential and I was specifically attentive to rephrase questions when the participants hesitated in their answer or quickly offered that they did not know (for example, a participant said they did not know what critical thinking was, but when I reinforced that I am not looking for the dictionary definition and that there is no right answer to this question, the participant produced a perfect definition of the concept).

Mixed methods studies have their own challenges in ensuring validity and reliability: first, the ability of the researcher to correctly represent the data is of crucial importance, second, data must be legitimate and trustworthy, and third, the integration of quantitative and qualitative data must take into consideration the sample and the volume of data compared.

The main goal of increasing validity and reliability in interviews is in reducing or eliminating researcher bias. Bias is defined as the tendency to systematically make

errors in the same direction, following an often unconscious pattern. Some of the challenges in ensuring validity and reliability in interviews might come from a tendency of the researcher to seek answers that support their theory. An error in interviewing techniques is asking leading questions, questions in which the researcher suggested the answer with the question they are asking.

Another challenge has to do with the decoding of the information shared: in order to achieve validity of data in interviews, the researcher must correctly understand what the participant is saying. In the same way, it's necessary for the participant to understand the questions correctly. Other challenges and threats to validity and reliability in interviews have to do with a tendency of researchers to see participants in their own image and to contextualize the answers they receive not within the socio-cultural context of the participant, but their own, having the research being influenced by the researcher's attitudes and opinions. As human beings, it's impossible to be purely objective, however, researchers can strive to be impartial and make an effort to embed themselves into the reality of the participants and see the world through their eyes.

In order to ensure reliability of the interviews, I was attentive to use the same structure in interviews, to ask the questions in the same order and using the same wording. I aimed to build rapport between myself and the interviewees and establish trust by writing my full name, and University I belonged to, on the interview consent form, I spent time to introduce myself to each participant before each interview, and I made use of video-conferencing to let participants see who I am and where I was recording from. I took time to answer their questions about why I was doing this research, explaining clearly how the data was going to be used, their rights to privacy and anonymity. At the end of each interview, I offered participants the opportunity to ask any other questions about me or my work and let them know they could follow up if they wanted to share more information with me on the same topic or if they had any doubts.

There are two more important consideration to take into account when using mixed methods research and ensuring the legitimacy of the method: one is sample in-

tegration and what kind of inferences do the samples used allow the researcher, and the second, the ability to balance between the views of insiders and outsiders (Onwuegbuzie & Johnson, 2006).

In this study, the qualitative sample is a sample of the larger quantitative sample, which allows for easier sample integration and increases the legitimacy of the inferences made. On the other hand, part of the qualitative study included an instructor survey specifically to balance the views of insiders (in this case students) and outsiders (in this case the instructors).

Ethical considerations

Research intrudes into people's lives and privacy, reason for which conducting research in an ethical way is a requirement of all research. Even anonymous questionnaires, such as the ones used in this study have ethical considerations: the researcher is required to ensure anonymity and safe-keep personal data, as well as explain the rights of participants to ask their data to be removed from study at any time. Another ethical consideration in questionnaires is that participants answer within the already designed, closed framework of the researcher, which might not allow them to fully express their opinion. This is one of the reasons for using catch-all open ended questions at the end of each section in the questionnaire.

Before conducting interviews, the participants signed a consent form that explained how the data was going to be used and what their rights as participant were: the fact that they could decide to stop or pause the interview at any time they wished, that they could choose not to answer any questions that they did not want to answer, and that their data could be removed from research at their request.

The process of data analysis aims to describe, illustrate, condense and evaluate data by dissecting, reviewing, and piecing together data with the help of statistical or logical techniques. Data analysis is an ongoing iterative process by which insight is brought to light from data.

4.5 Data analysis process

The goal of the quantitative research was to see: how motivated students were at the beginning and the end of the semester, how much effort and value they gave their learning, what specific features of the digital learning environment they used consistently and whether their learning allowed them to think critically. On the other hand, the aim of the qualitative phase of the research was to better understand why some students felt unmotivated or believed their learning is not helping them think critically, and why other, in the same group, had reported they were very motivated and enjoyed interacting with the course material and the challenging dialogue with the ideas in the course.

4.6 Data visualization and reporting

The quantitative data results are presented in tabled, diagrams and statistical models, using the standard visualization tools for descriptive statistics. The tone of the report is neutral and impartial, the researcher having not met the participants yet.

The qualitative data is reported in a fluid narration of the findings, describing common themes but also unique points of view and cases, and including participant stories, text fragments and paraphrases. The researcher having had multiple conversations with participants, having empathized with them and gotten to know them, the tone is warm and personal.

4.7 Preparation of data for analysis

To prepare the quantitative and qualitative data for analysis I have used the following strategies: for quantitative data, I have transferred the questionnaire data to excel, then carefully reviewed the data in search of any incomplete, inaccurate or irrelevant data, as well as any data that did not make sense in relation to the question (cleaning the data) and then scored the data, choosing the appropriate score for each item.

For qualitative data, as recommended by Creswell and Creswell (2017), for both the qualitative data collected via the questionnaire and the interviews, I have followed the same process: I organized and transcribed the data, I have scanned the data, and arranged it into different types depending on the source of information. I then read through all the data and made any notes of the first emerging ideas and patterns from the data.

4.8 Exploring and coding data, strategies for analysis

Coding is analysis, it is not merely technical and preparatory work for higher level thinking about study. Coding implies deep reflection and analysis and an interpretation about the meanings of the data(Miles, Huberman, & Saldaña, 2018). The coding process used during the descriptive phase requires the assignment of two types of codes: first, first-order codes and second, second-order codes.

After transcribing the data and reading it for the first few times, I have started coding the data. Coding the data is the process by which the data is organized by dividing it into segments and labeling it by writing a word representing a theme or a category in the margin (Rossman & Rallis, 2011, cited in (Creswell & Creswell, 2017)).

In this first stage I have used in vivo term labelling, using the actual language of the participant. I then re-read the data a few more times and grouped the first order codes into second order codes, looking to further condense data and show patterns. A next step was turning the codes into narratives, which where there turned into metanarratives.

4.8.1 Data coding

A descriptive code assigns labels to data to summarize in a word or short phrase the basic theme of a piece of text. This process provides an inventory of topics to index and categorize, which is especially useful in studies with different types of data (in

this case open-ended questionnaire questions and semi-structured interviews).

In Vivo coding is one of the most popular encoding methods. It uses words or short phrases from the participant's own language as codes. This may include terms unique to a particular culture, subculture, or microculture. Phrases that participants use repeatedly are good clues, as they often point to regularities or patterns in context. In Vivo codes are usually placed in quotes to differentiate them from codes generated by the researcher.

The coding method in this study is inductive. Unlike deductive coding, where the researcher develops a provisional list of codes before field work, inductive coding allows for the codes to emerge progressively during data collection. These types of codes allow the researcher to discover important aspects of the studied context.

4.9 Chapter summary

In this chapter I have outlined the methodology and theoretical consideration for data collection and analysis. The first sections stated the investigated problem and the purpose of research, as well as the main research questions of the study. A second part of the chapter presented the research framework, the research design employed in this study, as well as the rationale for using a mixed methods research design. A third part of this chapter described the data collection instruments used in this study, while in the fourth section I describe the data collection process, the validity and reliability of the instruments as well as the ethical considerations of the study.

Chapter 5

Data Analysis and Findings

In this chapter I report the findings of this study based on the quantitative and qualitative analysis of the data I have generated from this research, which consisted of a quantitative analysis of one professor questionnaire and two student questionnaires applied to the same sample, at the beginning and end of an academic trimester, and the qualitative analysis of the open-ended questions in the student questionnaires, as well as semi-structured student interviews.

5.1 Chapter introduction

The research design, as described in the methodology chapter, was sequential, and used quantitative data to identify themes that were explored qualitatively, resulting in an interpretation of the qualitative results in order to explain the qualitative results of the study.

The purpose of this study was to better understand what motivates students to learn and engage with the educational content, their peers and their instructor in digital learning environments and how their digital learning environment was supporting them to think critically and engage with others. I also aimed at better understanding how students perceive their level of critical thinking in a digital learning environment and whether a student's self reported motivation, level of engagement and critical

thinking changed in time, as they progressed through their courses.

In the next sections, I draw out the results from all analyzed data and present the findings in the following chapter sections, by answering the research questions. This research is focused around one main research question and five sub-questions.

Main research question:

What motivates post-secondary digital students to learn and engage with their course, peers and instructors, in a way that supports critical thinking?

Sub-questions:

1. What are the opinions of professors teaching in digital learning environments about the challenges that digital students face compared to traditional students, and to what extent do they believe their DLE, peers and instructors, can motivate them to think critically?
2. To what extent do digital students report to be motivated and intellectually stimulated?
3. How do they use their DLE: how easy or difficult do they find using it, and which are the features they use most?
4. What are the relationships between motivation, engagement and critical thinking for post-secondary digital students?
5. What are some themes and stories of motivated and critically engaged post-secondary digital students?

5.2 The professors' point of view

In this section, I present the findings related to the first research sub-question, specifically: What are the opinions of professors teaching in digital learning environments about the challenges that digital students face compared to traditional students, and to what extent do they believe their DLE, peers and instructors, can motivate them to think critically?

5.2.1 Professor questionnaire

After validating it with 5 professors from the University of Barcelona, Universitat Pompeu Fabra and Universitat Oberta de Catalunya, the professor survey was sent to 80 University professors from Universities in Europe, Canada, and the United States. I had emailed my former professors at the universities I had studied, as well as professors I had selected from the websites of the top universities in Europe who mentioned in their biographies digital learning, digital humanities, online learning. I used a snowballing technique and asked respondents if they could recommend a colleague who might have been interested in answering the survey. The final list of respondents (n=30), included professors teaching in Spain, France, the UK, Canada, United States, Norway and Colombia.

The original aim of the professor questionnaire was to gauge their opinions about digital learning, student motivation, engagement and critical thinking, as well getting their feedback regarding my focus, in general, in the open-ended sections of the questionnaire.

Descriptive analysis

In the following section, I will provide descriptive analysis for all independent and dependent variables used in the teacher questionnaire. This analysis includes the means, the standard deviations and the range of scores for these variables. I also identify the missing data for those participants who did not provide responses to some items and the strategies I have used to replace the missing data. The objective of conducting the professor survey was to describe the group, reasons for which descriptive statistics were used to visualize and report the findings.

Participant profiles

The majority of participants (n=30) were aged between 35 and 54 years old, with %50 being between 35 and 44 years old, %33 between 45 and 54 years old, %10 between 54 and 64 and %7 between 65 and 74 years old. There were no instructors under 24 years old, between the ages of 25 and 34 or above 75 years old.

All participants, except one, were University teachers and most had some experience teaching University level courses with digital tools, with 45% having taught at least one course using a digital learning environment, 28% having used blended teaching methods, 21% had taught face to face and reported using digital tools in their teaching. 7% reported not having taught digitally, but being highly interested in the topic. 6%3 used a digital learning environment provided by their institution and 23% had helped implement a digital learning environment in their institution. 63% had used Moodle as a learning management system, 23% Blackboard, 17% Brightspace, 3% (1 person).

Level and area of expertise

37% of participants had more than 10 years of experience teaching University courses, 23% had more than 20 years teaching experience and 20% had been teaching between 6 and 10 years, 10% between 1 and 5 years, 7% less than one year and one participant had more than 30 years teaching experience. Regarding their area of expertise, 37% of instructors' field of instruction was STEM (science, technology, engineering and mathematics), 27% in Social Sciences and 23% in Humanities.

Gauging instructors opinions on digital learners

When asked to state their opinion about the following statement: "Digital learners taking University-level courses have more personal/financial challenges that decrease their success rate than face-to-face/on campus learners", 30% of respondents said they disagreed with the statement, while the mean of the responded was "neutral" (fig.7).

The data shows the same tendency towards neither agreeing nor disagreeing with the following two statements: "Digital learners taking University-level courses are more intrinsically motivated than face-to-face/on campus learners" and "The success of digital learners taking University-level courses depends on the other classmates and the existence of learning groups", with the mean of the answers being "neutral", while for the statement that implied that the success of digital learners taking University

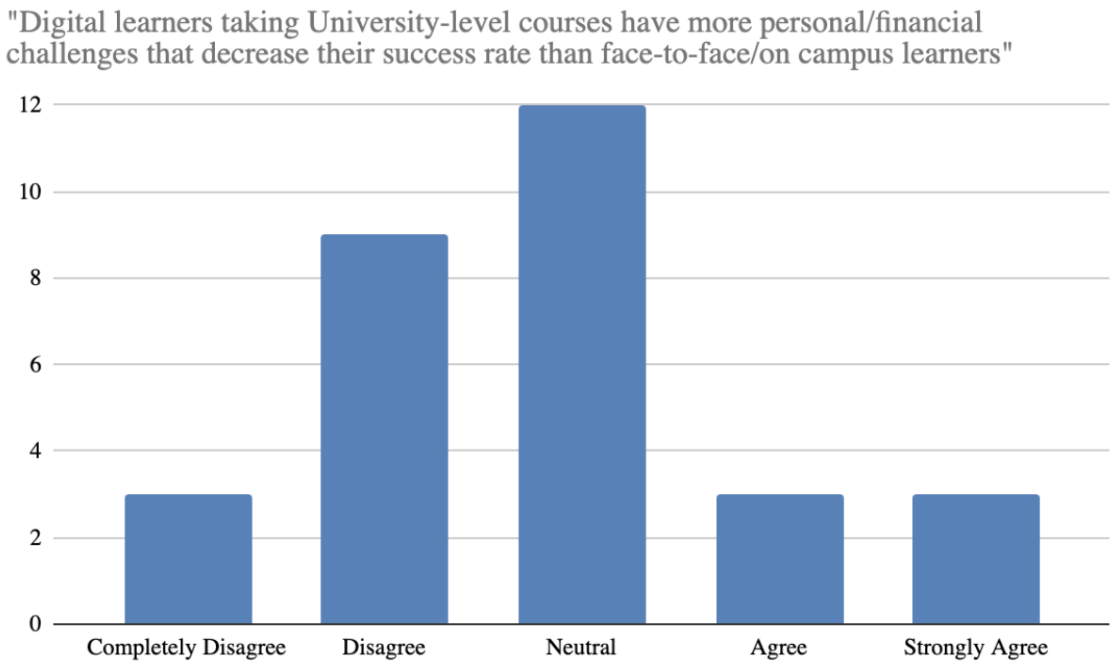

Figure 7: Professors' view on digital students' challenges compared to traditional students

level courses depends on the " instructor's ability to motivate and engage them", the mean was "agree". When asked their opinion on whether digital learners were more intrinsically motivated than face to face learners, 33% of the respondents said they agreed, while 17% disagreed and 13% strongly disagreed. The median score for this question was "neutral".

In responding to the statement that the success of digital learners depends on other classmates and the existence of learning groups, 33% disagreed, 27% agreed and 23% were neutral, with the median for this question being "neutral" (See fig.8).

When asked whether the success of digital learners depended on the instructor's help, 67% agreed, 17% strongly agreed, 10% disagreed, and 7% were neutral with the median for this question being "agree"(fig.9).

Opinions on LMS role in digital education

When asked whether they thought some LMS were better than others at motivating and engaging University learners, 33% said they agreed, 30% were neutral and 27%

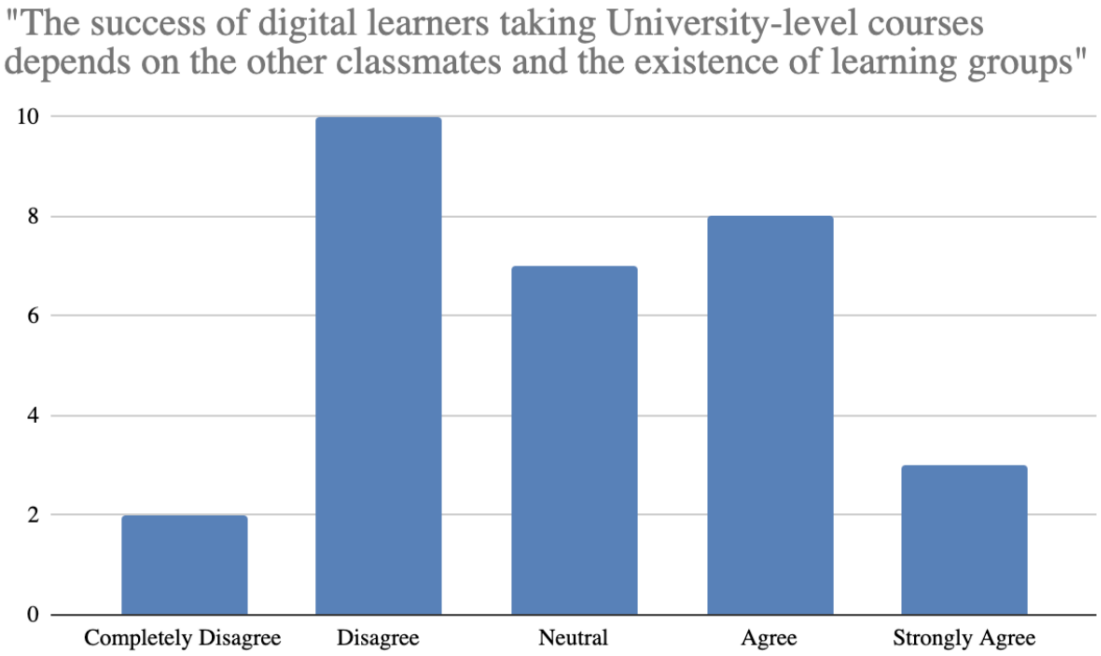

Figure 8: Professors' view on the importance of social learning for digital students

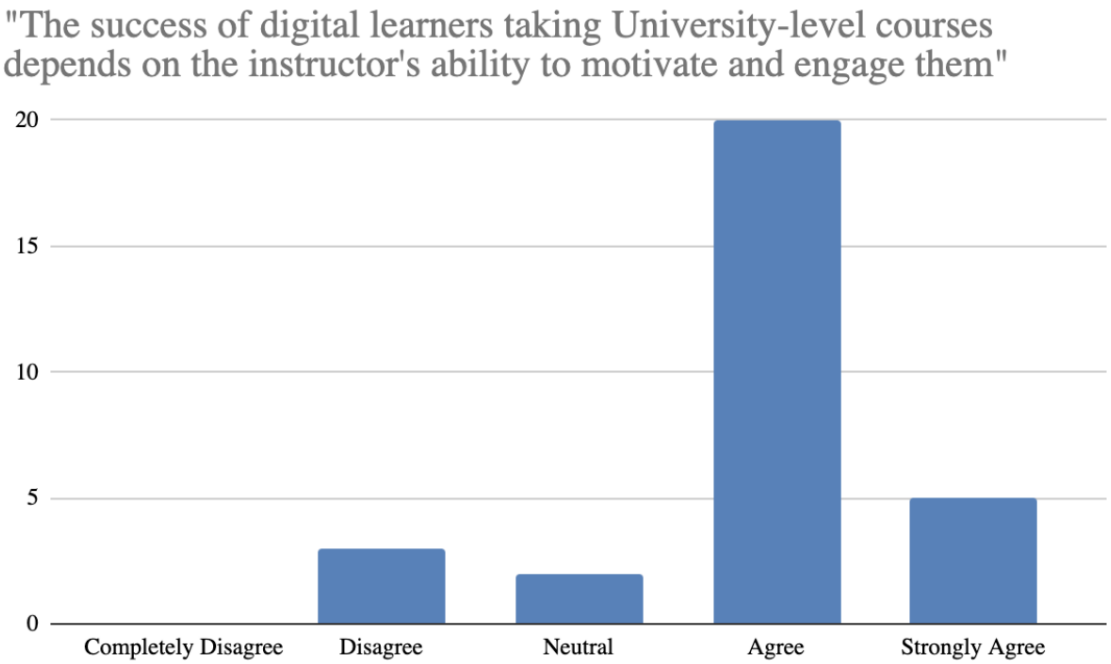

Figure 9: Professors' view on the importance of instructor influence for digital students

said they strongly agreed. Only 1 person disagreed with this statement. The median was "agree".

In responding to the statement whether the success of digital learners depends on the instructional design and the digital learning environment/LMS used, 63% said they agreed, 20% strongly agreed, 10% disagreed. The median was "agree".

To the statement that university digital learners' critical thinking depends on the instructional design and the digital learning environment used, 43% agreed, 27% were neutral, 13% strongly agreed and 13% disagreed. Only one participant strongly disagreed and the median response was "agree".

When asked their opinion on whether students were more motivated if the DLE managed to engage them, 48% agreed, 24% strongly agreed, 21% were neutral, one participant disagreed and another strongly disagreed. The median was "agree".

When asked whether university digital learners were more motivated if the instructor managed to engage them, 72% strongly agreed, 24% agreed and 3% was neutral. The median was also "strongly agree".

Opinions on digital students' critical thinking

When asked their opinion on whether students learning digitally were less likely to think critically than on campus students, 14% strongly agreed, 10% agreed, 38% were neutral, 31% disagreed and 7% completely disagreed. The median was "neutral". 43% of instructors said they agreed and 13% that they strongly agreed with the statement that critical thinking in DLEs depends on the instructional design and the DLE used. 27% were neutral, 13% disagreed and 3% strongly disagreed.

Summary descriptive analysis

The objective of conducting the professor survey was to describe the group, reasons for which descriptive statistics were used to visualize and report the findings. In the following section, I will provide descriptive analysis for all independent and dependent variables used in the teacher questionnaire. The descriptive analysis was

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age Range	30	1	4	1.73	.907
Teaching experience	30	0	5	2.70	1.236
DLE teaching experience	30	0	3	1.20	.664
Digital learners challenges	30	0	4	1.80	1.095
Digital learners motivation	30	0	4	1.97	1.098
Digital learners success depends on peers	30	0	4	2.00	1.145
Digital learners success depends on instructor	30	1	4	2.90	.803
Digital learners success LMS	30	0	4	2.87	.973
Motivation depends on LMS	30	0	4	2.77	1.073
Motivation depends on instructor	30	0	4	3.57	.858
Some LMS are more motivating than others	30	1	4	2.77	.971
Digital learners critical thinking	30	0	4	1.87	1.167
Critical thinking depends on LMS	30	0	4	2.50	1.009
Valid N (listwise)	30				

Figure 10: Descriptive statistics for the professor questionnaire

performed with SPSS.

Standard deviation measures the average distance between the values of the data in the set and the mean. A lower standard deviation indicates that the data points tend to be very close to the mean; a higher standard deviation indicates that the data points are spread out over a large range of values. Standard deviation helps express population variability.

5.2.2 Summary of open-ended question responses

The instructor questionnaire included an open-ended question: What do you think instructors can do to motivate students in DLE to learn in a critical way? The

instructors gave answers that can be grouped in the following themes: mentorship and personal connection with the instructor, offering student context and explaining the relevance of learning in their future careers, creating opportunities for collaborative learning, and creating challenges for students and ways for them to see their progress.

Mentorship and personal connection with the instructor

The most prominent theme was the importance of mentorship and personal connection in DLEs. Teachers saw DLE as limiting in building relationships: "students in DLE rarely have a personalized and familiar contact with the instructor, there is a flaw in building relationships with virtual environments, an instructor can only motivate students with basic orientations and subject content" and said that "communication mechanisms must still be created in virtual environments to ensure adequate mentoring".

Teachers said that students need to be actively supported and encouraged in order to develop their critical thinking skills. "Instructors should keep an active rapport with all the students, encouraging participation, keeping error-correction to a minimum, and introducing challenging questions or guidelines to foster critical thinking, particularly when students' responses are clearly off the track", said one teacher. "They also need for the instructor to be very "present", to interact with them and to respond to their participations", said another teacher.

Another teacher suggested that building direct instructor interaction into the course and DLE design would be helpful for students: "This is a difficult question that I'm still trying to figure out myself. I think one thing that helps is to build in direct instructor interaction into the course is helpful. For example, requiring the students to check in with the instructor either by video chat or by email a minimum number of times throughout the semester".

Other ways in which the instructor can help students think critically were: "continue to interact with participants during the learning/work and focus on the work being done", "show interest and concern for their goals and activities in the course", "hold

individual Skype (face to face) meetings with students on a regular basis, individually", and "maximize use of video (high quality) as a "hook" for the unit. Get to know the students individually and be responsive."

The importance or continuous and timely feedback was mentioned again and again. One professor suggested using different media to offer digital learners' feedback: "provide multiple modes of information delivery (videos, interactive graphics, etc.); respond to students in timely and descriptive ways; use video, audio and text to provide and interact with students". Giving proactive contributions and "consistent involvement in discussions" were considered helpful and important.

Context and relevance

Teachers said that connecting theory to professional relevance, explaining the relevance of the subject to the student and giving examples close to the environment of the learner would support students to think critically. "The instructor should always show the applicability of topics and must focus their students on how the learning outcomes will improve the professional life", said one professor. "Students need to understand the purpose of the materials, activities and tasks they're required to do, and to see how they help them progress" said another. "Choice of materials and design are very important as well, the relevance of the contents, the layout, to what extent they're up-to-date and relevant to the students' interests", said a third teacher.

One respondent mentioned that the content and examples that teachers use should be engaging and students need to be able to understand the digital resources, so they can successfully transition and become more independent in their mastery of the subject. Scaffolding, a process through which the teacher supports students in learning by building on the learner's experiences and learning as they are acquiring new skills, was suggested as an education technique that can support the student to think critically.

Collaborative learning, creating challenges and showing students their progress

A third most prominent theme was the importance of collaborative learning in DLE. Teachers believed that group work and collaborative activities would help digital learners think critically. Facilitating collaboration between peers, encouraging peer feedback, creation or authentic tasks and building real-time activities into the DLE were suggestions that teachers believed helped students.

Another theme that emerged from the answers of the instructors was that of creating engagement with the course by creating challenges and "challenging learning assignments", as well as showing students their progress. One teacher suggested the creation of "specific classes with short explanations, no more than ten minutes", that would help explain a topic, accompanied by a recap moment at the end of each class that would show the progress made in the course.

Another way an instructor said could help digital students think critically was creating activities in which students got to design and build things, and be encouraged to think critically about the decision they made. Another teacher mentioned connecting assessment criteria to critical thinking skills and specifically requiring the student to demonstrate critical thinking.

5.3 Quantitative analysis of the student questionnaires

The student questionnaires, sent to the same group of post-secondary digital students, at a 3-month time distance, were aimed at answering sub-questions numbers 2, 3 and 4, specifically aimed at better understanding how motivated and critically engaged students felt they were and how they used their DLE. Another aim was to better understand the relationships between motivation, engagement - with the DLE, peers and instructors - and intellectual stimulation for digital students. In the following sections of this chapter, all three questions will be answered, according to

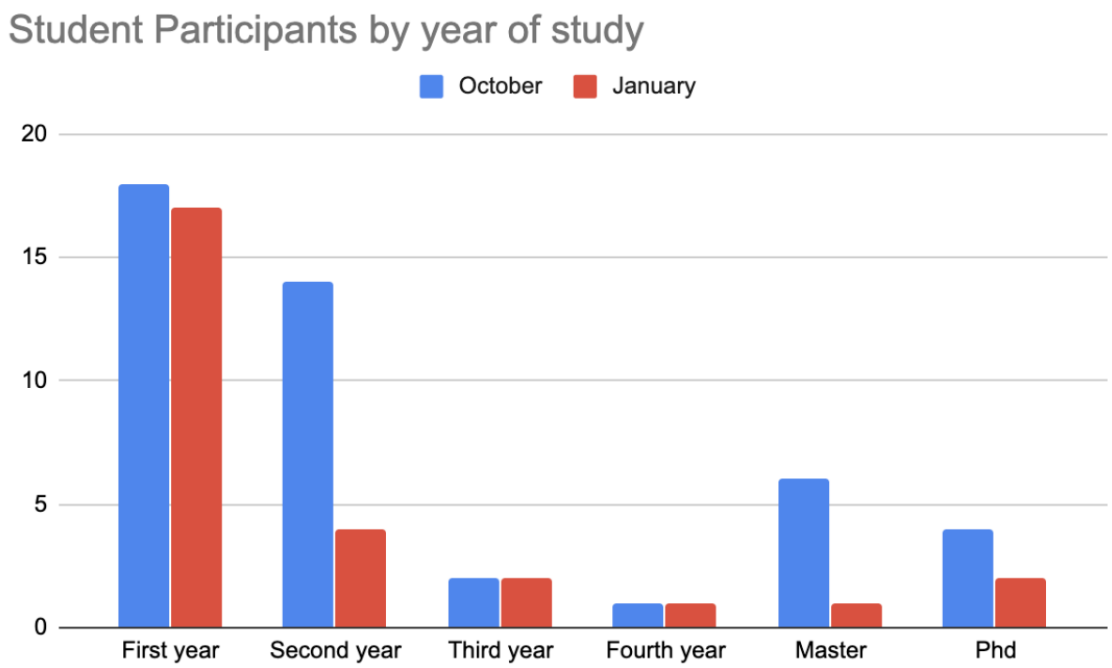

Figure 11: Student profiles by year of study

the finding of the study. A short section describing the participant profile precedes these sections.

5.4 Student profiles

The survey respondents were all University students learning digitally from two Universities in Barcelona, Spain. The students (n=45 in October and n=27 in January) were enrolled in different courses at different levels in their academic career. The majority of respondents were students in their first and second year of University: 71% in October, respectively 78% in January. 13% of students in October were Master students and 9% PHD students, while in January, master students represented 4% of total students and PHd students 7%.

From a conceptual point of view, the items were organized around three themes: motivation, engagement with the digital environment and critical thinking. The data collected is non-parametric and it does not make assumptions about the population. The type of data collected was categorical: nominal (gender, age group, year of study, area of study) and ordinal (ranking items).

5.5 Self-reported student motivation and intellectual stimulation

In order to address the second sub-question, specifically: "To what extent do digital students report to be motivated and intellectually stimulated?", I have divided it in two parts: the first shows to what extent students reported to be motivated in their DLE and course, while the second part describes how intellectually stimulated students in this study felt they were.

5.5.1 To what extent do post-secondary digital students report to be motivated?

In October, in the first questionnaire, 23% of students said that they were very motivated, 36% motivated, 23% somewhat motivated, 4% not motivated and 13% amotivated. In January, for the second questionnaire, 11% of the same group of students reported being very motivated, 54% being motivated, 23% somewhat motivated and 11% not motivated. No students reported feeling amotivated in January. Grouping the answers, we can see that 80% of students reported being motivated in October, and 85% in January. 20%, 15% respectively, said they were not motivated.

The most visible change in time, from the beginning of the course in October, when the survey was first administered to January was in the extremes: those who were motivated migrated into one of the categories to the right of the scale (towards more motivated), but also some of those who has said they were “very motivated” migrated to the left of the scale, towards a lower level of self-reported motivation (fig 12).

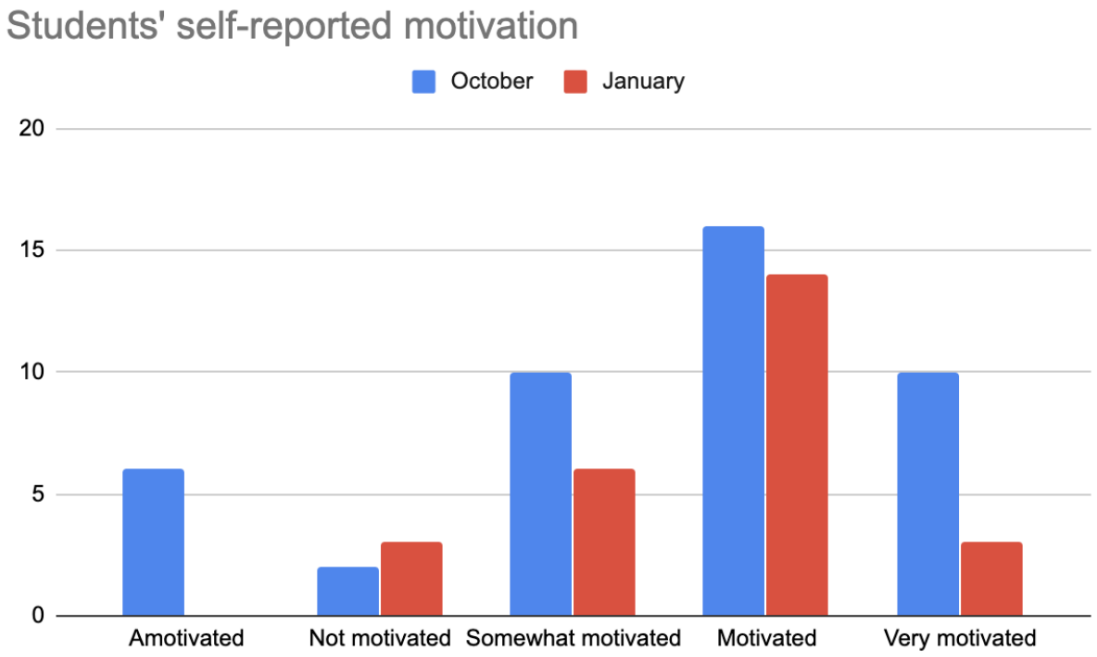

Figure 12: Student motivation in time

5.5.2 To what extent do post-secondary digital students report to be intellectually stimulated and able to think critically?

Next to the questionnaire items, students were offered the following definition of critical thinking: "We define critical thinking as the process of analysis, evaluation, inference and interpretation of resources and activities" and asked how much they felt that the course content was helping them in the development of their critical thinking. 41% of students had said their course helps a lot in October and 48% in January. 52% of students had said in October and their course somewhat helps, respectively 48% in January. Only 7% in October and 3% in January had said that their course does not help them at all in thinking more critically (fig.13).

When asked whether they agreed with the statement: "This course is intellectually stimulating for me", in October, 20% that they strongly agreed, 36% of students said they agreed, 27% that they neither agree nor disagree, 9% disagreed and 7% strongly disagreed. In January the responses were very similar, with 21% of students

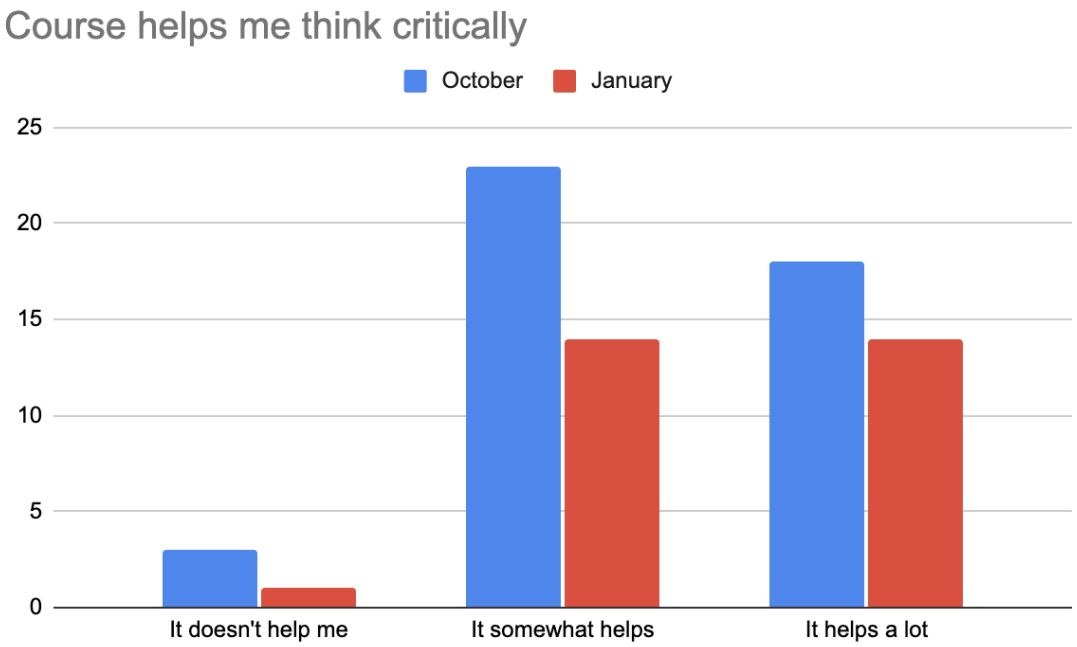

Figure 13: Student course critical thinking in time

saying they strongly agreed, 31% students saying that they agreed, 35% saying their neither agreed not disagreed, 10%disagreed and 3% completely disagreed(fig.14).

The data shows that both self-reported student intellectual stimulation and the critical thinking support students reporting getting from the course declined in time.

Overall, grouping the answers, the percentage of students who reported being intellectually stimulated in October was 57%, 27% were neutral, and 16% reported not being stimulated intellectually. In January, 52% said they were intellectually stimulated, 34% neutral and 14% said they were not stimulated intellectually.

5.6 DLE engagement and features used

This section addressed the third sub-question, specifically: "How do they use their DLE: how easy or difficult do they find using it, and which are the features they use most?". It describes the ease of use of the DLE, as seen by students in this study, the type of DLE they used and the features they reported using on a weekly basis.

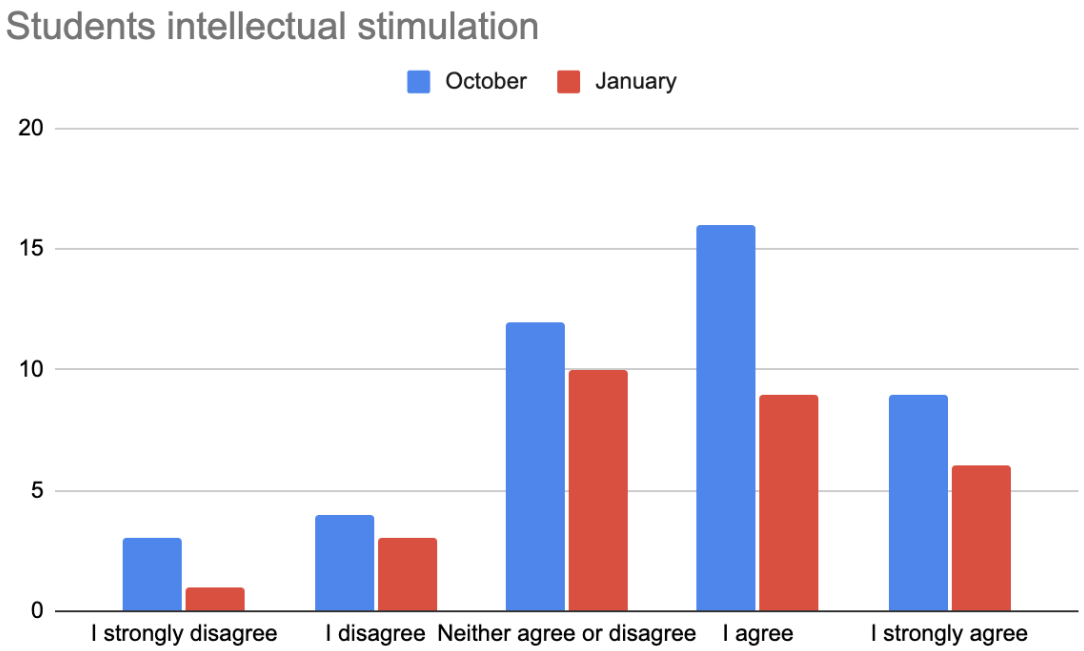

Figure 14: Students intellectual stimulation in time

At the start of the trimester, 30% of respondents had disagreed with the statement "My DLE is easy to use", compared to 16%, three months later. The percentage of those who neither agreed nor disagreed increased from 14% in October, to 24% in January. More students said that their DLE was easy to use in January (60%), compared to October (56%)(fig.15).

Most respondents used Moodle as their LMS (67% reported using Moodle in October and 71% in January). Some students said they used Fronter LMS, It's Learning, StudyIP, Blackboard, PearlTrees. The percentage of respondents who said they did not know which LMS they were using decreased from 26% to 18% from October to January(16).

In terms of the features they used, the two most used features was the public forum, used by 37% or respondents in October and 25% in January, followed by a student/instructor private communication space by 24% of students in October and 21% in January. A third most used features of the digital learning environment were other messaging tools within the course at the beginning of the trimester, and quizzes in

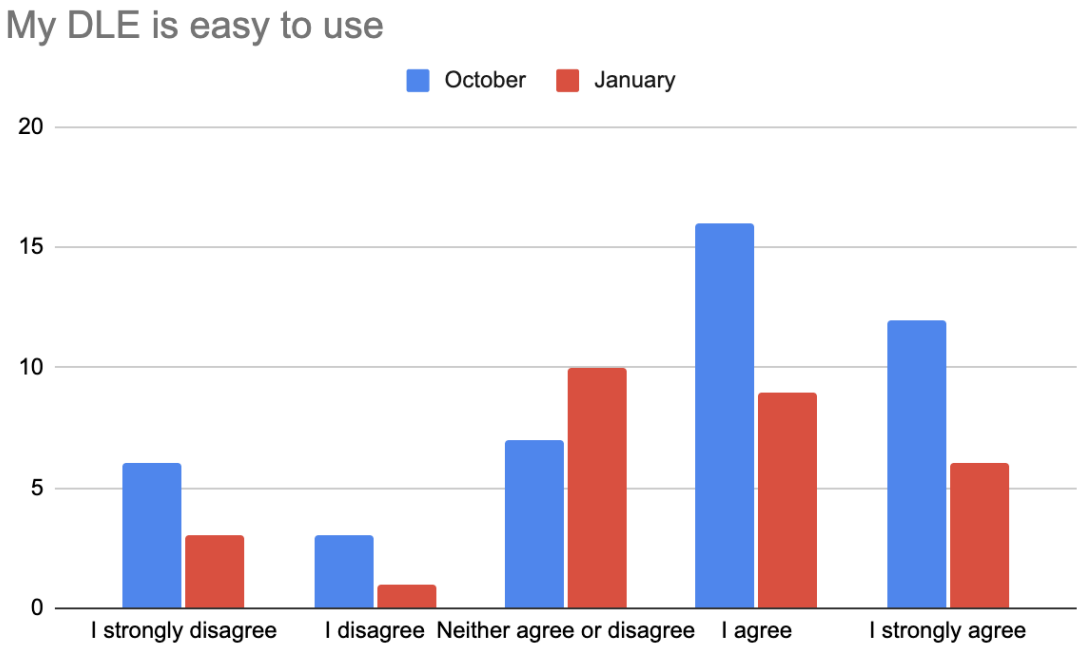

Figure 15: Student perceived DLE ease of use

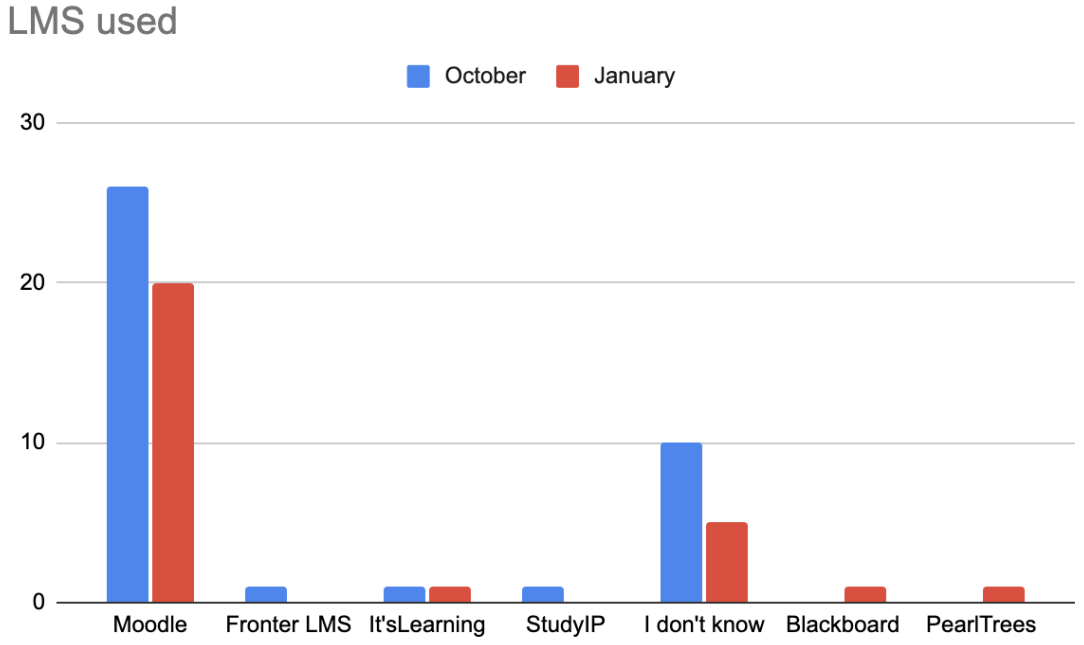

Figure 16: LMS used by students in this study

January. Few people used a group or class private forum (4% in October and 9% in January) and ever fewer used a synchronous video conference system during their course (5% in October and 2% in January). Quizzes were reported to have been used more often in January (21% of respondents) than in October (9%). The same 5% of students reported using a course embedded textbook or similar resource.

5.7 Relationships between motivation, engagement and critical thinking

In order to address the fourth sub-question, specifically: "What are the relationships between motivation, engagement and critical thinking for post-secondary digital students?", I have divided it in four subsections: in the first part, I look closer at the motivation variable in itself to better understand how competence, effort and task value relate to motivation in this study. In the second subsection I examine the relationships between student motivation and engagement with their digital environment, peers and instructors and investigate whether they have changed in time. In the third subsection I analyze the relationships between student motivation and critical thinking for students who study digitally. A fourth subsection inquires whether a relationship could be established between engagement with the DLE, their peers or their instructor and critical thinking. All sections include the change of these variables in time.

5.7.1 Relationships between motivation, competence, effort and task value

We examined student motivation in a previous section of this chapter. A short summary of student perceived competence, effort and task value follow.

Competence

When asked whether they believed whether they possessed the skills to successfully complete the course, in October 16% strongly agreed, 45% agreed and 39% were

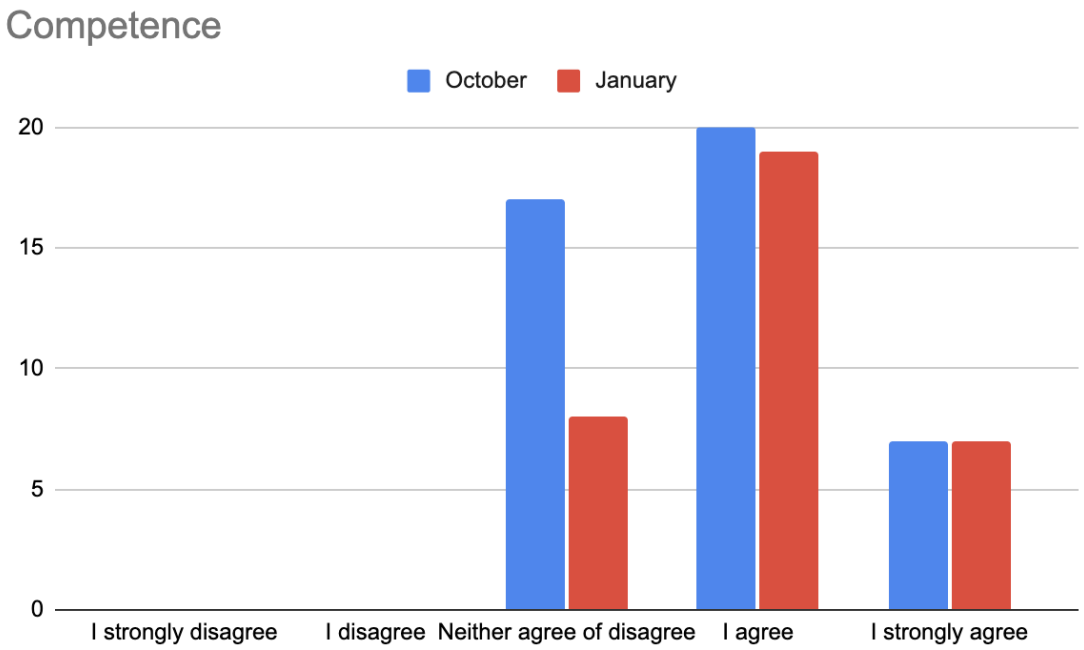

Figure 17: Student perceived competence in their DLE

neutral. In January, 20% of students strongly agreed, 56% agreed and 23% were neutral. No students said they disagreed or strongly disagreed, neither in October nor January.

Effort

When asked whether they were putting in sufficient effort to successfully complete their course, in October, 20% strongly agreed, 43% agreed, 20% neither agreed nor disagreed, 13% disagreed and 2% strongly disagreed. In January only 7% said they strongly agreed, 52% said they agreed, 38% neither agreed nor disagreed, 3% disagreed and no participant said they strongly disagreed.

Task value

The majority of students considered the course was valuable for their future studies or career at the beginning of the trimester, while at the end of it, in January, fewer respondents reported seeing value in their course and more moved into the "neither agree nor disagree" area. In October 32% said they strongly agreed, 36% that they

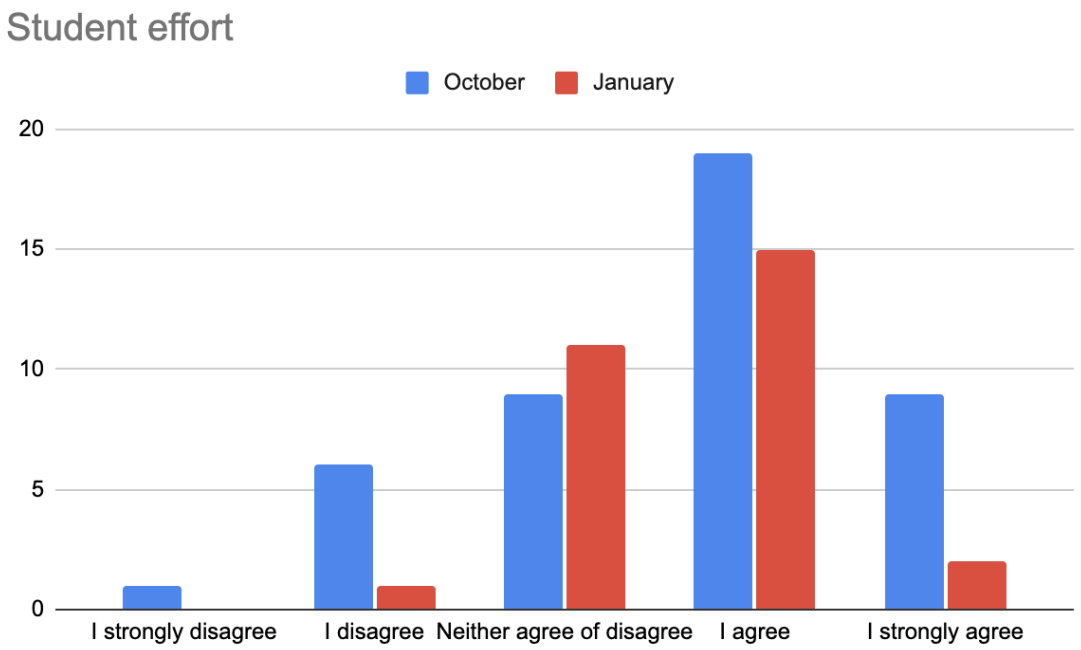

Figure 18: Student perceived effort in their DLE

greed, 18% were neutral, 9% disagreed and 4% strongly disagreed. In January, 27% of students strongly agreed, 28% agreed, 31% were neutral, 10% disagreed and 3% strongly disagreed.

5.7.2 Motivation and competence correlation

To investigate whether there was an association between the student motivation variable and the competence, effort and task value variables, I used a non-parametric data correlation test, Kendall Tau, since my data was likert-scale type, which is a type of non-parametric data (Cohen et al., 2017). The purpose of the Kendall correlation test is to indicate to which extent two ordinal or quantitative variables are monotonously related (Siegel, 1956).

One of the characteristics of non-parametric data, which can be nominal or ordinal, is that no assumption is made about the population from the data. In contrast, parametric data, which can be interval or ratio data, has some knowledge about the population or what inferences can be made from it. Interpretation of the results

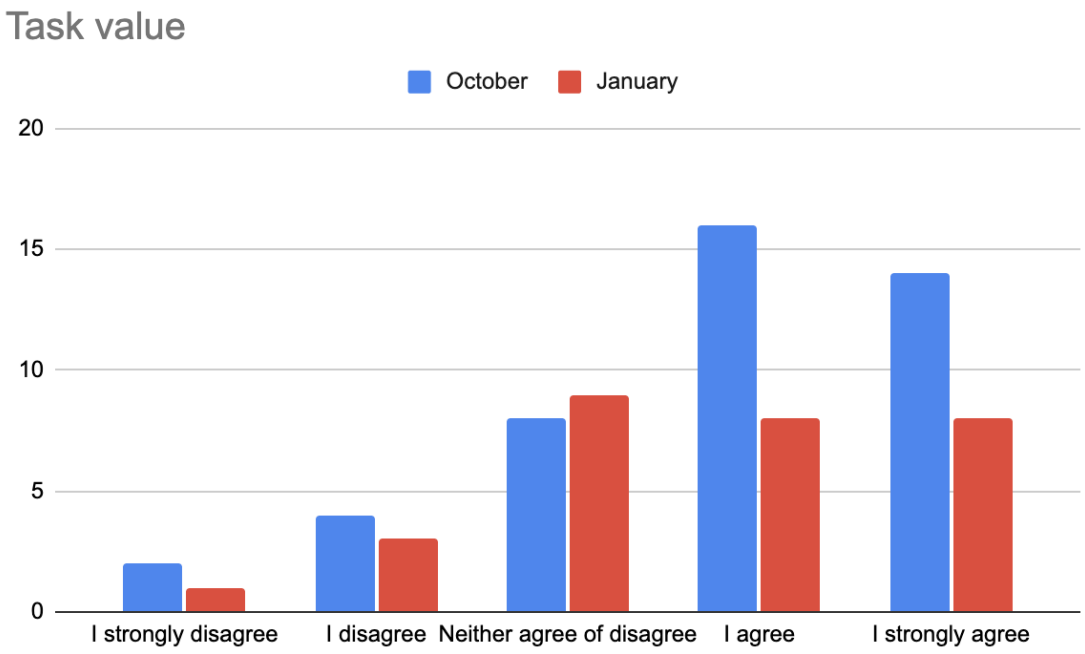

Figure 19: Student perceived value of their course

In statistics, the p-value, also called the probability value, is the probability that the null hypothesis (the theory tested is false) is correct. The p-value can range between 0 and 1. A smaller p-value indicates stronger evidence in favour of the alternative hypothesis (that the theory tested is correct) and allows the rejection of the null hypothesis. A p-value that is equal or less than 0.05 is statistically significant and a p-value that is greater than 0.05 is not statistically significant and indicates strong evidence for the null hypothesis, that no effect was observed.

The correlation coefficient is comprised between -1 and 1, where a) -1 indicates a strong negative correlation, which means that every time one variable increases, the other decreases, b) 0 means that no association between the two variables can be observed and c) 1, which indicates a strong positive correlation, meaning that every time one variable increases, the other one increases as well.

Interpretation of results

Questionnaire 1

Table 1: Motivation and competence correlation test results

Correlation results	**Questionnaire 1**	**Questionnaire 2**
p-value	0.01227	0.006701
tau	0.3319532	0.4609444

Table 2: Motivation and effort correlation test results

Correlation results	**Questionnaire 1**	**Questionnaire 2**
p-value	0.06167	0.9096
tau	0.238698	0.01933328

The p-value of the test is 0.01227, which is less than the significance level alpha = 0.05. We can conclude that motivation and competence are significantly correlated with a correlation coefficient of 0.3319532.

Questionnaire 2

The p-value of the test is 0.006701, which is less than the significance level alpha = 0.05. We can conclude that motivation and competence are significantly correlated with a strong correlation coefficient of 0.4609444.

5.7.3 Motivation and effort correlation

Interpretation of results

Questionnaire 1

The p-value of the test is 0.06167, which is more than the significance level alpha = 0.05. We can conclude that motivation and effort are not significantly correlated with a correlation coefficient of 0.238698

Questionnaire 2

The p-value of the test is 0.9096, which is more than the significance level alpha = 0.05. We can conclude that motivation and effort are not significantly correlated with a correlation coefficient of 0.01933328

Table 3: Motivation and task value correlation test results

Correlation results	**Questionnaire 1**	**Questionnaire 2**
p-value	0.004384	0.002297
tau	0.3634163	0.5108104

5.7.4 Motivation and task value correlation

Interpretation of results

Questionnaire 1

The p-value of the test is 0.004384, which is less than the significance level alpha = 0.05. We can conclude that motivation and task value are significantly correlated with a strong correlation coefficient of 0.3634163

Questionnaire 2

The p-value of the test is 0.002297, which is less than the significance level alpha = 0.05. We can conclude that motivation and task value are significantly correlated with a strong correlation coefficient of 0.5108104.

To summarize this section, motivation and competence, as well as motivation and task value, were found to be significantly and strongly correlated for both questionnaires. No correlation was found between motivation and effort.

5.7.5 Relationships between student motivation and engagement with their digital environment, peers and instructors

One of the research questions of this study was aimed at understanding the relationship between student motivation and their engagement with their DLE, their instructors and their peers. With the student questionnaires sent at the beginning and the end of an academic trimester, I wanted to see whether the students' self-reported motivation changed in time, and if there was any relationship between that

change and their reported engagement with their DLE, instructors and peers.

Engagement with their DLE

One of the changes in their relationship with their DLE, from October to January, was the students' perception of their DLE. At the start of the trimester, 30% of students had said that their DLE was difficult to use, compared to only 16%, three months later. The percentage of students who said their DLE was easy to use also increased, from 56% to 60%. So overall, in three months time, more students said that their DLE was easy to use and fewer that it was difficult to use.

In January, more students reported having used a group communication tool, 9%, compared to 4% in October. At the end of the trimester, fewer students reported using a messaging tool for private communication with their instructors, 21%, compared to 24% at the beginning of the trimester. The same decrease in tool usage was observed for the class forum, which was listed as an often used tool by only 25% of respondents in January, compared to 37% in October.

Motivation and forum use correlation

The feature students had reported using the most, both in October and January was a public forum. The other options were: quizzes, a student/instructor private communication space, a group/class private communication space, synchronous videoconferencing, a course-embedded textbook, a course-embedded messaging system, and an option for "other".

To investigate whether there was an association between the student motivation and use of a forum variable in this study, I used a non-parametric data correlation test, Kendall Tau, since my data was likert-scale type.

Interpretation of the results

Questionnaire 1

The p-value of the test is 0.1745743, which is less than the significance level alpha

Table 4: Motivation and forum use correlation test results

Correlation results	**Questionnaire 1**	**Questionnaire 2**
p-value	0.1745743	0.4565
tau	0.1745743	0.136522

Table 5: Motivation and instructor messaging tool correlation test results

Correlation results	**Questionnaire 1**	**Questionnaire 2**
p-value	0.3719	0.7523
tau	0.1240347	0.05785569

= 0.05. We can conclude that motivation and forum use are significantly correlated with a weak correlation coefficient of 0.1745743.

Questionnaire 2

The p-value of the test is 0.4565, which is less than the significance level alpha = 0.05. We can conclude that motivation and forum use are significantly correlated with a weak correlation coefficient of 0.136522.

Motivation and private teacher messaging

The second most used feature students had reported both in October and January was a student/instructor private communication space. The other options were: quizzes, a public forum, a group/class private communication space, synchronous video-conferencing, a course-embedded textbook, a course-embedded messaging system, and an option for "other".

To investigate whether there was an association between the student motivation and use of a student/instructor private communication space in this study, I used a non-parametric data correlation test, Kendall Tau. As mentioned at the beginning of this chapter, the purpose of the Kendall correlation test is to indicate to which extent two ordinal or quantitative variables are monotonously related.

Interpretation of the results

Questionnaire 1

The p-value of the test is 0.3719, which is less than the significance level alpha = 0.05. We can conclude that motivation and the use of a private student/instructor messaging tool are significantly correlated with a weak correlation coefficient of 0.1240347.

Questionnaire 2

The p-value of the test is 0.7523, which is more than the significance level alpha = 0.05, the test is thus statistically insignificant. The correlation coefficient of 0.05785569 demonstrates no observable association between the two variables.

In summary, a weak, statistically significant correlation between motivation and use of the forum was observed, both at the beginning and end of the academic trimester. Another weak, statistically significant correlation between motivation and use of a teacher private messaging tool was observed at the beginning of the trimester, for the first student questionnaire. No correlation has been observed for the second student questionnaire.

5.7.6 Relationships between student motivation and critical thinking in DLE

The second research question of this study was aimed at interrogating whether there was a relationship between student motivation and critical thinking in a DLE.

When asked whether they considered their course to be intellectually stimulating, in October, 36% said that they agreed, compared to 31% in January. 27% of students had neither agreed or disagreed with the statement “This course is intellectually stimulating for me”, and in January 34% had said the same. 20%, respectively 21% of students had said that they strongly agreed with the statement. 9%, respectively 10% disagreed and 7%, respectively 3% strongly disagreed.

Table 6: Motivation and intellectual stimulation correlation test results

Correlation results	**Questionnaire 1**	**Questionnaire 2**
p-value	0.0003251	0.000167
tau	0.4565831	0.6113962

To investigate whether there was an association between the motivation and stimulation variables in this study, I used the non-parametric data correlation test, Kendall Tau.

Interpretation of the results

Questionnaire 1

The p-value of the test is 0.0003251, which is less than the significance level alpha = 0.05. We can conclude that motivation and stimulation are significantly correlated with a strong correlation coefficient of 0.4565831.

Questionnaire 2

The p-value of the test is 0.000167, which is less than the significance level alpha = 0.05. We can conclude that motivation and stimulation are significantly correlated with a strong correlation coefficient of 0.6113962.

In summary, a strong correlation between student motivation and intellectual stimulation was observed both at the beginning and the end of the trimester.

5.7.7 Relationships between critical thinking and engagement with DLE peers and instructors

The third question of this study was aimed at observing any relationship between engagement with the course, through their DLE, their peers or their instructor and critical thinking for students who study digitally.

Table 7: Intellectual stimulation and forum use correlation test results

Correlation results	**Questionnaire 1**	**Questionnaire 2**
p-value	0.1528	0.909
tau	0.1989064	-0.01978651

Forum use and intellectual stimulation

The feature students had reported using the most, both in October and January was a public forum. The other options were: quizzes, a student/instructor private communication space, a group/class private communication space, synchronous videoconferencing, a course-embedded textbook, a course-embedded messaging system, and an option for "other".

To investigate whether there was an association between the student intellectual stimulation variable and use of a forum variable in this study, I used a non-parametric data correlation test, Kendall Tau, to indicate to which extent these quantitative variables are monotonously related.

Interpretation of the results

Questionnaire 1

The p-value of the test is 0.1528, which is less than the significance level alpha = 0.05. We can conclude that intellectual stimulation and forum use are significantly correlated with a weak correlation coefficient of 0.1989064.

Questionnaire 2

The p-value of the test is 0.909, which is more than the significance level alpha = 0.05. We can conclude that intellectual stimulation and forum use are not significantly correlated with a correlation coefficient of -0.01978651. No correlation association could be observed in this data sample.

Table 8: Intellectual stimulation and teacher messaging tool correlation test results

Correlation results	**Questionnaire 1**	**Questionnaire 2**
p-value	0.4264	0.2126
tau	0.1106379	0.2157792

Teacher private messaging feature use and intellectual stimulation

The second most used feature students had reported both in October and January was a student/instructor private communication space. To investigate whether there was an association between the student intellectual stimulation variable and use of a student/instructor private communication space in this study, I used the non-parametric data correlation test, Kendall Tau to interrogate to which extent two ordinal or quantitative variables are statistically associated.

Interpretation of the results

Questionnaire 1

The p-value of the test is 0.4264, which is less than the significance level alpha = 0.05. We can conclude that stimulation and the use of teacher messaging tools are significantly correlated with a weak correlation coefficient of 0.1106379.

Questionnaire 2

The p-value of the test is 0.2126, which is less than the significance level alpha = 0.05. We can conclude that stimulation and the use of teacher messaging tools are significantly correlated with a correlation coefficient of 0.2157792.

Intellectual stimulation and features use

I also wanted to see if there was any correlation between the intellectual stimulation variable and the number of features a student had reported using on a regular basis. I performed a Kendall correlation test for this purpose.

Table 9: Intellectual stimulation and features use correlation test results

Correlation results	**Questionnaire 1**	**Questionnaire 2**
p-value	0.8822	0.8927
tau	-0.01909866	-0.02182742

Table 10: Intellectual stimulation and peers support correlation test results

Correlation results	**Questionnaire 1**	**Questionnaire 2**
p-value	0.1263	0.1218
tau	-0.2046638	0.2628002

Interpretation of the results

Questionnaire 1

The p-value of the test is 0.8822, which is more than the significance level alpha = 0.05. We can conclude that stimulation and number of features used are not significantly correlated with a correlation coefficient of -0.01909866. No correlation association could be observed in this data sample.

Questionnaire 2

The p-value of the test is 0.8927, which is more than the significance level alpha = 0.05. We can conclude that stimulation and number of features used are not significantly correlated with a correlation coefficient of -0.02182742. No correlation association could be observed in this data sample.

Intellectual stimulation and peer critical thinking support

To investigate whether there was a statistically significant association between the student intellectual stimulation variable and the critical thinking support students said they got from their peers, I used the non-parametric data correlation test, Kendall Tau.

Table 11: Intellectual stimulation and instructor support correlation test results

Correlation results	**Questionnaire 1**	**Questionnaire 2**
p-value	0.003509	9.639e-05
tau	0.3953902	0.6650092

Interpretation of the results

Questionnaire 1

The p-value of the test is 0.1263 which is more than the significance level alpha = 0.05. We can conclude that stimulation and critical thinking support from peers are not significantly correlated with a correlation coefficient of -0.2046638. No correlation association could be observed in this data sample.

Questionnaire 2

The p-value of the test is 0.1218 which is more than the significance level alpha = 0.05. We can conclude that stimulation and critical thinking support from peers are not significantly correlated with a correlation coefficient of 0.2628002. No statistically significant correlation association could be observed in this data sample.

Intellectual stimulation and perspective of teacher help

To investigate whether there was a statistically significant association between the student intellectual stimulation variable and the critical thinking support students said they got from their teachers, I used the non-parametric data correlation test, Kendall Tau.

Interpretation of the results

Questionnaire 1

The p-value of the test is 0.003509, which is less than the significance level alpha = 0.05. We can conclude that stimulation and critical thinking support from teachers are significantly correlated with a strong correlation coefficient of 0.3953902.

Questionnaire 2

The p-value of the test is 9.639e-05 which is more than the significance level alpha = 0.05. We can conclude that stimulation and critical thinking support from teachers are not significantly correlated with a correlation coefficient of 0.6650092. No statistically significant correlation association could be observed in this data sample.

5.8 Qualitative analysis of student open-ended questionnaire answers and interviews

The analysis of the data is composed of two phases: a first descriptive phase that is based on the coding of the collected data and a second interpretive phase that is based on relating the codes obtained in the previous phase with each other, and with the theoretical foundations of the research.

The process of coding fragments transcripts into separate categories of topics, concepts, events, or states. Once individual themes have been found, they must be related to each other in order to develop an integrated explanation, seeking the links that may exist between them and with the theoretical foundation of the research.

Data collection is inevitably a selective process, we cannot and cannot cover everything, even if we think we can and do (Miles et al., 2018).

5.8.1 Qualitative analysis of open-ended questions in student questionnaire

Student Motivation

The open-ended question, "What has recently motivated you to pursue the successful completion of this course?" was located at the end of the motivation section of the questionnaire. Students responded to the open-ended questions of the questionnaire in English, Spanish and Catalan. All the translations are my own and the original text is provided in the footnotes section.

When writing about the things that motivate them to complete their course, students tended to look both inward and outward.

Some motivations were intrinsic: students were personally interested in the subject matter and passionate about studying it. "The fact that for the first time in my life I am studying something that I am really passionate about[1]. Another theme was their wish to make an impact in the world and change the educational system: "My objective is changing and improving the educational system. To reach my objective I must keep a positive attitude. It 's also important that I love teaching" [2]. A third most common theme was being motivated by their own past success, progress and hard work: "[What motivates me is] that I am doing something I like and I worked hard to get here" [3]

Other motivations were extrinsic and had to do with the goal of finishing University: Finishing [my studies] and having a University titles in a few years"[4], or the idea of being able to get a job they liked: " I think I am motivated by [the prospect of] working in the area of education, especially with children"[5], and a better future for themselves and their family: "My interest to achieve my goals and give to my family a life with dignity".

Factors driving learning success

Students were asked to reflect on what could help them be more successful at school, the current term (fig22).

Factors driving learning success

When listing factors that they believed to help them improve their academic results, more external factors were listed than internal factors. Internal factors were

[1]Original text: "El hecho de que por primera vez en la vida estoy estudiando algo que realmente me apasiona"

[2]Original text: "Mi objetivo es llegar a cambiar, y mejorar el sistema educativo. Para conseguir mi objetivo pues intento mantener una actitud positiva. También es importante el hecho de que me encanta la pedagogía"

[3]Original text: "Que hago algo que me gusta y me he esforzado para llegar aquí."

[4](Original text: "Acabarlo y tener un título universitario en unos años"

[5]Original text: "Creo que me motiva trabajar en el ámbito de la educación, sobretodo con niños"

Themes	Short description
Finishing my studies	Students were motivated in their course by the prospect of finishing their studies.
Better future career opportunities	Students were motivated by the idea that the course itself will allow them to access better opportunities in the future
My future work as an educational practitioner	Students were motivated by the idea of starting to practice what they were studying
Improve the educational system	Students were motivated by the idea of improving the existing educational system
Personal interest in field of study	Students were motivated by their own, intrinsic interest in the subject of the course
My successes	Students were motivated in their course by their previous success and valued their position in the course as a result of hard work

Figure 20: Questionnaire student motivation themes

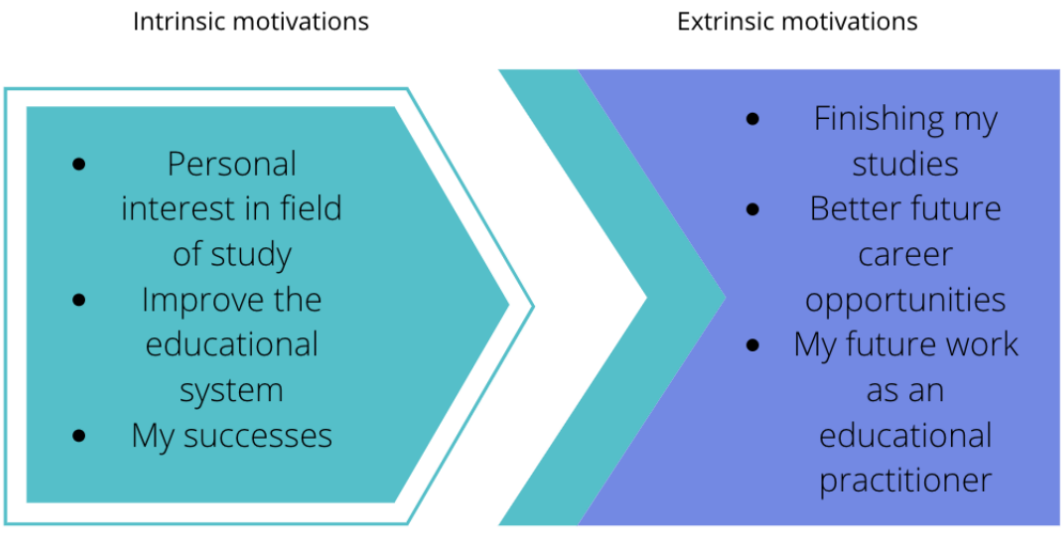

Figure 21: Student motivation themes matrix

Themes	**Short description**
More effort, focus and self-discipline	Students mentioned personal effort, more focus, more self-discipline and more self-confidence as actions that could help them be more successful at school
Fewer political distractions	At the time of the first survey in Catalonia there were strikes and protests that affected class access and made the overall social ambiance stressful and uncertain. In January, when the second survey was sent out, this theme disappears
Fewer money problems	Some students work and study at the same time, which creates challenges in dealing with University work. Students mentioned that having fewer money-related worries would help with their academic success
More time to study	Students mention more time to study and more time in general as something that would help them be more successful in their academic endeavors
More teacher support	Teacher support, teacher help, better teacher explanation, more class discussion, are all listed as ways in which students believe they could be more successful
Less theory, more practice	Students mention a need for practical information and don't see value in learning theory. They believe theory will not help them in their future career
More motivation	Students mention more motivation to study as something that could help them to better in school

Figure 22: Student success themes

sometimes phrased in a way that suggested that motivation or time to study was something they expected to be provided to them or that they did not have control on.

Students mentioned more time to study and more time in general as one factor that could help them do better at school. This concept of "more time to study" was sometimes phrased in a way that suggested the student understood that they needed to make time themselves: "Dedicate more time to reading to complement what I learn in University[6] and sometimes phrased in a way that suggested that time is something they don't have as a resource and don't have control on so it can be used to improve academic results: "More hours in the day so I can study" [7].

Other internal factors listed as drivers of academic success were focus, effort and discipline. In this case, the phrasing suggested that the student considered these factors to be their own responsibility and in their control: "I should apply myself more and organize myself better"[8].

Another factor that was listed as something students would need to have better results was more motivation to study.

External factors

In terms of external factors listed, students mention better teachers support and engagement, both from an academic and emotional point of view: "[It would help] that teachers would engage with students, for example they explain the subject matter, they read the Power[Point presentation] and if you understand it fine, if not it's your problem"[9]. Another factor listed as one that would help them achieve more academic success is studying less theory and more practical topics, that they see as being more helpful in their future career: "More dynamic lectures and not so much

[6]Original text: "Dedicar más tiempo a leer para complementar lo que aprendo en la universidad"
[7]Original text: "Más horas al día para poder estudiar"
[8]Original text: "Tendría que aplicarme más y organizarme mejor"
[9](Original text: "Que los profesores se implicasen (sic!) con los alumnos, como por ejemplo explican la materia que después leen el power y si lo entiendes bien y sino ya te las arreglas"

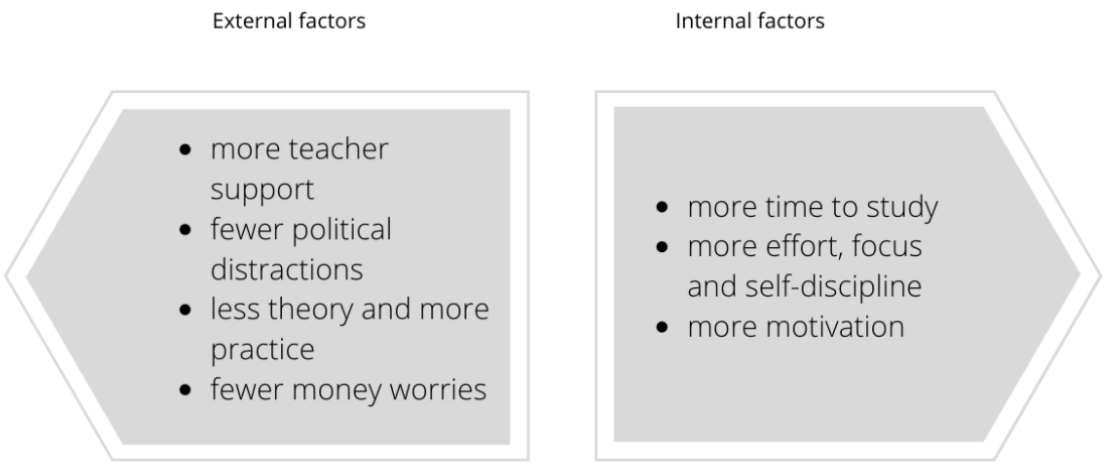

Figure 23: Student success themes matrix

theory... The second year is very theoretical and in the end students get tired"[10] and: "Less theoretical lectures and better related to our work"[11]

A factor that only appeared as a result of the first survey, was fewer political distractions. "I am currently demotivated because of the political situation, it brings me tension and discouragement"[12] and "[I would like] classes [to be] continued and not [to have] so many interruption in relation to strikes, demonstrations"[13]. At the time of the first survey, there were strikes and protests in Catalonia, which affected class access and made the overall social ambiance stressful and uncertain. In January, when the second survey was sent out, this theme had disappeared.

One last factor mentioned were economical problems which students felt it distracted them from their studies: "Not having economical problems"[14].

[10]Original text: "Más clases dinámicas y no tanta teoría. El segundo es un año muy teórico y al final el alumnado se acaba cansando"
[11](Original: "Clases menos teóricas y más relacionadas con nuestra labor".
[12]Original: "Actualmente la falta de motivación viene de la situación política, me genera tensión y desánimo"
[13]Original: "Clases continuadas y no tanto parón en relación a las huelgas, manifestaciones"
[14]Original: "No tener problemas económicos"

Internal factors

Some of the internal factors that students mentioned as believing to be influential in their academic success were: more time to study and more time in general, more effort, focus and self-discipline, as well as more motivation to study. This last factor was mention only in a generic way, while the others were more contextualized to their everyday routines: "Focus more and get on top of things"[15] or: "More work at home and more participation in class"[16].

Critical thinking factors

When asked "Is there something else that helps you think critically about what you are studying right now?" some students said "no, there is nothing else", while others talked about reading, listening to conferences and being exposed to more information from more sources and in different media formats, about peer exchange and dialogue, about class discussions and the class environment in general. Some students said that they "own curiosity" and their "own critical mind" was helping them. Other students demonstrated practicing critical thinking by making statements such as: "Relearning everything that I thought I already knew"[17] or "Starting from the classes [experience], I am questioning things more than I did before"[18].

Factors impeding critical thinking

Students mentioned as factors impeding them from thinking critically the excessive, in their eyes, use of theory "Too much senseless theory" [19] in class. Another factor mentioned is the lack of discussion in class. "In some classes I feel like the teacher is the source of wisdom and that he/she doesn't allow me to think in a way that is different from him/her" [20] said one student. "The thinking of people in my class,

[15](Original: "Concentrarme más y ponerme al día"
[16](Original: "Más trabajo en casa y más participación en clase"
[17](Original: "Reinterpretar tot el que ja donava per après"
[18]Original: "A partir de las clases, yo misma también me cuestiono más las cosas cosa que antes no hacía"
[19]Original: "Demasiada teoría sin sentido"
[20]Original: "En algunas asignaturas siento que el profesor es la fuente de sabiduría y que no se me permite pensar diferente a él/ella"

Figure 24: Factors supporting students' critical thinking

Themes	Short description
Too much theory	A recurrent theme in these sets of answers is "useless theory", or theory without context. Students see theory as something that keeps them from thinking critically
The curriculum	Related to the above theme, students believe that the curriculum is antiquated and relates little with their reality and their future careers. Other times they mention that the curriculum is not interesting enough.
My peers and teacher	Students mentioned that they felt their peers deterred them from thinking critically
Nothing	More than half of the students said that there was nothing stopping them from thinking critically

Figure 25: Factors impeding students' critical thinking

that I don't share" [21]said another student. Another theme that came up is the curriculum itself. The opinions of some of the students are well summarized by this quote: "It doesn't stop me [from thinking critically], but it limits me a lot, the academic plan that teacher have to follow and [the teachers] themselves" [22]. Many students said that there was nothing that stopped them from thinking critically. Others gave very diverse answers, that could not be grouped in a single theme: in one case the language comprehension made critical thinking difficult, the lack of personal experience, the lack of time, their own lack of effort, motivation to think critically and external distractions.

[21](Original: "Los pensamientos de la gente de mi clase, que no comparto"

[22]Original: "No me impide, pero si me limita mucho, el plan docente que tienen que seguir los profesores y ellos mismos"

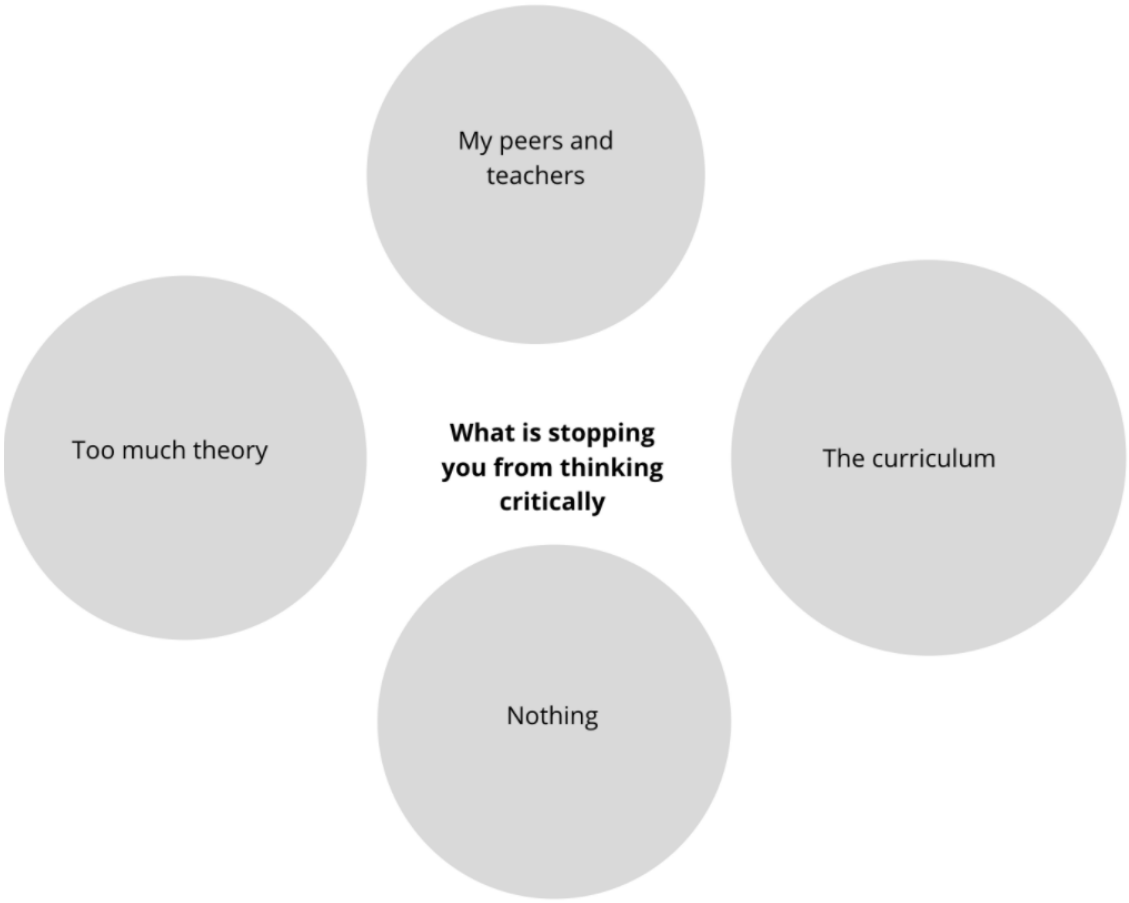

Figure 26: Factors impeding students' critical thinking matrix

5.9 Qualitative analysis of the student interviews

5.9.1 How DLEs motivate students

When asking students whether they believed their DLE was motivating them to learn, there were four main types of answers: while some students said that some tools and features of the DLE did indeed motivate them, others said the contrary, that it was harder for them to feel motivated in the DLE. Other students believed that it was not the DLE that was motivating them, but rather the actions and support of their teachers and peers, while a fourth group said that they were intrinsically motivated to learn.

I am intrinsically motivated

Some students said that they did not need to be motivated by their DLE, as they were already intrinsically motivated to learn. “The most important thing is the motivation from within, to [be able to] say, we are going to do it, and we are going to do it well and this helps”, a student said. Other students saw their learning as a way to better themselves and later, with their knowledge, society. This theme came up multiple times in the open-ended answers of the student survey as well. One student said: “I have an idea that I have forged in recent months ... we live in a society where the individual is in crisis. It is more important today how others see us and earn money. It motivates me to learn to be more than this. I want to be something more, and I believe that education and knowledge can help me to be something more”. Others initially said that their DLE was motivating them, but later realized that they were intrinsically motivated as students and that their DLE was not helping in any specific way. This can be illustrated by the following dialogue with a student:

INTERVIEWER: "How does your digital learning environment move you to learn if in any way?"

STUDENT: "Yes it does motivate me, but I would not know how to tell you in

what way."

INTERVIEWER: "And how do you know what motivates you then?"

STUDENT: "I'm thinking how... I don't know... let's see... it motivates me per se, I'm a motivated person."

INTERVIEWER: "In the questionnaire you said that you really like what you study?"

STUDENT: "Yes, I like it a lot and the truth is that it motivates me a lot."

INTERVIEWER: "And is there something about your virtual campus, when you use it, is there something that motivates you, that gives you an impulse to explore more?"

STUDENT: "I think it's nothing specific."

People motivate me, not the DLE itself

Some students believe that the DLE itself of digital tools themselves cannot help in motivating them to learn, and that their teachers and colleagues can help. "If I have a good teacher, and I like how they give a class, the fact that you have to do some homework online instead of going to class and... doubts ... doubts can be resolved anyway" said one student. Another student talked about an assignment in which she had to create a Wikipedia page together with another student from the other side of the world, and how the task seemed uninteresting in the beginning but how getting to know how to use the tool and working with someone else energized and motivated her. When asked why she though this experience was so motivating she said: I think it was a bit of everything, because it was also the Teacher who told me that I could work with this tool and who painted it so well that I kept working on it". The student described how she was already enthusiastic to do the assignment when the teacher described the tool, only to be even more motivated when she met her student partner and had to work together on the project.

Another student mentioned that only few teachers motivated her and that she believed that it was the job of the teacher, and not the DLE to motivate students: "I believe that the majority of teachers are not prepared and do not motivate me. There has also been a subject that has motivated me but because the teacher was a specialist in ICT", the student said.

Some tools and features of my DLE motivate me

Some students said that their DLE motivated them because it was easy to use, "intuitive", that they had everything they need in one place and that they felt they were capable to do their work well. One student described how she felt her DLE was motivating her: "[it's] the agility that the environment gives [you], to find the information, to quickly put it in a PowerPoint, it's easy ... it motivates me to do it and do it well because I know that I can do it, that I can use these tools correctly and quickly".

Ease of use, as the ability to access it via multiple devices, wherever they are, was another reason listed as motivating when using the DLE. In the following fragment a student described why using her DLE from her mobile phone is important and useful: "All my life I have lived a life full of technology, I was born in 2001, and I have always found myself in front of the computer, I think it is important for today's society. There are many discussions, for example should you use the mobile or not? For me, the mobile is fundamental for today's society, there are teachers who use the mobile as resources to learn. I have a note on my cell phone where I put all the digital tools that they tell us so that one day I can use them. These are didactic and fundamental tools [for me]". Talking about the importance of accessing her DLE and learning resources from her mobile phone another student said: "I have a complicated life, I have a job, I have a child, and I use it (n.ed: the DLE on her mobile phone) more or less to orient myself, so before starting the subject it gives me this ability... to enter the course from my mobile, while I am on my commute ... [so I can]refresh my brain with the topics that we are going to discuss [in the course]".

The fact that they could access it no matter where they were located geographically and in their free time, made other activities, such as full time work or caring for a family member, possible. The asynchronous environment gave them flexibility, and they felt like they saved time: "I have to make an effort, but it compensates me because in my case, for example, I have to work, so I know I would drop the university if I had to go every day, I could not study. Then it makes me angry, because, on the one hand, I would like to go, but I can't. And if I have the digital environment, which gives me the ease of not having to go [physically, to the University], I prefer it." Another student said: "You can do your work, you can submit the papers you have to do beforehand... for instance in this last course I had everything ready in the first two weeks, so that motivates me... it's not like in a face to face environment you need to go to class, you need to be there, it takes a lot of time, so this independence, this flexibility, there are huge benefits". The student later added "It's convenient for example if you prefer to study at night, it's very convenient for your studies. Or if you want to work on the weekend, when you don't have the routine and the stress of the week, you can".

Another aspect of their DLE that motivated students was that they knew they could access valuable additional learning resources via their DLE. "Something that motivates me a lot is when I go on [the virtual] campus and see I don't know what... it motivates me a lot because I like to read. I prefer to read texts like this and then be able to study, but for the class I prefer a text of this, a text of this, and then you can contrast and compare how different they are, I like it, it motivates me." Another student mentioned the embedded video-conference tool in her DLE and how much she enjoyed connecting to other people through it: "The conferences (n.ed conference calls), which you can do with someone from another country, someone who is an expert in some subject... it is very good because we can learn about some subjects from other people from the other side of the world".

My DLE doesn't motivate me, and sometimes it even demotivates me

Some students mentioned that they felt that their DLE didd not motivate them and that they felt they have to make an effort to study in a digital environment. "Honestly, it motivates me less than going to the [physical] classroom, I have to be much more constant, [I have to] be in front of the screen, and if I compare it with the human contact with a teacher that I especially like [...] I don't feel like having to do it online... this can never be ... as they say ... it cannot be compared, for me, from this point of view..." said a student talking about how she feels something is missing in her DLE.

This student stressed that she has to study digitally because of her personal circumstances, but that it's not her preferred choice. Other students talked specifically about the challenges of asynchronicity and how having to "wait for an answer" or to "get a reply" made them not want to start conversations at all. "I used to teach face to face classes, and it's different" said one student. "The student is there, I am there, and you can ask something at the same moment: [if]I have a doubt... this is complicated in online environments because they are asynchronous. [...] This is the main problem with the DLE. Sometimes you have to wait, sometimes they don't answer, and you get a bit lost. Especially when you have problems with submissions and so on, you depend on the other person, but it's not like a face to face relationship... because it's not synchronous" the student added. When asked to give an example of how the asynchronicity has demotivated him in the past (because he has said that the DLE demotivated him), the student added: "If I have six or seven submissions, thank God none of that was group submission because then you depend on other people, and then it can become very complicated. I am used to working by myself, I function very well like that. When I don't have an answer I keep thinking about that task and that thinking adds up to the load of tasks I have to keep in mind already. It messes my schedule, it messes the way I like to work. I think that's the main hassle, the main thing with online learning."

A definition of critical thinking

One of the main goals of the qualitative study was to better understand whether students believed their learning environment was helping them think critically and if so, how. Before exploring this topic, I asked students for their own definition of critical thinking, stressing the point that there was no right or wrong answer and that i wanted to understand what critical thinking meant to them.

There were three themes that came up again and again in these conversations, and those were: the ability to question authority and others in general, collecting, verifying and using information to inform their opinions and, last but not least, that thinking critically, as a student, can get one “in trouble”.

According to the student participants in this study, critical thinking is defined as the ability to "not close yourself to anything", to be open to new points of view and seeing things differently, and as a result, the ability to change your opinion. It is "being able to be wrong and being able to evolve", it is "wanting to see further". Critical thinking, one student said, is "confronting oneself" and "reflecting about what one is about to do". It is the ability to "believe in your own doubts", another student said.

Questioning authority and the opinions of others

Critical thinking is the ability to "question authority, even teachers" in order to "confirm to ourselves that what we are hearing and what we are doing is correct". "Some students see the teacher like the authority in all existing knowledge, and it’s not true", one student said. "Not anything that comes from a teacher has to be true".

It is being able to "see the other side of what the person is saying" when they are sharing their opinion. Is it exploring the opposite opinion. Critical thinking is making the time to "make my own mind before you sell me your point of view".

It is using what one knows from their own experience to be able to distinguish between an opinion, pure storytelling and the real world. Collecting and verifying

information

Students believed that critical thinking is having enough information to have an opinion. One key aspect of critical thinking, they believed, is "verifying information", "verifying sources", "triangulating sources".

Students saw critical thinking as the "lifelong ability" to be "reluctant about the information you receive even if it comes from official settings". For one piece of information to be good enough, "you have to find a lot of things that are of no use".

Critical thinking is the ability to put weight on all the information one has and decide for themselves. In their view, critical thinking is the ability to apply the information to one's own questions. "Fake news happen because of a lack of critical thinking" students said.

The students' opinion was that critical thinking can be taught and trained by debates and listening to people with different backgrounds, with different points of view, and that "it can be improved with your experiences, with your studies" as one student said. They said that they tend to be more critical about things they know well and less critical about things that are new to them.

Critical thinking can get you in trouble

Students have said that in their experience, voicing their disagreement with the teacher or other authority figures has got them into trouble. They don't think they were wrong in their opinions, but that their criticism was not welcome, or was not well explained. Thinking critically, could be an advantage, a good work practice, "but it could also land you intro trouble", one student said. Another student said "I tended to voice my criticism very often, and I would get answers like: oh, no that goes against the dogma, you cannot say that".

How DLEs support students in thinking more critically

When asked whether their digital learning environment was helping them think critically, almost half of the interviewed students responded affirmatively and the

other half, negatively. One student said they did not know and did not wish to elaborate further. This was also the only student who did not attempt to give a definition of critical thinking and declined to explore this concept further during the interview.

Themes and stories of students who believed their DLE was supporting their critical thinking

All the students who believed their learning environment was supporting the development of their critical thinking skills mentioned access to information as an aid to critical thinking. There were three different themes that described how the students felt their learning environment was helping them: one was about the access itself, the ability to consult a series of extensive educational resources within the extended digital library, which they said was broader than what they could have previously found on the internet and in the physical library. The second was about having access to a series of relevant, previously selected, trusted sources of information. The students who talked about this mentioned the difference between browsing the internet and receiving a document that is relevant to your work from a specialist in the matter, whom you can trust, the Professor. A third theme was having access to a variety of points of view and getting used to seeing issues with new eyes.

Access to information as critical thinking support

The students who saw the main critical thinking support from their DLE as being access to information in general tended to conceptualize their learning environment in a broader sense than those who mentioned the importance of access to a relevant, carefully selected curriculum. They saw the Internet as part of their learning environment and had mentioned "searching on google" as a tool for learning when asked to describe the way they used their DLE on a weekly basis and mention their most and least favourite tools. These students believed that information itself, and a variety of information from different sources was helping them think critically.

The following dialogue illustrates the conversations I had with students who saw

their DLE helping similarly:

INTERVIEWER: "How, if in any way, does your digital learning environment help you think critically?"

STUDENT: "I think so, because you have access to the information, and you can contrast and reach your own conclusions."

INTERVIEWER: "And is it just access to information or is there something extra in the learning environment?"

STUDENT: "I don't know, I think it's especially the access [to information]"

INTERVIEWER: "Does it add any value to this information, the fact that you receive it within a course at the University, or could it be any information?"

STUDENT: "Ah, no, no, any information."

INTERVIEWER: "So what's important is to have access to information?"

STUDENT: "Yes, yes."

INTERVIEWER: "And how do you differentiate between the information... like you mentioned before, between fake news and information that is accurate?"

STUDENT: "I don't know ... read a lot and ... try to see what is the truth ... [the thing] is that it is difficult, eh? Yes, I know..."

When describing how their digital library was helping her think critically, one student said: "What we find in the library can encourage critical thinking and say, look there is another person who has said this and has verified this, so it may be my choice to believe it or not. Depending on what I have found, I can verify what I have found from other sources, it may be useful."

Another student said: “I think that looking for any information on the internet on any subject, now whether it is true is something else, but there is a lot of digital information on many aspects, there are people who have access to it thanks to the internet, so I think it is something very positive to have access to documents online and not paid, because in the end you give access to everyone, not those who have money, who have more ways [to make an informed opinion].” “Not exactly the DLE, but the resources I can get, I think they are a huge asset for critical thinking. Like, before when I was an undergrad, it was really difficult to get the materials and now in ten seconds I can get almost anything, so in that regard it’s a huge difference” said another student.

Access to relevant, trusted, information as critical thinking support The students who saw their DLE as a hub of trusted information they could access and compare put a lot of focus on their instructors and the help and guidance they give during the learning process. They conceptualized the resources available in the DLE as part of it, as well as the help and feedback they were receiving from their instructor and tutors. “Each professor recommends us new texts through the campus, books that are normally related to our ideas”, said one student. “The professors are more experienced, and they give you the best information [...] professors can guide you through the literature”, said another. Part of critical thinking, one student saw, was “looking for a lot of information and looking for experts in the end, because they will know more about the subject and will know if it is true or not”.

One student believed that within the trusted, curated, learning material there was such an expanse of information that she felt lost, and that the process of finding meaning, finding her way through the information, with the help of her instructors and teachers was helping her think critically. “Because of the massive information you can feel lost, and you need guidance, but I think it’s the perfect context to cultivate this ability”, the student said. This student also mentioned that not having “someone who will give you this info face to face”, managing the available learning resources was more difficult and that she believed that other students were not able to navigate through the “massive information available”, but that the instructors

help them: "Some people [...] cannot select the appropriate info so the professors and the tutors of the courses can provide this support". Another student said: "Like, for instance, when I did my masters in [his home country] oh you should check this author and so on, I had to go to the library, trying to find the paper and it sometimes it takes days for you to find... and now it's almost the same time the person sends me some article I can find it online and that complicates things as well because we have a hundred times more material than back in my undergrad studies, so it's also some... it increases your responsibility, you need to be aware, you need to be familiar with loads and loads of literature, and papers and people that before it was simply not possible".

Access to a variety of points of view

Another way student said they got support to think critically from their DLE was having access to a variety of opinions and points of view. "Yes, because we see many opinions, many different professors, many talks and the truth is we see many different points of view", said one student, illustrating an idea that many other students mentioned as well.

The fact that they interacted with learning resources created by specialists in different areas, who shared their sometimes contradicting points of view was considered helpful for students in creating a habit of being critical about what they saw and heard. The following fragment from a conversation in which the student described how her DLE was helping her, illustrates this:

S: "For example, I saw a video the other day, it seemed super real, on the news and then, searching, searching, I realized that it was a lie, but it is hard to know what is a lie and what is not ..."

I: "Do you think that if you were not a university student it would be more difficult to distinguish between fake news and real news? Is there a benefit to studying more?"

S: "Yes. More than anything because it gives you tools to search for more ... in the

end, you keep studying because you are curious, because if not ... you would be left with fewer studies ... I think it also helps you with [managing] the information."

Themes and stories of students who believed their DLE was not supporting their critical thinking

There are three main themes in the accounts of what students who said they didn't think their DLE was helping them think critically: some students believe that face to face interaction and face to face education cannot be replaced with digital tools and that a digital learning environment will never be as good as face to face, synchronous dialogue. Other students felt that the digital environment actually limits them because it prescribed their interactions to a limited space, with strict rules to follow, which they see as working against critical thinking. A third theme was related to the aspect of asynchronicity in digital learning and how a digital space might look the same for all students, but the physical space and time in which students situate themselves when they interact in the digital space conditions their interactions with the environment and others.

A digital learning environment will never be enough

Some students mentioned that they did not like learning in a digital environment and that they preferred face to face learning and interactions. Some students said that a digital environment "will never be enough" for them or that they don't like "looking into a screen all day" and that they would much prefer for the instructor "to explain something to you" than have to read "some PDFs and Powers (PowerPoint presentations)". The digital resources themselves, no. The university depends on the staff, the professor in front of you. I mean, I always think that digital resources ... there has to be a very big change so that it can be sustained by itself if there is no person next to you who can explain it so that you can understand it critically" Another student expressed her frustration about feeling invisible inside the virtual classroom, feeling like the "place was cold" and that she felt she could not connect with others and could not solve her doubts: "... and the person outside ... it's me ...to learn better I would like to change this ... I would like to have visual

communication, I would like to be able to talk to the Professor, to be able to tell him «I need help, I don't understand what you are saying to me»". When asked whether she had access to a way of contacting the teacher directly she said that she could email her teachers, but most took too long to answer, when her question was related to an exam or did not answer at all.

My DLE limits my critical thinking

Another theme that came up during the student interviews were the ways in which the students felt their learning environment limited them to think critically and act freely. "No, it limits me. [...] For example Twitter, there you can vent all you want, but on the [virtual] campus you can't, because it gives you the steps to follow, do this and this... they give you a model to follow and if you don't do it, they suspend you because you have not followed these guidelines... Why do I have to follow patterns that the teacher has created, when he does not give me priority to see this in a critical way, from my [own] point of view?" said one student. Another student said: "sometimes I would like to ask the teacher ... but I limit myself and follow the steps that I have to follow...".

A few students, from different universities, using very different digital learning environments, coincided in talking about how restricted they felt in the digital learning environment, where everything was prepared and designed in advance, including the way to solve problems and find solution to the learning activities in their program. Some students said that if they were in a face to face classroom they would raise their concerns, ask the instructor and share their point of view with their classmates, but in their DLE they don't.

Many students, of all ages, made a point about not being able to use correctly or understand fully how the tools in their digital learning environments worked. One older student said: "We live in a society that ... it is not [about] how easy it is to use the tools ... they do not take in account your age ... you have to follow some steps and if you do not follow them you become human waste ... I have felt that way ... you have to pay attention to the people who have not had the ability to use

a computer, or who don't live in this digital world." Even though this student was older, another much younger students, individuals we would call "digital natives", talked about how sitting in front of the computer and "not getting it" made them feel: "I think there is a lack of adaptation in the diversity of education. All the tools that they give us in primary and secondary school that in theory were to teach us [...]. I sat inside the computer and I did not feel part of that world" said one student. "I'm a little slower, and it takes a bit of work for me, so I didn't feel comfortable, so maybe some kind of adaptation is needed [for me]. "

Feeling overwhelmed: one of the challenges of physical time and space versus virtual space in a DLE

A few students talked about how being in a DLE was not the same as being in a face to face class, in that you could be in a DLE and be very tired, or in a noisy room and in a face to face classroom the time and space was reserved for all students and instructors involved, which left them free to be attentive and engage with others. "You can be anywhere, in any state of mind. For example when I don't sleep I answer things in the forum at 4 am, I am tired... That kind of circumstance, I think, it makes it easier to say things they would not normally say in a face to face environment..." said one student. Another challenge of thinking critically in a DLE students mentioned was their feeling that they had to be connected all the time and to answer quickly which made them feel overwhelmed by the work they had to do and the amount of information they needed to process and understand alone. "I was used to working a lot and the DLE while it makes many, many things easier [...], at the same time it complicates things a lot because you have to be connected almost all the time, you need to access and to study with loads and loads of materials" said a student.

When asked to describe a situation in which he felt like this, the student said: "You need to be connected all the time, sometimes you have a huge number of messages that you need to ponder, and sometimes they are from completely different fields. For instance this morning I received the correction of an article that we will publish

after three years, and it's social psychology, it has nothing to do with my PhD work now. I try to be very fast, I need to give an answer today until 3, and then I have to stop thinking and working with my [...] PhD because I need to answer that. Everything has to be very fast, so the demands are sometimes really huge. I sometimes think they surpass... the demands are more costly than the advantages that a DLE can give you".

The ideal digital learning environment

When asked:" In an ideal world, what should a DLE be able to do so you can learn better, be more motivated and think critically?", there were a few qualities and features that were mentioned by students. Two of them stood out as they were mentioned again and again by students: one, that an ideal DLE is adapted to their own needs and goals and second, that the ideal DLE for them, would not be a purely digital one, but one that would include some form of face to face interaction. Other idea features of the DLE mentioned were: easy to use and engaging, immersive and gamelike, a safe and friendly space, futuristic and assistant-like, interactive, diverse, and accessible.

A blended DLE would be best

When imagining their ideal DLE, many students stated their preference for a blended model, in which some activities were done using digital tools, but where direct human contact was also present. Students said that they were torn, they were used to technology as an ever present part of their life, but expressed their need to interact with their teachers and peers, face to face.

These students believed that "some part is lost", that a personal connection was not the same via digital tools. "I would not focus on everything digital, because the way in which something is transmitted can greatly influence how it reaches a person", said one student. "I believe that within this world (n.ed, their imagined DLE), there would be a balance between [learning by] experience and [learning with] digital tools. Nowadays, they say that us, young people, are eaten away by digital tools..." said

another. “Here, my heart is divided. I am a person who uses technology a lot, either for academic or leisure activities. It seems very good to me to go out one afternoon with my friends or stay at home with the computer. I can do both, but I am more often at home than to go out with my friends ... because they don’t always have availability ... hence the idea of balance ... maybe 60/40, gaining technologies ... we are creating a utopia but one that is based on today’s society. Technologies would win because it is a medium that can be used for many things” said another student.

Another student talked about her previous experience learning with digital tools: “I did primary school with [physical] books and secondary school with a computer and I didn’t like it at all. I had a lot of problems with the technology, you have to enter the school Moodle and do so, you have to download ... when I got to the 4th grade I was happy to have a book in my hands”. Yet another example: “above all [it should] have different ways of learning ... for example ... part face-to-face and part online. In the face-to-face part, [you would] only do debates about what has been worked online and that in the online way there is so much to do: written work, read resources, watch videos, learn through video-games... [there should be] many varied tools that together become a way of learning”.

Another student said that for her, it was very important to have face to face contact, to hear their feedback and that doing this digitally was very difficult for her. What the students had in common is that they saw the core as being a DLE, supplemented by direct, personalized interaction and tutoring.

A DLE personalized to my needs and objective

Many students imagined their DLE as an environment that is personalized to their needs and objectives. Many students said that the age of students should be taken into account when designing a DLE. “I think they should take into full account that most online students using a DLE are adults, they are not traditional learners... I don’t know if you know this categorization, traditional learners are 18, 19 years old who just finished colleges and go to university. In my university, 90% of students are older, have jobs, families and more responsibilities. Adult learners tend to function

differently, they usually they don't want to study something that they don't perceive is useful, connected to their lives, not their jobs, but their professional capabilities and so on. There are many characteristic that differentiate adult learners from traditional learners. DLE should take that into consideration... it wouldn't mean huge changes, because the learning design would be very affected by that. For instance, besides being student-centred, like the student has the responsibility for their learning, the learning resources should be more focused on practical issues, on real issues, on connecting the learning with what the student has lived already [...] that would be a real big change", said one student.

If many students imagined their DLE as an intelligent environment that is personalized to their needs and objectives, some went further and imagined a DLE that would be totally connected to them and intuitive: "a perfect balance between what is human, the explanation, the support of a teacher or any figure that can help us digitally, who can use it when you need it ... maybe at best there are some tools... where you think something, and it has already looked for it, it has found it".

Easy to use and engaging

One of the important features of an ideal DLE mentioned in the discussions with the students was ease of use. "First", said one student, "[it would need to be] something that attracts attention, that motivates the student". She explained how technology, tools and apps constantly compete for her attention and how she would like her DLE to motivate her to engage and to learn. Another student had a similar idea when she said that her ideal DLE should be more like one of the mobile applications she used: "for example, Instagram is very successful, because it is very easy to use, it is very visual, it is something else, but perhaps it will attract attention through certain groups of these types of applications ... well, I don't know ... make a more positive use [of the DLE] ... create more projects ... so people will use this type of technology".

Another student mentioned that she gets distracted a lot, and this is why the DLE itself has to be attractive and motivating the student to use it.

In the first part of the interviews, when asked about the ways they use their current DLE environments, students repeatedly said that unless the teacher asks them to read a resource that they have uploaded to the virtual campus, they will not use their DLE often. When asked to describe their DLE and how they use it on a normal week, many answers were very similar to this one: "We have this virtual campus, so the teachers of all subjects post texts for us to read, activities to do, sometimes we have to deliver things through the campus". Or "upload and download PowerPoints (sic!)"

When asked their opinion about their current DLE, many had a similar opinion to this student's: "I don't know now ... I think that I would have to be more educational, that is ... if we talk about the teachers, I think they give us as many PowerPoints and in the end it is a lot of reading, and they could do it more ... like the inverted classroom, that they could give us more videos, an explanation of theirs, but [make it] more visual... instead of so much reading, that in the end it is easier to read it in a book than from the tablet."

Some students mentioned that they didn't really understand how to use their DLE: "It's a little complicated. I am in the first year of pedagogy and until now I did not understand very well how the [digital] campus worked. The first semester it was all a bit of chaos, but hey... this happens! In fact, they gave us a survey with the [digital] campus at the beginning of the course, they had a day to welcome us where they explained a little about this technological content, but it was not very clear, so I already told you until now I did not understand very well how everything worked".

Immersive and gamelike

Students imagined their DLE as an immersive, interactive space with game-like features. One student imagined an environment in which the information is available formats and where life-like situations can be experimented with:" I would put different cases, and talk about these cases, also create situations where there are conflicts of values". Another student imagined a blended DLE, were "in the online way there is so much to do: written work, read learning resources, watch videos, learn through

video-games". Another student imagined that an ideal DLE would be "like an online course that you go through phases, as well as going through modules ... it would also be good [for you] to pass small tests, so that people are also motivated [to use it]". Yet another student talked about how using the DLE could be rewarded: "Maybe a system of points... for example if you participate as much as possible in the meetings, then you will get a grade. If you help another graduate or master student you win points".

Immersion was another important characteristic of the ideal DLE: "first you can see it inside your computer and look at it, alone and when you are inside you are like playing" said one student. Another student imagined how an immersive DLE where one could live an experience might be a good learning tool for her area of study, social education:" Well, for example, for the people I am helping, that this can happen: it would be like you are entering another dimension. It would be that I can enter and from here ... I do not know why but if you live it, you learn at a deeper level".

A safe and friendly space

A few students mentioned their desire for the ideal DLE to be a safe space, where they can connect with their teacher and peers, where they can ask for help if they need to and where teachers answer their questions in time. When asked about an ideal DLE, one student said: "I don't know ... I can't imagine it ... I think that for me [it would be important] to improve the relationship between teachers and students. There are many different ways [to do this], but sometimes the students are afraid of the teachers, you know?".

Another student mentioned that she feels alone and isolated in her DLE and she would imagine one in which she can easily connect and stay in contact with others: "because you are alone, and maybe you feel isolated, and you lack connection with the teachers ... You feel alone, and you don't have sufficient motivation to keep going and feel part of the team" she said, before adding:"this depends on your age and your goals. If you have family and other obligations you don't care, and maybe

it's better to be alone in this environment. If you are younger this depends on the goal of your participation. If you do a master for example, you need more peer connections. If it's a doctorate you don't need motivation because you are self-motivated, and you don't need peers to motivate you."

This feeling was shared by other students: "so many possibilities ... where everything is possible, well ... let me think ... for me human contact is important, because I have seen that it is the way in which I can learn better ... the knowledge that is transmitted ... not only by colleagues, but also the family, the moral values you learn from others".

Stressing the importance of connection for learning, one student said: "A concept in biology explained with passion and with great interest, comes to me easier than other writings or a paper that may be the most important ... the figure of the teacher or family member is also important every day to train individuals. In the end, education is this, forming individuals, isn't oit, that they can live in a society, that they can adapt..." she said. When asked to describe what elements of an ideal DLE are important for him, one student said: "The presence of other people, even if it's online, but it's synchronous". "You can gather students through Skype meetings or hangout meetings and stuff like that, and you can discuss things", he added.

Accessible to all kinds of learners

When imagining an ideal DLE, students talked about the need to make this imagined DLE accessible and adaptable to all kinds of learners. They said that in the design of DLE should take into account the wide range of ages, social and cultural backgrounds, special needs. "My grandmother or even my mother, who is 50-60, are people who are not agile in this digital world. In general ... I'm not talking about people from the University or specialists ... I'm talking about normal people: they don't know how to use these tools well, it's very sad because then not everyone is reached" said one student. "The digital world is very volatile. I do not like this feeling of loss", another student said. "Maybe you are looking for something on the web, it no longer exists, it has been modified, you get an error, the document, the

program, the constant updating of the programs, the constant learning how to carry out the task... for many people, this is a nuisance, an inconvenience".

Another student talked about the importance of making access to learning democratic and available to everyone, no matter what personal situation they are in. "I believe that a free access policy has to be created for everyone, in an ideal world, even in the work environment, [the DLE] is integrated into your working hours, [ready] for one to learn and use easily. In many places, in fact even in the public administration [...] it may be that a person who works as a civil servant, cannot use a certain program. That can't be happening, and it does happen".

5.9.2 Participant spotlight

In the following section, I will describe the cases of two student participants who stood out as highly motivated, engaged and critical in their thinking. I will present their story through the responses given in the questionnaires and the interviews. Their names have been changed to pseudonyms to respect their privacy.

Tina

The first participant, with the pseudonym Tina, is a young woman in her early twenties, enrolled in her first year of University. She had described herself, consistently as very motivated both at the beginning and the end of her first academic trimester and during the interview. She had said in both questionnaires that she felt competent to follow through successfully with her course, that she was making a sufficient effort to ensure her success and that her studies were highly valuable for her future studies or career.

When asked about her motivation to study, she had said in October: "My objective is to change the educational system. To achieve my objective I try to maintain a positive attitude. The fact that I love teaching is also important to mention.". In January, she had simply said "My objectives". When asked what she would need to improve her chance of success, Tina had given in both surveys the same answer "Improve my critical thinking skills". She had answered consistently, in October and

January that she considered her courses highly intellectually stimulating, that her course, her teacher and her peers were helping her a lot in improving her critical thinking. When asked what else she could do to improve her critical thinking skills, Tina has said in October: "read a lot", and then in January, "Read the right texts, talk to people with a different perspective".

She was initially concerned that her language skills would be a challenge, and in October she had said:" My greatest obstacle is the language (I've been here in Spain for two years) and also the fact that I have not had to use my critical thinking skills". I found during the interview that Tina spoke two other Latin languages and English and her Spanish was almost perfect. In January, Tina has changed her answer to: "A lack of experience". At the start of her trimester, Tina was already using the class forum, and other messaging systems embedded in her DLE. In January, she was using more DLE features, including reading the course resources.

Tina is engaged, energetic and curious. When asked if she has any more comments she expressed an interest in the study and its purpose, in both questionnaires and volunteered to answer more questions if needed. During she told me how she navigated her DLE and how she discovered useful tools for her University work. "This year, now that I think about it, I started using OneNote to take notes. It's useful because you can draw and write at the same time, you can put a date and all, and it's all very well organized. And it's also good for the world, this way we don't use paper", she said. When I asked her whether the tool was recommended by one of her teachers, she said: "No, I've discovered it because I had it on my phone and I wanted to see what it was."

She is confident and hard-working. She thinks that the more effort you put into your work the better you get. This is what her family believes, and she feels the same. She thinks she has a lot to learn, and she is keen to absorb as much knowledge as she can. "En this last few months I got to understand [that I may] also question what the teacher says, who is an authority for the student. Not all of it, but to believe in our doubts to confirm that what we hear, in what we take part of, is the right thing". One of her favorite digital tools is the digital library: "What we find

in the library can support critical thinking and say, look, there's a another person who said this and has proved this, so it can be my choice to believe them or not"

She is intrinsically motivated and driven. "Motivation... I think the most important is personal motivation. You only know why you are studying at the University" she said when asked what motivated her to study. "The agility that the environment gives you, to quickly find the information [you need], to quickly add it in a PowerPoint, it's easy... it motivates me to do it and do it well because I know I can do it and that I can use these tools in the right and fast way".

Tina finds her studies in meaningful personally and of crucial importance to society. It's important for her to study and her family supports her and encourages her. When she will become a teacher, she will be able to support others. "In the end, this is what education is, shaping individuals, right?, who can live in a society to which they can adapt to".

Maya

The second participant focus, with the pseudonym Maya, is also a young woman in her early twenties, enrolled in her first year of University. At the start of the trimester she has said she was motivated and in January that she was very motivated. Her confidence in her ability to successfully finish the course increased over the three months, while her self-reported effort she made for the course decreased. She had consistently said that her course was valuable for her future academic life and career. When talking about what motivates her she had said in October: "The fact that for the first time in my life I am studying something that I am really passionate about", and later, in January: "That i love what I am studying". When reflecting on what she would need to do to improve her success in her course, she had said in October: "Dedicate more time to reading to complement what I learn at University" and in January: "I should apply myself more and organize myself better".

She had reported considering her course intellectual stimulating and had said that her course and her teacher were helping her a lot in developing her critical thinking skills. In October, she had said that her peers were not helping her much in thinking

critically, but in January she reported that they helped her a lot. As what she could do to improve her critical thinking skills she wrote: "read a lot". Maya is intrinsically motivated. When asked whether her DLE motivates her to study and why she answers: "Yes, it motivates me per se, I am a motivated person". When asked about her answer in the questionnaire, that she had mentioned she enjoys studying, she replied: "Yes, I like it a lot, and to be honest, it motivates me a lot". Of her DLE she said: "Something that motivates me a lot is when I go into the virtual campus and I see a new reading, it motivates me a lot because I like reading. I almost prefer reading texts like this and then study, but in the class, I prefer a text from here, one from there, and being able to compare and contrast the differences, this is what I like, what motivates me".

She is passionate about learning new things and new points of view. Of critical thinking she said that it is "the ability to be wrong [about something], and being able to evolve". "I like debating with people who think differently than me because I like to see different points of view of the same thing, I like it a lot to be honest", she added.

5.10 Chapter summary

This chapter outlined the findings of this study based on the quantitative and qualitative analysis of the data used to answer the research questions. It answered the four research sub-questions of this study and highlighted the most relevant results for each of them. I thus answered the main research question, by better understanding the relationships between motivation, engagement and critical thinking in DLEs, at a post-secondary level. In the next chapter, I highlight and discuss the main finding and provide my conclusions for this study, present its limitations and suggest future avenues for research.

Chapter 6

Conclusions and final reflections

6.1 Chapter introduction

This study addressed the relationships between motivation, engagement and critical thinking for post-secondary students learning digitally. In order to get a more complex understanding the phenomena and the relationships between them, the research for this thesis employed a mixed methods study, conducting an instructor survey with participants experienced in digital instruction, followed by two student questionnaires administered in a time distance of three months (a school trimester) and followed up by semi-structured interviews with the students.

This chapter presents the conclusions of this study and brings forward final conclusions and reflections on the relationships between the main phenomena described in this study, discusses limitations and suggests new lines of research for the area of study.

In order to answer the overarching research question, I have divided it into four sub-questions aiming to further focus the question and facilitate the answers. In the following sections, I synthesize and discuss the findings for each one of them.

6.2 Professors' view of DLE challenges

To ensure that my reduced teaching experience did not compromise the study and to increase the reliability and validity of this study, I started by discussing with professors who were teaching digitally, which then led to a questionnaire with 30 university professors from all over the world.

All the teachers participants in the instructor survey had experience teaching in a digital learning environment and yet the majority expressed a neutral stance to statements such as "Digital learners taking University-level courses have more personal/financial challenges that decrease their success rate than face-to-face/on campus learners", "Digital learners taking University-level courses are more intrinsically motivated than face-to-face/on campus learners" and "The success of digital learners taking University-level courses depends on the other classmates and the existence of learning groups". In the same teacher questionnaire, 83% of the respondents agreed that the success of digital learners depended on the ability of their instructors to motivate and engage them, while only 10% disagreed and 7% were neutral. When asked whether university digital learners were more motivated if the instructor managed to engage them, 97% of respondent agreed and 3% were neutral.

The data suggested that even if they recognized the importance of their own guidance and its effect on student motivation, the teachers did not recognize the challenges and particularities of digital students or the importance of peer support and social learning for this type of "social-connection-hungry" students.

Previous studies also showed that, while they tend to be successful and persistent, tend to be problem solvers (Howell et al., 2003) and independent learners (R. L. Martens et al., 2004R. Martens et al., 2007b) who habitually employ critical thinking skills (Holder, 2007b), digital learners have needs that are not essential for face to face learners, regarding feelings of isolation and self-direction (Bocchi et al., 2004). Digital learners tend to be insecure about succeeding, and have other demands that conflict with learning, such as scheduling issues, money and long-term commitment challenges and constraints that places them at a higher risk of drop-

ping out, compared with learners in traditional learning environments (Carr, 2000, Diaz, 2002). In digital learning, student abandon tends to be higher as learners feel isolated and interaction is low (Bolliger, 2004a).

While this data describes the tendency of the group of teachers surveyed, some teachers were acutely aware of these factors and used the open-ended fields of the questionnaire to make a point about the limitations of DLE and how students can be better supported, mentioning the additional effort the instructor should make, from being proactive about feedback, to creating communication mechanisms on top of what the interaction design of the DLE offers, to building and maintaining rapport with the students and creating a feeling of being present in their academic lives, to the usefulness of giving feedback by using a variety of media.

During the student interviews, the central role of the teacher in digital learning, as in traditional learning, was very clear. Students credited their teachers for being motivated to use certain tools or in their course in general, but they also held them responsible for not engaging enough, not being as responsive as they wanted and from their point of view, not being sufficiently experienced and knowledgeable about digital teaching.

Further research is needed to better understand how aware are digital learning instructors of the specific challenges of digital learners and why some digital students might perceive their teacher's support as insufficient. However, the teacher questionnaire suggests that some teachers might apply the same techniques they use in traditional learning to digital students, and that might not be sufficient for the latter.

6.3 Changes in student motivation and intellectual stimulation, in time

At the beginning of the school year and the trimester, when the first questionnaire was administered, 80% of students said that thew were feeling motivated, while 20% said they were not. Three months later, 85% of students reported feeling motivated,

while 15% said they were not motivated. So student motivation increased in time, as students progressed in their course.

In terms of intellectual stimulation and self-reported critical thinking[1], at the beginning of the trimester, 41% of students had said their course helps them a lot in their development of their critical thinking. In January, 48% gave the same answer. Some students said that their course somewhat helps them think more critically: 52% in October and 48% in January. Only 7% in October and 3% in January had said that their course does not help them at all in thinking more critically. Thus, the appreciation for the way in which their course was supporting them to think critically increased in time.

When asked to asses the level of their own critical thinking throughout the course, at the beginning of the trimester, 57% of students said they were thinking critically, while in January 52% gave the same answer. The percentage of students who reported feeling that they were not thinking critically decreased, from and 16% in October, to 14% in January. The percentage of those who said they were neutral to the statement increased from 27% in October to 34% in January. So, while fewer students reported not thinking critically, more students seemed to also be confused whether they were indeed thinking critically or not. Freire(1972, 2018) would probably say that it a good sign, as critical thinking is a continuous process that allows us to rethink and relearn what we think we know. Questioning in itself is a sign of critical thinking. Freire believed that any human being, no matter how "ignorant", was capable of looking at the world critically, in a dialogical encounter with others. Critical pedagogy gives education the task to offer students the tools and habits of the mind necessary for thinking critically and for actively and constantly questioning and negotiating between theory, practice and the beliefs of the society they live in.

In the open-ended questionnaire item fields, as well as during the interviews, I noticed that younger students took critical thinking as a personal quest. Some had

[1]To reduce misunderstandings, next to the questionnaire items related to critical thinking, students were offered the following definition of critical thinking: "We define critical thinking as the process of analysis, evaluation, inference and interpretation of resources and activities"

said that they had only found out about the concept of critical thinking at university. Others said that they finally understood what it means. Others continuously and consistently mentioned it as something they needed to improve, throughout both questionnaire and the interviews. Older students, on the other hand, believed that they were thinking critically and that even though their quality of thinking was superior to their younger colleagues, their professors' did not appreciate their interventions.

Many students I've interviewed, otherwise motivated and engaged with their learning, believed their digital learning environment did not promote dialogue, nor critical thinking sufficiently. On the contrary, they felt like their digital learning environment was limiting their ability to interact with their instructors and ask questions. Some said they felt isolated and were ashamed not to know how to use the DLE, others that they felt they were not able to ask the same questions they would in a traditional environment, others that they were afraid of their teachers and their reactions. These all seem to corroborate existing data on the importance of instructors' actions toward increasing trust and creating a feeling of belonging, presenting in detail in the sub-chapters referring to digital learning and social learning.

6.4 Students' use and opinions of DLEs

The most used feature was the class forum, followed by a student/teacher private messaging tool. I had initially considered the forum as a peer communication tool, however the use described by all interviewed students was that of the instructors using the forum as a message board, with the students interacting little or none at all with the forum posts. The Kendall correlation test results for the student motivation and forum use variables indicated a weak, statistically significant correlation between motivation and use of the forum, both at the beginning and end of the academic trimester. Students who were motivated tended to use the forum more than students who were not motivated.

During the interviews, students mentioned that they would log in periodically to

the DLE to see if there was something new available for them, a teacher message, an assignment or a new reading. One student said seeing a new reading uploaded to their class motivated her because she loved reading, and she was passionate about their subject. Interest is a cognitive and affective motivational variable, defined as the psychological state of an individual engaged with particular content and the motivation to return to it (Hidi & Renninger, 2006, Renninger & Hidi, 2011). While personal interest is intrinsic in nature (Krapp, 2002), interestingness can be created by novelty, surprise, complexity or ambiguity. Interest and motivation are very tightly connected, so it is possible that the interestingness of the forum updates also positively influenced student motivation.

The Kendall correlation test was also applied to the motivation and use of a teacher private messaging tool variables, and the result indicated a weak, statistically significant correlation between motivation and use of a teacher private messaging tool at the beginning of the trimester, for the first student questionnaire. No correlation has been observed for the second student questionnaire. For the first questionnaire, at the beginning of the trimester, students who were motivated also tended to make use of a private teacher messaging tool. A 12% decrease in tool usage was observed for the class forum, which was used by 37% of students in October and by only 25% of respondents in January.

During the interviews, some students had complained that their teachers don't reply in time or that they don't reply at all and that they felt that their teachers were distant and cold. Many students said that it was easier to communicate with others and get feedback in a traditional learning environment. If during the first part of the trimester students had sent messages to their teachers and had not received the answers they were expecting, that could explain the decrease in use, as well as for the change in correlation between the two variables, for the second questionnaire.

Even tough relatively few students reported using a group work tool, in January, more students reported having used a group communication tool, 9%, compared to 4% in October. During interviews, tools for group work were mentioned by almost all students as their favorite DLE tools, for their easy of use and practicality. One

student gave as an example for a way on which the DLE was motivating her a project she had worked with another student located on another continent, and their work together on the same project. When imagining their ideal DLE all students imagined it as including a way to connect with others, with one student imagining an artificial intelligence that understood her challenges and supported her in finding answers to her questions. Other students who described themselves as motivated, mentioned as their favorite tools: the library, the fact that they could work independently and asynchronously, at any time of day or the week. These results corroborate Coates' (Coates, 2007) findings, who saw that some students who engaged collaboratively preferred social learning, such as group activities and discussion to independent learning, while students who engaged independently, were highly motivated academically, but preferred independent work to social interactions.

In summary, what became apparent during the student interviews, was that students who said that their DLE was motivating them talked about tools that were easy to use, about their DLE allowing them to access useful learning resources easily, on a variety of devices, allowing them to save time and to add little learning moments when they found free time during their day, such as on their commute.

The fact that the DLE allowed them to create notes, work with others and find all required reading materials in one place was also mentioned as a motivating aspects of their DLE. The students interviewed said that they logged in to their DLE weekly, sometimes twice-weekly.

Another aspect of the DLE that was motivating to students was the ability to interact with a variety of media, to get access to a broad specter of information and see different points of view.

6.5 Relationships between motivation, engagement and critical thinking

6.5.1 Relationships between motivation and engagement

Relationships between motivation and engagement with the DLE

The data showed that motivation did change in time for the students who participated in the study and that the number of students who said they were motivated increased, while the number of students who said they were not motivated decreased, at the end of the trimester.

The most notable changes in their self-reported behaviour had to do with their perception of ease of use of their digital learning environment itself, which, after three months of use became more familiar to them. During the interviews, some students said that it took them months to understand the DLE, that it had been "a chaos", and some said they did not fully understand it even at the time of the interviews, in early March, two months after the second student questionnaire was sent. Other students said that they had difficulty in the beginning, but then found their DLE to be very intuitive and useful in their learning journey. Furthermore, the Kendall Tau correlation test between the motivation and competence variables showed a statistically significant, strong correlation, of 0.3319532 for the first questionnaire, respectively 0.4609444 for the second.

The data indicated that, in line with Ryan and Deci's (Deci & Ryan, 1985, Deci & Ryan, 2010, Deci et al., 2013) self-determination theory of motivation, as competence of use of the DLE increased, motivation also increased. Bandura's(Bandura & McClelland, 1977 Bandura, 1989 Bandura, 2010)self-efficacy theory, which refers to the ability of the learner to self-manage and exert control over one's actions, could also apply here and be an explanation for the increased student motivation observed in the study.

Relationships between motivation and engagement with peers

The students I talked with in this study mostly felt disconnected from their peers. Some said they felt alone and isolated and that they missed face to face interactions. They said they did not like "staring into a screen all day" and that they preferred face to face debates, as well as listening to their opinions and being convinced to change their mind. Other students said they were disconnected from their peers because of age differences, social-demographic differences, academic background differences, academic interest differences. All in all they did not feel like they were part of a group of students or belonged to a community.

These findings further confirm studies such as Kemp and Grieve (2014), which found that students preferred face to face activities to online interactions and Henderson (Henderson, 2011) which showed that students can be reluctant to participate in online threaded conversations and would prefer face to face debates. The loss of connectedness and sense of community in digital classrooms has been observed before by researchers such as Johnson and Brescia Jr. (2006) and Liu et al (2011).

During the interviews, most students mentioned, as their favorite part of their DLE, tools that enabled them to do group work and collaborate and connect digitally. It seemed that, even though they did it rarely, they also enjoyed participating in digital conferences and connecting from people from other geographies and disciplines. Relatedness, belonging to a group and feeling connected to others, as Ryan and Deci (2000) argue, is a basic human need. In digital education, where the experience is isolating by nature, "I don't like looking into a screen all day", like some students mentioned during the interview, peer connection is essential to supporting students' motivation.

Relationships between motivation and engagement with instructors

When asked, in the questionnaires, about what would allow them to be successful in their learning, students said that they would be more successful if they received more support from teachers and if the teachers would focus more on the "real-world"

aspects of their curriculum and their learning, rather than "useless" theory.

During the interviews, a theme that came up was that the DLE itself cannot be motivating, but rather than the people students interact with, their peers and teachers motivated them. Teachers were mentioned most often as drivers of student motivation.

Some students said that their DLE was demotivating them because it limited access and connection to their teachers and peers. That they felt like they couldn't ask all the questions they would have asked in a face to face classroom, that teachers didn't answer in time, and sometimes not at all.

Corroborating existing research, the data suggests a strong relationship between motivation and teacher influence and support. The teacher has the central role in motivating and supporting students in their learning. The data indicates the possibility that teachers might not be aware of the specific challenges and emotional needs of digital students and that their support could be improved.

6.5.2 Relationships between motivation and critical thinking

The second research question of this study was aimed at better understanding the relationship between student motivation and student's critical thinking. The analysis supports the theory that motivation and critical thinking in digital learning are closely related.

The data showed that the students' self-reported motivation overall increased at the end of the first academic trimester, and that the motivation variable correlated significantly with the course stimulation variable, thus those students who reported being intellectually stimulated by their course also reported being motivated, while those who said they were not stimulated intellectually by their course, reported being unmotivated.

Although both motivation and critical thinking are areas of deep interest for educational researchers, there is little research available on the relationships between

motivation and critical thinking in a digital learning environment. However, these results support evidence found in traditional learning environments, that there is a positive and significant relationship between motivation and critical thinking (Garcia & Pintrich, 1992, Valenzuela et al., 2011 Fahim & Hajimaghsoodi, 2014 Research in blended learning by Roberts and Dyer (2005) supports this claim as well.

During the interviews I noticed that the act of thinking critically, the pleasure of "trusting our doubts", like one student said, or of seeing a problem from different points of view, the surprise of having proven wrong and having realized they now had a better answer was motivating in itself. Younger students talked about not having had to think critically before and of the drive that thinking for themselves, and being "allowed to doubt even what the teacher said" was giving them. Of the richness they felt having access to trusted information and expert opinions they could "compare and contrast" before coming up with their own conclusions. These findings further confirm previous research suggesting that the act of learning about critical thinking itself can be stimulating and engaging (Carmichael & Farrell, 2012).

Older students in this study had described critical thinking as something that often got them into trouble and had complained about their instructors not allowing sufficient space for alternative points of view or ways to give an answer to a problem. For these latter students, this habit of the mind was still pleasurable to use and still a driving force for their need of knowledge and better understanding their subject from the lens of their own experience. Even if they thought their DLE and their instructors were limiting their critical thinking, the act of practicing it as a symbol of resistance, was motivating and powerful for them.

6.5.3 Relationships between critical thinking and engagement

One question of this study was aimed at observing any relationship between engagement with the course, through their DLE, their peers or their instructor and critical thinking for students who study digitally. During the literature review, I had found support factors of student engagement that are common to both face to face

and digital learning, such as interaction with the instructor and peers, the feeling of belonging to a community, cognitive effort and problem-solving, as well as student motivation (Lee et al., 2019). In the following subsection, I discuss the findings.

Relationships between critical thinking and engagement with the DLE

The goal was to better understand if there was any relationship between the self reported intellectual stimulation they felt in their course and their engagement with their DLE.

No correlation between the intellectual stimulation variable and the number of features a student had reported using on a regular basis was observed. Thus, merely using more features of the DLE did not show any relationship with students' self-reported critical thinking.

However, when looking at the relationship between critical thinking and the use of the two most popular feature in this study, forum use and teacher private messaging use, I found a significant correlation between critical thinking and the use of a teacher private messaging tool, for both questionnaires. When observing the relationships between critical thinking and forum use, for the first questionnaire, the data showed a significant correlation for the first questionnaire, but not the second.

Previously, a meta-analysis of 231 studies (Schmid et al., 2009), which investigated the effects of using digital technology-assisted and computer-based assessments in post-secondary settings, suggested that technologies supporting cognitive processes, which directly aid students in learning, produce significantly better results than technologies used to merely present or deliver content

In this thesis, I conceptualized critical thinking in a constructivist approach, following Laurillard's definition (2002). Critical thinking is related to help-seeking, which is a valuable learning strategy that helps graduate students studying in digital learning environments successfully achieve their learning goals (Dunn et al., 2014). The fact that students who reported being intellectually stimulated by their course, also used the forum to interact with others and interacted directly with their instructor,

possibly asking for clarification and receiving feedback, is in line with these previous findings.

Relationships between critical thinking and engagement with peers

When asked whether their peers are helping them think critically, 41% has said their peers help a lot, in October, compared to 34% in January. 48% had said that their peers somewhat help them think critically in October, respectively 55% in January. In regard to those who said that their peers did not help, the answers were almost identical in October and January with only 11% (10% respectively) saying their peers did not help them think critically. When performing the Kendall Tau correlation tests between intellectual motivation and critical thinking support from peers, no statistically significant correlation was found.

In digital learning, students are also in charge of planning and managing their own learning and creating time and space for effective learning, which can sometimes make peer engagement difficult or appear as time-consuming and less relevant than the course material itself. However, collaborative learning has a strong positive impact on learning success and on motivation, as well as critical thinking.

Peer feedback has been shown to have a positive impact on critical thinking skills, which can in turn increase students' levels of confidence in discussing their ideas in a digital learning environment, and increase student motivation (Ekahitanond, 2013). Moreover, as Magolda (1992) discovered, "the ability to develop a distinctive voice stems from defining learning as a constructing meaning jointly with others".

During the interviews students mentioned that they felt alone, isolated, that their DLE was limiting their contact with others and that it made them less likely to ask questions or start debates, compared to their previous traditional learning experiences. It's possible, thus, that the above results can be explained by this lack of connection and exchange between the students involved in this study.

Relationships between critical thinking and engagement with instructors

When asked whether their instructor was helping them think critically, 41% of students said their instructor helps a lot in October, and 45% in January. 52% had said their instructor somehow helps in October and 52% in January. Only 7% in October and 3% in January had said their instructor does not help them at all think more critically. Overall, the vast majority of students said that their instructor was helping them think critically.

When performing the Kendall correlation test for the first questionnaire, a strong statistically significant correlation was observed between critical thinking and engagement with instructors. The correlation score for the second questionnaire was also very strong, however the data was found to be statistically insignificant.

When asked their opinion on whether students learning digitally were less likely to think critically than on campus students, 14% of the instructors who participated in the study strongly agreed, 10% agreed, 38% were neutral, 31% disagreed and 7% completely disagreed. The median was "neutral".

In the open-ended parts of the questionnaire, the instructors said that, in order to motivate students to think critically in a DLE, mentorship and personal connection with the instructor was key, followed by contextualizing the learning and explaining the relevance of learning in their future careers, creating opportunities for collaborative learning, and creating challenges for students and ways for them to see their own learning progress.

6.6 Themes and stories of motivated and critically engaged post-secondary digital students

Students who were motivated and critically engaged with their learning were primarily strongly intrinsically motivated. Some were motivated by the intellectual challenge itself, other by the ability to help others, later in their careers, or the prospect of a better job, which would offer their families a better life. Those who

stood out the most as motivated, engaged and thinking critically were driven, they felt competent and confident they could achieve their goals as long as they put in the necessary work.

In contrast, students who reported feeling demotivated or not critically engaged with their learning, were disenchanted with their instructors and peers, they felt restricted by the DLE and that their learning had to fit into a pre-designed pattern. Those students who said that too much theory was stopping them from thinking critically, talked about their need to understand the application of theory for the future careers or said they lacked the life experience to really understand the context.

The most motivated and engaged students also seemed to be independent learners, the access to the course library online and the ability to explore, compare and contrast new information and make their own minds about it was exciting and motivating. The fact that they could organize their time as they wanted and do good work where and where they chose, was motivating for them.

These students also seemed to be well connected with role models, either members of their family who supported them emotionally or professors they admired. I was surprised how little they talked about their peers and colleagues, but further research would be required to better understand how much true interaction and collaboration there is in DLEs today.

6.7 Contributions of the research

This thesis contributed to bridging the gap between aspects of motivation and engagement in DLEs that support critical thinking for post-secondary students, by offering a holistic view of the relationships between these factors, as students saw them.

The research design allowed me to use quantitative data to inform the qualitative research and the longitudinal aspects of the study, following the same group of people over two academic trimesters, allowed me to get a more nuanced view of what motivation, engagement and critical thinking look like for university students

studying digitally.

This study identified, building on the existing literature, those characteristics of DLEs that motivate, engage and support students in thinking critically and brought to light some of the challenges DLE pose to students, instructors and instructional designers. The study also brings new sets of tested and validated data collection instruments.

By examining motivation, engagement and critical thinking in a group of digital students, in a longitudinal way, this study enabled a better understanding of the relationships between motivation, engagement and intellectual stimulation and how they are experienced by digital students.

For educational practitioners, this thesis contributes to integrating the concepts of critical thinking and the practice of dialogue to motivation and engagement studies, moving research away from interventionist studies, into an integrated conceptualization of student experience in DLE, where motivation, engagement and critical thinking are studied together.

6.8 Limitations of this study

This research presented various challenges: the topics of critical thinking, engagement and motivation are broad and multifaceted. To narrow the focus of the study, I placed less emphasis on some very important related areas, such as instructional design, user experience, LMS design. Instead I focused on the experiences and feeling of students in order to bring to light how they felt studying digitally.

The participant sample in this study is also relatively small: 30 professors participated in the instructor study, 44 students responded to the first questionnaire and 29 to the second, group from which 10 students accepted to be interviewed. After finishing the student interviews, the Covid crisis began and I decided to not further press the study group for interviews, as the new data would be socially and emotionally completely different than the rest of data I had collected. On the other hand, the open-ended items I include in all questionnaires gave me further insight

and nuance into answering the study research questions.

6.9 Suggestions for future research

The challenge with dialogue in digital education is that it cannot be standardized. As we saw in the first part of this thesis, dialogue requires an environment of acceptance and trust, it requires participants to engage in a process of knowledge creation that is continuous and shared, it requires critical thinking, attention, dedication and time.

Most digital learning environments include a version of a public forum, or a space of discussion, yet the forum is always situated by design outside the learning experience, from a user experience point of view. One needs to leave the class to go to the forum, find the right thread, or create a new one and ask a question or share a personal opinion. In most cases, those pieces of content don't become conversations, much less turn into the transformational form of social learning that Freire calls dialogue. Students and instructors need to make an effort to embed true dialogue in digital learning environments, specifically because it is difficult to achieve.

If a learning experience is organized around a lecture or any other type of educational text, and there is an instructor and at least a student engaged in the learning experience, why does the student need to leave the learning space, in order to engage in dialogue? Why is not the ability to start a dialogue embedded in the learning experience. Why is there a separate, secondary space for "talking"? Further research is required to implement digital spaces in which discussion is embedded in the learning experience and better understand whether DLE need to be further adapted to the needs of digital students.

Some universities have made improvements in the instructional design of DLEs and include proactive, personalized feedback for each, student. At each step of their learning journey feedback is given actively and proactively by instructors and tutors. This kind of personal and personalized attention to the individual, as well as the traditional model of following up closely through the term allows both student and teacher to create human connections and become human to each-other. The

results in this study indicate that students need more support. Some thrive in their DLEs and are able to engage critically with their curriculum, their peers and instructors, while others feel isolated, small, unimportant, unseen and misunderstood. These students need more help and further research is required to understand, what percentage of digital universities students are feeling left out. With the Covid crisis, many if not all educational institutions has to implement digital learning in the last few months. There is a danger that simply trying to bring face to face activities in a digital environment is sufficient for all students in helping them feeling they are competent, autonomous, and belong to a community that respects and supports them.

I had collected my data for this study before the start of the Covid crisis, thus the impact of abruptly digitizing all social experiences, needs to be further investigated.

Chapter 7

Conclusiones y reflexiones finales

7.1 Introducción al capítulo

Este estudio ha abordado las relaciones entre la motivación, el compromiso y el pensamiento crítico para los estudiantes postsecundarios que aprenden digitalmente. Con el fin de obtener una comprensión más compleja de los fenómenos y las relaciones entre ellos, mi investigación para esta tesis ha empleado un estudio de métodos mixtos, realizando una encuesta con instructores e instructoras con experiencia en instrucción digital, seguida de dos cuestionarios para estudiantes, administrados en una distancia de tiempo de tres meses (un trimestre escolar) y de una serie de entrevistas semiestructuradas con los estudiantes.

Este capítulo presenta las conclusiones de este estudio y aporta conclusiones finales y reflexiones sobre las relaciones entre los principales fenómenos descritos en este estudio, discute limitaciones y sugiere nuevas líneas de investigación para el área de estudio.

Para responder a la pregunta de investigación general, la he dividido en cuatro sub-preguntas con el objetivo de enfocar aún más la pregunta y facilitar las respuestas. En las siguientes secciones, sintetizo y analizo los resultados de la investigación para cada uno de ellos.

7.2 El punto de vista de los profesores sobre los desafíos de los entornos de aprendizaje digital(EAD)

Para asegurar que mi reducida experiencia docente no comprometiera mi estudio y para aumentar la confiabilidad y validez de este estudio, comencé hablando con profesores que enseñaban digitalmente, lo que luego condujo a un cuestionario con 30 profesores y profesoras universitarios de todo el mundo.

Todos el profesorado que participaron en la encuesta de instructores tenía experiencia en la enseñanza en un entorno de aprendizaje digital y, sin embargo, la mayoría expresó una postura neutral ante afirmaciones como “Los estudiantes digitales que toman cursos de nivel universitario tienen más desafíos personales / financieros que disminuyen su tasa de éxito que los estudiantes presenciales o en el campus",y "Los estudiantes digitales que toman cursos de nivel universitario están más motivados intrínsecamente que los estudiantes presenciales" y " El éxito de los estudiantes digitales que toman cursos de nivel universitario depende de los otros compañeros y la existencia de grupos de aprendizaje ".

En el mismo cuestionario para el profesorado, el 83% de los encuestados coincidió en que el éxito de los alumnos y alumnas digitales dependía de la capacidad de sus instructores e instructoras para motivarlos e involucrarlos, mientras que solo el 10% no estuvo de acuerdo. Cuando se les preguntó si los estudiantes digitales universitarios estaban más motivados si el instructor o intructora lograban involucrarlos, el 97 % de los encuestados estuvo de acuerdo y el 3% fue neutral.

Los datos sugirieron que aunque reconocieran la importancia de su rol y su efecto en la motivación de los estudiantes, los docentes no reconocieron los desafíos y particularidades de los estudiantes digitales o la importancia del apoyo entre compañeros de clase y el aprendizaje social.

Estudios anteriores también mostraron que, si bien tienden a ser exitosos y persistentes, tienden a resolver problemas (Howell et al., 2003) y son aprendices independientes (R. L. Martens et al., 2004 R. Martens et al., 2007b) que habitualmente

emplean habilidades de pensamiento crítico (Holder, 2007b), los estudiantes digitales tienen necesidades que no son esenciales para los estudiantes cara a cara, en cuanto a sentimientos de aislamiento y autodirección (Bocchi et al., 2004).

Los estudiantes digitales tienden a sentirse inseguros sobre su éxito y tienen otras demandas que entran en conflicto con el aprendizaje, como problemas de programación, dinero y desafíos y limitaciones de compromiso a largo plazo que los colocan en un mayor riesgo de abandonar la escuela, en comparación con los estudiantes en entornos de aprendizaje tradicionales. (Carr, 2000, Diaz, 2002). En el aprendizaje digital, el abandono de los estudiantes tiende a ser mayor ya que los estudiantes se sienten aislados y la interacción es baja (Bolliger, 2004a).

Si bien estos datos describen la tendencia del grupo de profesores y profesoras encuestados, algunos de ellos eran muy conscientes de estos factores y utilizaron los campos abiertos del cuestionario para señalar las limitaciones de los EAD y cómo se puede apoyar mejor a los estudiantes, mencionando el esfuerzo adicional que el instructor debe hacer, desde ser proactivo sobre la retroalimentación (feedback), hasta crear mecanismos de comunicación además de lo que ofrece el diseño de interacción del EAD, para construir y mantener una relación con los estudiantes y crear una sensación de estar presente en sus vidas académicas, tanto como la utilidad de ofrecer retroalimentación utilizando una variedad de medios.

Durante las entrevistas al estudiantado, quedó muy claro el papel central del docente en el aprendizaje digital, tanto como en el aprendizaje tradicional. Los estudiantes acreditaron a sus profesores por estar motivados para usar ciertas herramientas o en su curso en general, pero también los responsabilizaron por no participar lo suficiente, no ser tan receptivos como querían y, desde su punto de vista, no tener la suficiente experiencia y conocimiento sobre enseñanza digital.

Se necesita más investigación para comprender mejor qué tan conscientes son los instructores de aprendizaje digital de los desafíos específicos de los estudiantes digitales y por qué algunos estudiantes digitales pueden percibir el apoyo de su maestro como insuficiente. Sin embargo, el cuestionario para el profesorado sugiere que al-

gunos profesores y profesoras podrían aplicar las mismas técnicas que utilizan en el aprendizaje tradicional a los estudiantes digitales, y eso podría no ser suficiente para estos últimos.

7.3 Cambios en la motivación de los estudiantes y la estimulación intelectual, en el tiempo

Al comienzo del año escolar y el trimestre, cuando se administró el primer cuestionario, el 80% de los estudiantes y las estudiantes dijeron que se sentían motivados, mientras que el 20% dijo que no. Tres meses después, el 85% del estudiantado informó sentirse motivado, mientras que el 15% dijo no estar motivado. Entonces, la motivación de los estudiantes aumentó con el tiempo, a medida que los estudiantes progresaban en su curso.

En términos de estimulación intelectual y pensamiento crítico autoinformado footnote Para reducir los malentendidos, junto a los ítems del cuestionario relacionados con el pensamiento crítico, se les ofreció a los estudiantes la siguiente definición de pensamiento crítico: "Definimos el pensamiento crítico como el proceso de análisis, evaluación , inferencia e interpretación de recursos y actividades ", al inicio del trimestre, el 41% de los estudiantes había dicho que su curso les ayuda mucho en el desarrollo de su pensamiento crítico. En enero, el 48% dio la misma respuesta. Algunos estudiantes dijeron que su curso les ayuda un poco a pensar de manera más crítica: 52% en octubre y 48% en enero. Solo el 7% en octubre y el 3% en enero habían dicho que su curso no les ayuda en absoluto a pensar de forma más crítica. Así, la apreciación por la forma en que su curso los estaba apoyando para pensar críticamente aumentó con el tiempo.

Cuando se les pidió que evaluaran el nivel de su propio pensamiento crítico a lo largo del curso, al inicio del trimestre, el 57% de los estudiantes dijo que pensaba críticamente, mientras que en enero el 52% dio la misma respuesta. El porcentaje de estudiantes que informaron sentir que no pensaban críticamente disminuyó del 16% en octubre al 14% en enero. El porcentaje de los que se manifestaron neu-

trales al comunicado pasó del 27% en octubre al 34% en enero. Entonces, mientras menos estudiantes informaron que no pensaban críticamente, más estudiantes también parecían estar confundidos si realmente estaban pensando críticamente o no.

Freire (1972, 2018) probablemente diría que es una buena señal, ya que el pensamiento crítico es un proceso continuo que nos permite repensar y volver a aprender lo que creemos saber. El cuestionamiento en sí mismo es un signo de pensamiento crítico. Freire creía que cualquier ser humano, por "ignorante" que fuera, era capaz de mirar el mundo de manera crítica, en un encuentro dialógico con los demás.

La pedagogía crítica le da a la educación la tarea de ofrecer a los estudiantes las herramientas y hábitos mentales necesarios para pensar críticamente y para cuestionar y negociar activa y constantemente entre la teoría, la práctica y las creencias de la sociedad en la que viven.

En los campos de los ítems del cuestionario abierto, así como durante las entrevistas, noté que los estudiantes más jóvenes tomaban el pensamiento crítico como una búsqueda personal. Algunos habían dicho que solo se habían enterado del concepto de pensamiento crítico en la universidad. Otros dijeron que finalmente entendieron lo que significa. Otros lo mencionaron de manera continua y constante como algo que necesitaban mejorar, tanto en el cuestionario como en las entrevistas. Los estudiantes mayores, por otro lado, creían que estaban pensando críticamente y que aunque su calidad de pensamiento era superior a la de sus colegas más jóvenes, sus profesores no apreciaban sus intervenciones.

Muchos estudiantes a los que entrevisté, motivados y comprometidos con su aprendizaje, creían que su entorno de aprendizaje digital no promovía el diálogo ni el pensamiento crítico lo suficiente. Por el contrario, sentían que su entorno de aprendizaje digital estaba limitando su capacidad para interactuar con sus instructores y hacer preguntas. Algunos dijeron sentirse aislados y avergonzados de no saber cómo usar el DLE, otros que sentían que no podían hacer las mismas preguntas que harían en un ambiente tradicional, otros que tenían miedo de sus maestros y sus reacciones. Todo esto parece corroborar los datos existentes sobre la importancia de

las acciones de los instructores para aumentar la confianza y crear un sentimiento de pertenencia, presentándose en detalle en los subcapítulos referidos al aprendizaje digital y al aprendizaje social.

7.4 Uso y opiniones de los estudiantes sobre los EAD

La función más utilizada fue el foro de la clase, seguido de una herramienta de mensajería privada para estudiantes y profesores. Inicialmente había considerado el foro como una herramienta de comunicación entre pares, sin embargo, el uso descrito por todos los estudiantes entrevistados fue el de que los instructores usaran el foro como un tablero de mensajes, con los estudiantes interactuando poco o nada con las publicaciones del foro. Los resultados de la prueba de correlación de Kendall para las variables de motivación de los estudiantes y uso del foro indicaron una correlación débil y estadísticamente significativa entre la motivación y el uso del foro, tanto al comienzo como al final del trimestre académico. Los estudiantes que estaban motivados tendían a usar el foro más que los estudiantes que no estaban motivados.

Durante las entrevistas, los estudiantes mencionaron que se conectarían periódicamente al DLE para ver si había algo nuevo disponible para ellos, un mensaje del maestro, una tarea o una nueva lectura. Un estudiante dijo que ver una nueva lectura cargada en su clase la motivó porque le encantaba leer y le apasionaba el tema. El interés es una variable motivacional cognitiva y afectiva, definida como el estado psicológico de un individuo comprometido con un contenido particular y la motivación para volver a él (Hidi & Renninger, 2006, Renninger & Hidi, 2011). Si bien el interés personal es intrínseco por naturaleza (Krapp, 2002), el interés puede ser creado por la novedad, la sorpresa, la complejidad o la ambigüedad. El interés y la motivación están estrechamente conectados, por lo que es posible que el interés de las actualizaciones del foro también influya positivamente en la motivación de los estudiantes.

La prueba de correlación de Kendall también se aplicó a las variables de motivación y uso de una herramienta de mensajería privada para maestros, y el resultado indicó una correlación débil y estadísticamente significativa entre la motivación y el uso de una herramienta de mensajería privada con maestros al comienzo del trimestre. No se ha observado correlación para el segundo cuestionario para estudiantes.

Para el primer cuestionario, al comienzo del trimestre, los estudiantes que estaban motivados también tendían a hacer uso de una herramienta privada de mensajería para maestros. Se observó una disminución del 12% en el uso de herramientas para el foro de la clase, que fue utilizado por el 37% de los estudiantes en octubre y solo por el 25% de los encuestados en enero.

Durante las entrevistas, algunos estudiantes se habían quejado de que sus profesores no respondían a tiempo o de que no respondían en absoluto y de que sentían que sus profesores eran distantes y fríos. Muchos estudiantes dijeron que era más fácil comunicarse con los demás y obtener comentarios en un entorno de aprendizaje tradicional. Si durante la primera parte del trimestre los estudiantes habían enviado mensajes a sus profesores y no habían recibido las respuestas que esperaban, eso podría explicar la disminución en el uso, así como por el cambio de correlación entre las dos variables, para el segundo cuestionario .

Aunque relativamente pocos estudiantes informaron haber utilizado una herramienta de trabajo en grupo, en enero, más estudiantes informaron haber utilizado una herramienta de comunicación grupal, un 9%, en comparación con un 4% en octubre. Durante las entrevistas, casi todos los estudiantes mencionaron las herramientas para el trabajo en grupo como sus herramientas DLE favoritas, por su facilidad de uso y practicidad. Una estudiante dio como ejemplo de una forma en la que el DLE la estaba motivando un proyecto en el que había trabajado con otra estudiante ubicada en otro continente, y su trabajo en conjunto en el mismo proyecto. Al imaginar su EAD ideal, todos los estudiantes lo imaginaron como una forma de conectarse con otros, con un estudiante imaginando una inteligencia artificial que entendió sus desafíos y la ayudó a encontrar respuestas a sus preguntas. Otros estudiantes que se describieron a sí mismos como motivados, mencionaron como sus

herramientas favoritas: la biblioteca, el hecho de poder trabajar de forma independiente y asincrónica, en cualquier momento del día o de la semana. Estos resultados corroboran los resultados de (Coates, 2007), quien vio que algunos estudiantes que participaban en colaboración preferían el aprendizaje social, como las actividades grupales y la discusión, al aprendizaje independiente, mientras que los estudiantes que participaban de forma independiente, estaban muy motivados académicamente, pero preferían el trabajo independiente a las interacciones sociales.

En resumen, lo que se hizo evidente durante las entrevistas con los estudiantes fue que los estudiantes que dijeron que su DLE los estaba motivando hablaron sobre herramientas que eran fáciles de usar, sobre su DLE que les permite acceder fácilmente a recursos de aprendizaje útiles, en una variedad de dispositivos, lo que permite ahorrar tiempo y agregar pequeños momentos de aprendizaje en su tiempo libre durante el día.

El hecho de que el EAD les permitiera crear notas, trabajar con otros y encontrar todos los materiales de lectura necesarios en un solo lugar también se mencionó como un aspecto motivador de su DLE. Los estudiantes entrevistados dijeron que se conectaban a su EAD semanalmente, incluso dos veces por semana.

Otro aspecto del DLE que motivó a los estudiantes fue la capacidad de interactuar con una variedad de medios, tener acceso a un espectro amplio de información y ver diferentes puntos de vista.

7.5 Relaciones entre motivación, compromiso y pensamiento crítico

7.5.1 Relaciones entre motivación y compromiso

Relaciones entre la motivación y el compromiso con el DLE

Los datos mostraron que la motivación sí cambió con el tiempo para los estudiantes que participaron en el estudio y que el número de estudiantes que dijeron estar

motivados aumentó, mientras que el número de estudiantes que dijeron no estar motivados disminuyó, al final del trimestre.

Los cambios más notables en su comportamiento autoinformado tuvieron que ver con su percepción de la facilidad de uso de su propio entorno de aprendizaje digital, que, después de tres meses de uso, se volvió más familiar para ellos. Durante las entrevistas, algunos estudiantes dijeron que les tomó meses entender el DLE, que había sido "un caos", y algunos dijeron que no lo entendían del todo incluso en el momento de las entrevistas, a principios de marzo, dos meses después. se envió el segundo cuestionario para estudiantes. Otros estudiantes dijeron que tuvieron dificultades al principio, pero luego encontraron que su DLE era muy intuitivo y útil en su viaje de aprendizaje. Además, la prueba de correlación de Kendall Tau entre las variables de motivación y competencia mostró una fuerte correlación estadísticamente significativa de 0,3319532 para el primer cuestionario, respectivamente 0,4609444 para el segundo.

Los datos indicaron que, de acuerdo con la teoría de la motivación de la autodeterminación de Ryan y Deci (Deci & Ryan, 1985, Deci & Ryan, 2010, Deci et al., 2013), a medida que aumentaba la competencia en el uso del DLE, también aumentaba la motivación. La teoría de la autoeficacia de Bandura (Bandura & McClelland, 1977 Bandura, 1989 Bandura, 2010), que se refiere a la capacidad del alumno para autogestionarse y ejercer control sobre sus acciones, también podría aplicarse aquí y ser una explicación por la mayor motivación de los estudiantes observada en el estudio.

Relaciones entre la motivación y el compromiso con los compañeros

La mayoría de los estudiantes con los que hablé en este estudio se sentían desconectados de sus compañeros. Algunos dijeron que se sentían solos y aislados y que hecaban de menos las interacciones cara a cara. Dijeron que no les gustaba "estar todo el día mirando una pantalla" y que preferían los debates cara a cara, además de escuchar sus opiniones y ser convencidos de cambiar de opinión. Otros estudiantes dijeron que estaban desconectados de sus compañeros debido a diferencias de edad, diferencias sociodemográficas, diferencias de formación académica, diferencias

de intereses académicos. En general, no se sentían parte de un grupo de estudiantes ni pertenecían a una comunidad.

Estos resultados confirman aún más estudios como Kemp y Grieve (2014), que encontraron que los estudiantes preferían las actividades cara a cara a las interacciones en línea y Henderson (Henderson, 2011) que mostró que los estudiantes pueden ser reacios a participar en conversaciones en línea y que prefieren los debates cara a cara. Investigadores como Johnson y Brescia Jr. (2006) y Liu et al (2011) han observado anteriormente la pérdida de conexión y sentido de comunidad en las aulas digitales.

Durante las entrevistas, la mayoría de los estudiantes mencionaron, como su parte favorita de su DLE, herramientas que les permitieron hacer trabajo en grupo y colaborar y conectarse digitalmente. Parecía que, aunque rara vez lo hacían, también disfrutaban participando en conferencias digitales y conectando con personas de otras geografías y disciplinas. El parentesco, la pertenencia a un grupo y el sentirse conectado con los demás, como sostienen Ryan y Deci (2000), es una necesidad humana básica. En la educación digital, donde la experiencia es aislada por naturaleza, "no me gusta mirar una pantalla todo el día", como mencionaron algunos estudiantes durante la entrevista, la conexión con los compañeros es esencial para apoyar la motivación de los estudiantes.

Relaciones entre la motivación y el compromiso con los instructores

Cuando se les preguntó, en los cuestionarios, qué les permitiría tener éxito en su aprendizaje, los estudiantes dijeron que serían más exitosos si recibieran más apoyo de los maestros y si los maestros se enfocaran más en los aspectos del “mundo real” de su plan de estudios y su aprendizaje, en lugar de una teoría "inútil".

Durante las entrevistas, un tema que surgió fue que el DLE en sí mismo no puede ser motivador, sino que las personas con las que los estudiantes interactúan, sus compañeros y profesores los motivaron. Los profesores fueron mencionados con mayor frecuencia como impulsores de la motivación de los estudiantes.

Algunos estudiantes dijeron que su DLE los estaba desmotivando porque limitaba

el acceso y la conexión con sus maestros y compañeros. Que sentían que no podían hacer todas las preguntas que habrían hecho en un aula cara a cara, que los profesores no respondían a tiempo y, a veces, no respondían nada.

Corroborando la investigación existente, los datos sugieren una fuerte relación entre la motivación y la influencia y el apoyo de los docentes. El docente tiene el papel central de motivar y apoyar a los estudiantes en su aprendizaje. Los datos indican la posibilidad de que los profesores no sean conscientes de los desafíos específicos y las necesidades emocionales de los estudiantes digitales y que su apoyo pueda mejorarse.

7.5.2 Relaciones entre motivación y pensamiento crítico

La segunda pregunta de investigación de este estudio tuvo como objetivo comprender mejor la relación entre la motivación del estudiante y el pensamiento crítico del estudiante. El análisis apoya la teoría de que la motivación y el pensamiento crítico en el aprendizaje digital están estrechamente relacionados.

Los datos mostraron que la motivación autoinformada de los estudiantes en general aumentó al final del primer trimestre académico, y que la variable motivación se correlacionó significativamente con la variable de estimulación del curso, por lo que los estudiantes que informaron haber sido estimulados intelectualmente por su curso también informaron estar motivados, mientras que aquellos que dijeron que no se sintieron estimulados intelectualmente por su curso, dijeron estar desmotivados.

Aunque tanto la motivación como el pensamiento crítico son áreas de profundo interés para los investigadores de la educación, hay poca investigación disponible sobre las relaciones entre la motivación y el pensamiento crítico en un entorno de aprendizaje digital. Sin embargo, estos resultados respaldan la evidencia encontrada en los entornos de aprendizaje tradicionales, de que existe una relación positiva y significativa entre la motivación y el pensamiento crítico (Garcia & Pintrich, 1992, Valenzuela et al., 2011 Fahim & Hajimaghsoodi, 2014. La investigación del aprendizaje combinado (blended learning) de Roberts y Dyer (2005) también apoya esta afirmación.

Durante las entrevistas noté que el acto de pensar críticamente, el placer de "confiar en nuestras dudas", como dijo un alumno, o de ver un problema desde diferentes puntos de vista, la sorpresa de haber demostrado estar equivocados y haberse dado cuenta de que ahora tenían un mejor respuesta fue motivadora en sí misma. Los alumnos más jóvenes hablaron de no haber tenido que pensar críticamente antes y del impulso que les estaba dando el pensar por sí mismos, y que se les "permitiera dudar incluso de lo que decía el profesor". De la riqueza que sintieron al tener acceso a información confiable y opiniones de expertos, pudieron "comparar y contrastar" antes de llegar a sus propias conclusiones. Estos resultados confirman aún más investigaciones previas que sugieren que el acto de aprender sobre el pensamiento crítico en sí mismo puede ser estimulante y atractivo (Carmichael & Farrell, 2012).

Los estudiantes mayores de este estudio habían descrito el pensamiento crítico como algo que a menudo los metía en problemas y se habían quejado de que sus instructores no dejaban suficiente espacio para puntos de vista alternativos o formas de dar una respuesta a un problema. Para estos últimos estudiantes, este hábito de la mente aún era placentero de usar y aún era una fuerza impulsora para su necesidad de conocimiento y mejor comprensión de su tema desde el lente de su propia experiencia. Incluso si pensaban que su DEA y sus instructores estaban limitando su pensamiento crítico, el acto de practicarlo como símbolo de resistencia fue motivador y poderoso para ellos.

7.5.3 Relaciones entre el pensamiento crítico y el compromiso

Una pregunta de este estudio tuvo como objetivo observar cualquier relación entre el compromiso con el curso, a través de su DLE, sus compañeros o su instructor y el pensamiento crítico para los estudiantes que estudian digitalmente. Durante mis revisiones de literatura, encontré factores de apoyo al compromiso de los estudiantes que son comunes tanto al aprendizaje presencial como al digital, como la interacción con el instructor y los compañeros, el sentimiento de pertenencia a una comunidad, el esfuerzo cognitivo y la resolución de problemas, como así como la motivación del estudiante (Lee et al., 2019). En la siguiente subsección, analizo los resultados.

Relaciones entre el pensamiento crítico y el compromiso con el EAD

Mi objetivo era comprender mejor si había alguna relación entre la estimulación intelectual autoinformada que sentían en su curso y su compromiso con su EAD.

No se observó ninguna correlación entre la variable de estimulación intelectual y el número de funciones que un estudiante había informado que usaba de forma regular. Por lo tanto, el mero uso de más características del EAD no mostró ninguna relación con el pensamiento crítico autoinformado de los estudiantes.

Sin embargo, al observar la relación entre el pensamiento crítico y el uso de las dos funciones más populares en este estudio, el uso de foros y el uso de mensajes privados de profesores, encontré una correlación significativa entre el pensamiento crítico y el uso de una herramienta de mensajes privados de profesores ambos cuestionarios. Al observar las relaciones entre el pensamiento crítico y el uso de foros, para el primer cuestionario, los datos mostraron una correlación significativa para el primer cuestionario, pero no para el segundo.

Anteriormente, un metaanálisis de 231 estudios (Schmid et al., 2009), que investigó los efectos del uso de evaluaciones asistidas por tecnología digital y basadas en computadora en entornos postsecundarios, sugirió que las tecnologías que apoyan los procesos cognitivos, que ayudan directamente a los estudiantes en el aprendizaje, producir resultados significativamente mejores que las tecnologías utilizadas para simplemente presentar o entregar contenido

En esta tesis, conceptualicé el pensamiento crítico en un enfoque constructivista, siguiendo la definición de Laurillard (2002). El pensamiento crítico está relacionado con la búsqueda de ayuda, que es una valiosa estrategia de aprendizaje que ayuda a los estudiantes graduados que estudian en entornos de aprendizaje digital a alcanzar con éxito sus objetivos de aprendizaje (Dunn et al., 2014). El hecho de que los estudiantes que informaron haber sido estimulados intelectualmente por su curso, también usaron el foro para interactuar con otros e interactuaron directamente con su instructor, posiblemente pidiendo aclaraciones y recibiendo comentarios, está en línea con estos hallazgos anteriores.

Relaciones entre el pensamiento crítico y el compromiso con los compañeros

Cuando se les preguntó si sus compañeros les estaban ayudando a pensar críticamente, el 41 % dijo que sus compañeros les ayudaron mucho, en octubre, frente al 34 % en enero. El 48 % había dicho que sus compañeros les ayudaban un poco a pensar críticamente en octubre, respectivamente el 55 % en enero. En cuanto a los que dijeron que sus compañeros no les ayudaron, las respuestas fueron casi idénticas en octubre y enero, con solo un 11 % (10 % respectivamente) diciendo que sus compañeros no les ayudaron a pensar críticamente. Al realizar las pruebas de correlación de Kendall Tau entre la motivación intelectual y el apoyo al pensamiento crítico de los compañeros, no se encontró una correlación estadísticamente significativa.

En el aprendizaje digital, los estudiantes también están a cargo de planificar y administrar su propio aprendizaje y de crear tiempo y espacio para un aprendizaje efectivo, lo que a veces puede dificultar la participación de los compañeros o parecer que requiere mucho tiempo y es menos relevante que el material del curso en sí. Sin embargo, el aprendizaje colaborativo tiene un fuerte impacto positivo en el éxito del aprendizaje y en la motivación, así como en el pensamiento crítico.

Se ha demostrado que la retroalimentación de los compañeros tiene un impacto positivo en las habilidades de pensamiento crítico, lo que a su vez puede aumentar los niveles de confianza de los estudiantes para discutir sus ideas en un entorno de aprendizaje digital y aumentar la motivación de los estudiantes (Ekahitanond, 2013). Además, como descubrió Magolda (1992), "la capacidad de desarrollar una voz distintiva surge de definir el aprendizaje como una construcción de significado en conjunto con otros".

Durante las entrevistas, los estudiantes mencionaron que se sentían solos, aislados, que su EAD estaba limitando su contacto con los demás y que los hacía menos propensos a hacer preguntas o iniciar debates, en comparación con sus experiencias de aprendizaje tradicionales anteriores. Es posible, entonces, que los resultados anteriores se puedan explicar por esta falta de conexión e intercambio entre los

estudiantes involucrados en este estudio.

Relaciones entre el pensamiento crítico y el compromiso con los instructores

Cuando se les preguntó si su instructor les estaba ayudando a pensar críticamente, el 41 % de los estudiantes dijo que su instructor les ayuda mucho en octubre y el 45 % en enero. El 52 % dijo que su instructor ayuda de alguna manera en octubre y el 52 % en enero. Solo el 7 % en octubre y el 3 % en enero habían dicho que su instructor no les ayuda en absoluto a pensar de forma más crítica. En general, la gran mayoría de los estudiantes dijo que su instructor los estaba ayudando a pensar de manera crítica.

Al realizar la prueba de correlación de Kendall para el primer cuestionario, se observó una fuerte correlación estadísticamente significativa entre el pensamiento crítico y el compromiso con los instructores. La puntuación de correlación para el segundo cuestionario también fue muy fuerte, sin embargo, se encontró que los datos eran estadísticamente insignificantes.

Cuando se les preguntó su opinión sobre si los estudiantes que aprenden digitalmente eran menos propensos a pensar críticamente que los estudiantes del campus, el 14 % de los instructores que participaron en el estudio estaban totalmente de acuerdo, el 10 % estaban de acuerdo, el 38 % eran neutrales, el 31 % estaban en desacuerdo y 7 % totalmente en desacuerdo. La mediana fue "neutral".

En las partes abiertas del cuestionario, los instructores dijeron que, para motivar a los estudiantes a pensar críticamente en un DLE, la tutoría y conexión personal con el instructor fue clave, seguido de contextualizar el aprendizaje y explicar la relevancia del aprendizaje en su carreras futuras, creando oportunidades para el aprendizaje colaborativo y creando desafíos para los estudiantes y formas para que vean su propio progreso en el aprendizaje.

7.6 Temas e historias de estudiantes digitales postsecundarios motivados, comprometidos, que piensan de manera crítica

Los estudiantes que estaban motivados y comprometidos críticamente con su aprendizaje estaban principalmente fuertemente motivados intrínsecamente. Algunos estaban motivados por el desafío intelectual en sí, otros por la capacidad de ayudar a otros, más adelante en sus carreras, o la perspectiva de un mejor trabajo, que ofrecería a sus familias una vida mejor. Aquellos que se destacaron más como motivados, comprometidos y pensando críticamente fueron motivados, se sintieron competentes y confiados de que podrían lograr sus metas siempre y cuando pusieran el trabajo necesario.

En contraste, los estudiantes que informaron sentirse desmotivados o no comprometidos críticamente con su aprendizaje, estaban desencantados con sus instructores y compañeros, se sentían restringidos por el DLE y que su aprendizaje tenía que encajar en un patrón prediseñado. Aquellos estudiantes que dijeron que demasiada teoría les impedía pensar críticamente, hablaron sobre su necesidad de comprender la aplicación de la teoría para las carreras futuras o dijeron que les faltaba la experiencia de vida para comprender realmente el contexto.

Los estudiantes más motivados y comprometidos también parecían ser estudiantes independientes, el acceso a la biblioteca del curso en línea y la capacidad de explorar, comparar y contrastar nueva información y tomar sus propias decisiones al respecto fue emocionante y motivador. El hecho de que pudieran organizar su tiempo como quisieran y hacer un buen trabajo donde y donde quisieran, fue motivador para ellos.

Estos estudiantes también parecían estar bien conectados con modelos a seguir, ya sea miembros de su familia que los apoyaban emocionalmente o profesores que admiraban. Me sorprendió lo poco que hablaron de sus compañeros y colegas, pero se necesitarían más investigaciones para comprender mejor cuánta interacción y colaboración verdaderas hay en los EAD en la actualidad.

7.7 Contribuciones de la investigación

Mi tesis contribuyó a cerrar la brecha entre los aspectos de la motivación y el compromiso en los EAD que apoyan el pensamiento crítico para los estudiantes de educación superior, al ofrecer una visión holística de las relaciones entre estos factores, tal como los veían los estudiantes.

El diseño de la investigación me permitió usar datos cuantitativos para informar mi investigación cualitativa y los aspectos longitudinales de mi estudio, siguiendo al mismo grupo de personas durante dos trimestres académicos, me permitió obtener una visión más matizada de lo que buscan la motivación, el compromiso y el pensamiento crítico. como para los estudiantes universitarios que estudian digitalmente.

Este estudio identificó, basándose en la literatura existente, las características de los EAD que motivan, involucran y apoyan a los estudiantes en el pensamiento crítico y sacó a la luz algunos de los desafíos que el DLE plantea a los estudiantes, instructores y diseñadores instruccionales. El estudio también trae nuevos conjuntos de instrumentos de recopilación de datos probados y validados.

Al examinar la motivación, el compromiso y el pensamiento crítico en un grupo de estudiantes digitales, de manera longitudinal, este estudio permitió comprender mejor las relaciones entre la motivación, el compromiso y la estimulación intelectual y cómo las experimentan los estudiantes digitales.

Para los profesionales de la educación, esta tesis contribuye a integrar los conceptos de pensamiento crítico y la práctica del diálogo a los estudios de motivación y compromiso, alejando la investigación de los estudios intervencionistas, hacia una conceptualización integrada de la experiencia del estudiante en DLE, donde la motivación, el compromiso y el pensamiento crítico son estudiaron juntos.

7.8 Limitaciones de este estudio

Esta investigación presentó varios desafíos: los temas de pensamiento crítico, compromiso y motivación son amplios y multifacéticos. Para acotar el enfoque del

estudio, puse menos énfasis en algunas áreas relacionadas muy importantes, como el diseño instruccional, la experiencia del usuario, el diseño de LMS. En cambio, me concentré en las experiencias y sentimientos de los estudiantes para sacar a la luz cómo se sentían al estudiar digitalmente.

La muestra de participantes en este estudio también es relativamente pequeña: 30 profesores participaron en el estudio del instructor, 44 estudiantes respondieron al primer cuestionario y 29 al segundo, grupo del cual 10 estudiantes aceptaron ser entrevistados. Después de terminar las entrevistas con los estudiantes, comenzó la crisis de Covid y decidí no presionar más a mi grupo de estudio para las entrevistas, ya que los nuevos datos serían social y emocionalmente completamente diferentes al resto de datos que había recopilado. Por otro lado, los ítems abiertos que incluyo en todos los cuestionarios me dieron más información y matices para responder las preguntas de investigación del estudio.

7.9 Sugerencias para futuras investigaciones

El desafío del diálogo en la educación digital es que no se puede estandarizar. Como vimos en la primera parte de esta tesis, el diálogo requiere un ambiente de aceptación y confianza, requiere que los participantes se involucren en un proceso de creación de conocimiento que sea continuo y compartido, requiere pensamiento crítico, atención, dedicación y tiempo.

La mayoría de los entornos de aprendizaje digital incluyen una versión de un foro público o un espacio de discusión, sin embargo, el foro siempre se sitúa por diseño fuera de la experiencia de aprendizaje, desde el punto de vista de la experiencia del usuario. Es necesario dejar la clase para ir al foro, encontrar el hilo correcto o crear uno nuevo y hacer una pregunta o compartir una opinión personal. En la mayoría de los casos, esas piezas de contenido no se convierten en conversaciones, y mucho menos en la forma transformadora de aprendizaje social que Freire llama diálogo. Los estudiantes e instructores deben hacer un esfuerzo para incorporar un verdadero diálogo en los entornos de aprendizaje digital, específicamente porque es difícil de

lograr.

Si una experiencia de aprendizaje se organiza en torno a una conferencia o cualquier otro tipo de texto educativo, y hay un instructor y al menos un estudiante involucrado en la experiencia de aprendizaje, ¿por qué el estudiante necesita abandonar el espacio de aprendizaje para entablar un diálogo? ? ¿Por qué la capacidad de iniciar un diálogo no está integrada en la experiencia de aprendizaje? ¿Por qué hay un espacio secundario separado para "hablar"? Se requiere más investigación para implementar espacios digitales en los que la discusión esté integrada en la experiencia de aprendizaje y comprender mejor si el DLE debe adaptarse aún más a las necesidades de los estudiantes digitales.

Algunas universidades han realizado mejoras en el diseño de instrucción de los EAD e incluyen comentarios proactivos y personalizados para cada estudiante. En cada paso de su viaje de aprendizaje, los instructores y tutores brindan retroalimentación de manera activa y proactiva. Este tipo de atención personal y personalizada al individuo, así como el modelo tradicional de seguimiento de cerca a lo largo del término, permite tanto al alumno como al maestro crear conexiones humanas y volverse humanos entre sí. Los resultados de este estudio indican que los estudiantes necesitan más apoyo. Algunos prosperan en sus DLE y pueden participar críticamente con su plan de estudios, sus compañeros e instructores, mientras que otros se sienten aislados, pequeños, sin importancia, invisibles e incomprendidos. Estos estudiantes necesitan más ayuda y se requiere más investigación para comprender qué porcentaje de estudiantes de universidades digitales se sienten excluidos. Con la crisis de Covid, muchas, si no todas, las instituciones educativas tienen que implementar el aprendizaje digital en los últimos meses. Existe el peligro de que el simple hecho de tratar de llevar las actividades cara a cara en un entorno digital sea suficiente para que todos los estudiantes se sientan competentes, autónomos y que pertenecen a una comunidad que los respeta y apoya.

Había recopilado mis datos para este estudio antes del inicio de la crisis de Covid, por lo que el impacto de digitalizar abruptamente todas las experiencias sociales debe investigarse más a fondo.

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