Approaches to learning in a blended learning environment in higher education

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ABSTRACT

As blended learning becomes the prevalent learning environment, student experience and approaches to learning they adopt become more and more relevant. Positioning approaches to learning in these environments will help understand the students' experience and support the construction of a high-quality modern learning environment.

The main goal of this research is to improve the knowledge on approaches to learning in a blended learning environment. In literature review, several key considerations of blended learning environments were detected. A questionnaire was developed to evaluate the relationships between these concepts and each of the approaches to learning. Measurement model in structural equation modeling was used to validate the questionnaire and estimate the aforementioned relationships. Further statistical methods were used to evaluate differences in each approach to learning between groups of students. Interviews were conducted as a second step of this mixed method study and the findings were then brought together.

Results indicate a positive correlation between deep and strategic approach to learning and experience with e-learning, learner control, social influence when using LMS, and teaching-learning environment. Interviews have shown, among other findings, that students mainly, regardless of their adopted approach to learning, appreciate the benefits of on-demand online learning and find focusing on learning challenging because of technology.

Implications for further research are also discussed.

Keywords: blended learning, approaches to learning, educational videos, learning management systems, experience with e-learning, learner control, mixed method research

SAŽETAK

U vrijeme kada hibridno okruženje postaje prevladavajuće okruženje za učenje, iskustvo studenata i njihovi pristupi učenju postaju sve važniji. Smještanje pristupa učenju u hibridna okruženja za učenje pomaže u shvatiti iskustva studenata i podupire izgradnju modernih okruženja za učenje.

Glavni cilj ovog istraživanja je unaprijediti znanje o pristupima učenju u hibridnom okruženju za učenje. Prilikom pregleda literature, otkriveno je nekoliko ključnih koncepata u okviru hibridnog okruženja za učenje. Kako bi se analizirale veze između ovih koncepata i pristupa učenju, kreiran je upitnik. Mjerni model u modelu strukturnih jednaždbi korišten je za validaciju upitnika i procjenu povezanosti između ovih koncepata i pristupa učenju. Druge statističke metode korištene su za procjenu razlika između svakog od pristupa učenju između određenih grupa studenata. Na kraju, provedeni su intervjui kao drugi korak u ovoj studiji mješovitog tipa.

Rezultati su pokazali pozitivnu povezanost između dubinskog i strateškog pristupa s: iskustvom s e-učenje, kontrolom u učenju, društvenim utjecajem prilikom korištenja sustava za upravljanje učenjem i okruženja za poučavanje i učenje. Intervjui su, među ostalim, pokazali da studenti većinom, bez obzira na pristup učenju, cijene prednosti učenja na zahtjev i vide fokusiranje na učenje kao zahtjevan zadatak zbog tehnologije koja ih okružuje.

Prikazani su i prijedlozi za buduća istraživanja.

Ključne riječi: hibridno učenje, pristupi učenju, obrazovna videa, sustav za upravljanje učenjem, iskutstvo s e-učenjem, kontrola u učenju, istraživanje mješovitog tipa

PROŠIRENI SAŽETAK

Ova disertacija počinje **uvodnim dijelom** u kojem je predstavljen problem istraživanja, ciljevi i hipoteze, kratki pregled prikupljenih podataka i korištenih metoda te doprinos istraživanja. Hibridna okruženja za učenje postaju sveprisutna u obrazovnim sustavima te je stoga važno istraživati ih i potkrijepiti izgradnju upravo onakvih okruženja kakvi odgovaraju studentima, nastavnicima i institucijama. Istovremeno, pristupi učenju detaljno su istraživani većinom u klasičnim okruženjima za učenje te djelomično u hibridnim okruženjima, ali ne na način koji obuhvaća neke od ključnih elemenata takvih okruženja. Nakon iznošenja važnosti teme, u ovom se dijelu prikazuje glavni cilj istraživanja te pripadajućih pet potciljeva, zatim tri istraživačka pitanja i pet glavnih hipoteza s pripadajućim pothipotezama koje su razrađene na temelju prvog istraživačkog pitanja. Dalje, dan je pregled istraživačkih pitanja i hipoteza prema koracima u istraživanju te uzorku i metodama prikupljanja podataka i obrade podataka. Vizualni model ovog istraživanja, koje spada u istraživanje mješovitog tipa, dan je kako bi se čitatelju olakšalo razumijevanje primjenjenih metoda i rezultata dobivenih u svakom koraku istraživanja. Na kraju, prikazan je doprinos ove disertacije i struktura rada.

U **drugom poglavlju** obrađen je teoretski okvir i prikazan je pregled literature u tri ključna dijela: hibridno učenje, pristupi učenju, pristupi učenju u hibridnom okruženju za učenje. U okviru pregleda literature o hibridnom učenju, prvo je definiran pojam hibridnog učenja u literaturi i u ovoj disertaciji te su predstavljene prednosti i nedostaci ovakvog okruženja za učenje. Dalje, izneseni su pogledi na hibridno učenje iz perspektive studenata, nastavnika i institucije, slijedeći već viđenu metodologiju u kojoj su ove tri grupe glavni dionici hibridnog učenja. Iz pregleda literature uočeno je da postoje određeni pojmovi koji su važni za sve dionike u definiranju, primjeni i evaluaciji hibridnih okruženja za učenje pa su dalje obrađeni u zadnjem dijelu potpoglavlja o hibridnom učenju. Radi se o obrazovnim videima, masivnim otvorenim online tečajevima, sustavima za upravljanje učenjem, iskustvu s e-učenjem i kontroli u učenju. Nakon toga, obrađeni su teoretski okvir i istraživanja o pristupima učenju. Isto kao i kod hibridnog učenja, prvo je obrađena definicija pristupa učenju i što karakterizira pojedini od tri pristupa učenju: dubinski, strateški i površinski. Zatim su prikazane različite perspektive o pristupima učenju što uključuje ključna istraživanja te važnost specifičnih elemenata okruženja u procjeni pristupa učenju, kao i karakteristika studenata koje su obrađivane u istraživanjima u ovom području kao što su spol, godina studija i područje studija. Treći dio drugog poglavlja obrađuje dosadašnja istraživanja o pristupima učenju u hibridnom okruženju za učenje kako bi se obuhvatili dosadašnji radovi u području. Zadnji dio drugog poglavlja je sažetak

sveobuhvatnog pregleda literature i iznosi ključne pojmove koji su dalje razrađivani u samom istraživanju, istraživačkim pitanjima i hipotezama.

Treće poglavlje obuhvaća metodologiju istraživanja i podijeljeno je u tri glavna dijela. U prvom se dijelu opisuje istraživanje mješovitog tipa, karakteristike takvog istraživanja i zašto je upravo taj tip istraživanja odabran u ovom istraživanju. Dalje, u ovom je istraživanju korišten eksplanatorni sekvencijalni dizajn koji podrazumijeva da se prvo napravi kvantitativno istraživanje, a zatim kvalitativno koje unaprjeđuje i proširuje saznanja iz kvantitativnog istraživanja. Zatim su prikazane metode prikupljanja i obrade podataka u svakom od koraka ove metode mješovitog tipa kroz vizualni model istraživanja. U kvantitativnom dijelu istraživanja, za prikupljanje podataka korištena je metoda ankete, a u kvalitativnom dijelu metoda intervjua. U drugom dijelu obrađena je metodologija kvantitativnog istraživanja. Prvo, opisuje se način odabira uzorka. Zatim, opisuje se upitnik koji je korišten za prikupljanje podataka te se razrađuju komponente upitnika koje predstavljaju osam ključnih konstrukata: dubinski, strateški i površinski pristup, okruženje za poučavanje i učenje, iskustvo s e-učenjem, kontrola te faktori koji utječu na korištenje sustava za upravljanje učenjem (tjeskoba prilikom korištenja sustava i utjecaj okoline). Opisuju se različite vrste validnosti upitnika te kako je u ovom istraživanju provjerena validnost sadržaja (pregled literature) i konstrukata (faktorska kroz mjerni model u modelu strukturnih jednadžbi i nomološka) te pouzdanost skala (Cronbach alfa i kompozitna pouzdanost). U kvantitativnom dijelu istraživanja korištene su sljedeće metode: mjere disperzije, centralne tendencije i asimetrije, analiza frekvencija za pregled podataka, Kolmogorov-Smirnov i Shapiro-Wilk test, mjere asimetričnosti i zakrivljenosti, grafovi za analizu normalnosti distribucije varijabli i na kraju parametrijski i neparametrijski testovi za razliku među grupama ovisno o distribuciji zavisne varijable. Nadalje, predstavljen je model strukturnih jednadžbi kroz šest koraka te je opisano kako su podaci u ovom istraživanju analizirani prema tim koracima. Ustanovljeno je kako je veličina uzorka primjerena za planirane metode analize podataka, da će se nedostajući podaci umetnuti linearnom interpolacijom ukoliko je student propustio odgovoriti na jedno pitanje te su dalje razrađene metode obrade podataka u modelu strukturnih jednažbi koje odgovaraju odstupanjima od normalnosti. Iznesene su i definicije pristajanja modela. Na kraju, prikazano je pilot istraživanje koje je provedeno prije glavnog istraživanja s ciljem procjene pouzdanosti upitnika i daljnjeg usavršavanja istraživanja. Treći dio trećeg poglavlja obuhvaća kvalitativni dio istraživanja, način i razloge odabira osam studenata koji su sudjelovali u intervjuima te proces izrade pitanja intervjua s ključnim pitanjima kojima su se ispitivala ključna područja prema istraživačkim

pitanjima i kvantitativnim rezultatima. Protokol i procedure prikupljanja i zapisivanja podataka su prikazane, kao i cjelokupni proces kodiranja kvalitativnih podatak. U ovom je istraživanju primjenjen općeniti induktivni pristup koji je počeo od 35 kategorija za 182 reference iz intervjua i na kraju završio s osam ključnih kategorija koje su od najvećeg značaja za istraživanje. Na kraju, opisane su procedure provjere kvalitativnog istraživanja.

Četvrto poglavlje je centralni dio disertacije s obzirom da donosi rezultate istraživanja i podijeljen je u tri dijela. U prvom dijelu su obrađeni rezultati kvantitativnog istraživanja, kroz razvoj mjernog modela u modelu strukturnih jednadžbi te procjenu faktorske validnosti upitnika i pouzdanosti skala. Dobro pristajanje modela u koraku faktorske analize pokazuje da podaci dobro pristaju modelu, potvrđuje faktorsku validnost upitnika i omogućuje daljnju analizu i istraživanje povezanosti među kontstruktima. Analiza pouzdanosti skala pokazuje dobru pouzdanost, ali i ograničenja istraživanja. Testiranje hipoteza rezultiralo je prihvaćanjem 12 od 15 pothipoteza i pokazalo da za njih postoje statistički značajne povezanosti između promatranih konstrukata i pristupa učenju. Također, primjećene su razlike među pojedinim od pristupa učenju i prema skupinama studenata. U drugom dijelu obrađeni su rezultati kvalitativnog dijela istraživanja, odnosno osam intervjua s odabranim studentima i dani su opći zaključci o stavovima studenata o pojedinim pitanjima u njihovom okruženju za učenje. U trećem dijelu integrirana su saznanja kvantitativnog i kvalitativnog dijela istraživanja.

Peto poglavlje obrađuje raspravu o rezultatima i zaključke rada, prikazane kroz znanstveni i praktični doprinos. Nadalje, obrađena su ograničenja rada, kao i implikacije za daljnja istraživanja. Na kraju, dodan je popis referenci i prilozi koji su važni za razumijevanje tijeka istraživanja.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ASI	Approaches to Study Inventory
ASSIST	Approaches and Study Skills Inventory for Students
AVE	Average variance extracted
CFI	Comparative fit index
CR	Composite reliability
ETL	Enhancing Teaching-Learning Environments
ETLQ	Experiences of Teaching and Learning Questionnaire
FOI	Faculty of Organization and Informatics
GOF	Goodness of fit
HEI	Higher education institution
ICT	Information-communication technology
LMS	Learning management system
ML	Maximum likelihood
RASI	Revised approaches to study inventory
RMSEA	Root mean square error of approximation
SEM	Structural equation modeling
SETLQ	Shortened Experience with Teaching-Learning Questionnaire
SRCE	the University Computing Centre
SRMR	Standardized root mean residual
TAM	Technology acceptance model
TLI	Tucker Lewis Index
UTAUT	Unified Theory of Acceptance and Use of Technology
VLE	Virtual learning environment

1 INTRODUCTION

In this introductory chapter, the research problem, research goals and hypothesis, short overview of research methods, contribution and the overall thesis structure are laid out.

1.1 Research problem

Technology supported learning is an important element of modern education. In practice, there are various ways of blending and enriching traditionally taught courses with technology: e-learning, mobile learning, leveraging the features of learning management systems (LMSs), or integrating pre-made videos in class can be found in classrooms around the world. Leveraging technology is not surprising given the benefits such as flexibility of time and place, scalability, addressing different learning styles etc. In Croatia, the University Computing Centre (SRCE) and the Ministry of Science, Education and Sport (MSES) conducted a national survey on applying information-communication technology (ICT) and e-learning in educational processes in higher education institutions (HEIs) to find that approximately 86% of those participating do have a certain level of e-learning applied (Bralić, 2016). Further, students perceive their experience with e-learning and the quality of integrating it in class and general learning experience in a certain way. Also, there are reports of students excelling or struggling to keep the control over learning online, be it the focus when learning or their control over material. Similarly, learning management systems (LMSs) are implemented in a large number of higher education institutions and are used by teachers and students in different ways and with different success, depending on various criteria.

Ference Marton and his research group were investigating why students who read the same text understand it differently and found that that the difference "hinged on initial intention" (Entwistle & Peterson, 2004). The approaches to learning theory was developed further in literature (Biggs, 1987; Entwistle & Ramsden, 1983; Marton & Säljö, 1976). Three main approaches to learning have been identified: deep, surface, and strategic (organized). Deep approach is characterized by an intention to understand the ideas and by connecting them with previously acquired knowledge and experience. The surface approach is characterized by the intention to cope with course requirements and reproducing knowledge by treating the course as unrelated bits of knowledge (Entwistle, 2009, p. 36). Students with strategic approach tend to approach learning with the goal of achieving a good grade and in some research an organized approach is mentioned, as an equivalent to the strategic approach (Entwistle, Mccune, &

Hounsell, 2002). The same student can approach learning or a task in different ways; relationships have been established between: (a) elements of student's teaching-learning environment (teaching, workload, assessment, choice in learning) and the approaches to learning (Entwistle & Ramsden, 1983), (b) motivation, threat, and anxiety and approaches to learning (Fransson, 1977; Marton & Säljö, 2005), (c) approaches to teaching and approaches to learning (Trigwell, Prosser, & Waterhouse, 1999). An important research project in this area is „Enhancing Teaching-Learning Environments in Undergraduate Courses". There have been several instruments developed and reports published throughout it, one of which highlights the importance of the perception of the teaching-learning environment: "the students' perceptions of the teaching and assessment procedures, rather than the methods themselves, that affect student learning most directly (Entwistle et al., 2002)."

As blended learning is becoming the prevalent way of teaching in traditional education, the experience of students with elements of it and the approaches to learning they adopt need to be taken into consideration. Blended learning environment needs to support the approaches to learning characterized by understanding and the ability to apply the acquired knowledge. Positioning approaches to learning in a blended learning environment will help to understand the students' experience.

Some research has been done on approaches to learning in a blended learning environment, analyzed in detail in chapter 2.3 Approaches to learning in blended learning environment. To the best of this researcher's knowledge, authors to date have focused on experience of using a virtual learning environment, they studied the role of a teacher in learning experience, and explored networked learning, among others. In none of these studies were the concepts of interest in this research: educational videos in class, massive open online courses (MOOCs), approaches to learning, teaching-learning environment, experience with e-learning, learner control, and factors affecting the use of LMS brought together.

This study attempted to provide contribution in this area by connecting the mentioned concepts and evaluating their relationships as well as impact they could make on building strong learning environments.

1.2 Research goals and hypothesis

The main goal of the research is to improve the knowledge on approaches to learning in a blended learning environment.

Subgoals include:

- To conduct an overview of research to date through a literature review
- To conduct quantitative research using the survey method and analyze the data
- To conduct qualitative research using the interview method
- To integrate the findings of quantitative and qualitative research
- To put together recommendations for structuring a blended learning environment that supports specific approaches to learning

There are **three research questions** in this study:

RQ1: What is the relationship between gender, student status, use of MOOCs and educational videos in class, experience with e-learning, learner control, teaching-learning environment, and factors affecting the use of LMS (anxiety and social influence) and deep, strategic, and surface approaches to learning?

RQ2: How do students describe their experience with blended learning and the use of the online materials and their approaches to learning?

RQ3: How do the outcomes of the interviews contribute to understanding the results gained through quantitative research?

Part of the **first research question** was built in **research hypothesis:**

H1. There is a correlation between experience with e-learning and: (a) deep approach to learning, (b) surface approach to learning, (c) strategic approach to learning.

H2. There is a correlation between learner control and: (a) deep approach to learning, (b) surface approach to learning, (c) strategic approach to learning.

H3. There is a correlation between anxiety when using LMS and: (a) deep approach to learning, (b) surface approach to learning, (c) strategic approach to learning.

H4. There is a correlation between social influence in using LMS and: (a) deep approach to learning, (b) surface approach to learning, (c) strategic approach to learning.

H5. There is a correlation between experience with teaching-learning environment and: (a) deep approach to learning, (b) surface approach to learning, (c) strategic approach to learning.

1.3 Short overview of data and research methods

This research consists of two parts: theoretical and empirical. The theoretical part includes literature overview. For empirical research, mixed method design is used, explained thoroughly in following chapters. Table 1 outlines the parts of the research with sample, data collection method, and methods of analyzing the data, as well as how each part of the research relates to the research questions and hypothesis. Figure 1 shows a visual model built to explain the key steps in this mixed method study.

Research question 3 is not in Table 1; this research question will be answered after all results are evaluated, through a discussion that clarifies how the qualitative results have helped expand or clarify the results achieved in the quantitative part of the research. Further, in chapter 3.1 Mixed method design, further explanation is given on connecting the quantitative and qualitative parts of the research.

Table 1: Parts of empirical research explained

RQ	Hypo thesis	Step	Sample	Method of data collection	Methods of data analysis
RQ1	H1 - H5	Analyzing relationships between each of the approaches to learning and experience with e-learning, learner control, factors affecting the use of LMS (social influence, anxiety), and teaching-learning environment	578 students in 7 different subjects across 3 universities	Survey	- Confirmatory factor analysis/SEM: Measurement model
RQ1		Evaluating differences in each of the approaches to learning based on gender, study area, use of educational videos and use of MOOCs	578 students in 7 different subjects across 3 universities	Survey	- Testing differences in measures of central tendency among groups (test depends on normality: t-test, ANOVA, Mann-Whitney, Kruskal-Wallis, post-hoc test
RQ2		Follow-up analysis with a subset of students to follow up on the quantitative approach	8 students in 1 subject	Interview	- Coding and thematic analysis - Within case and across case analysis

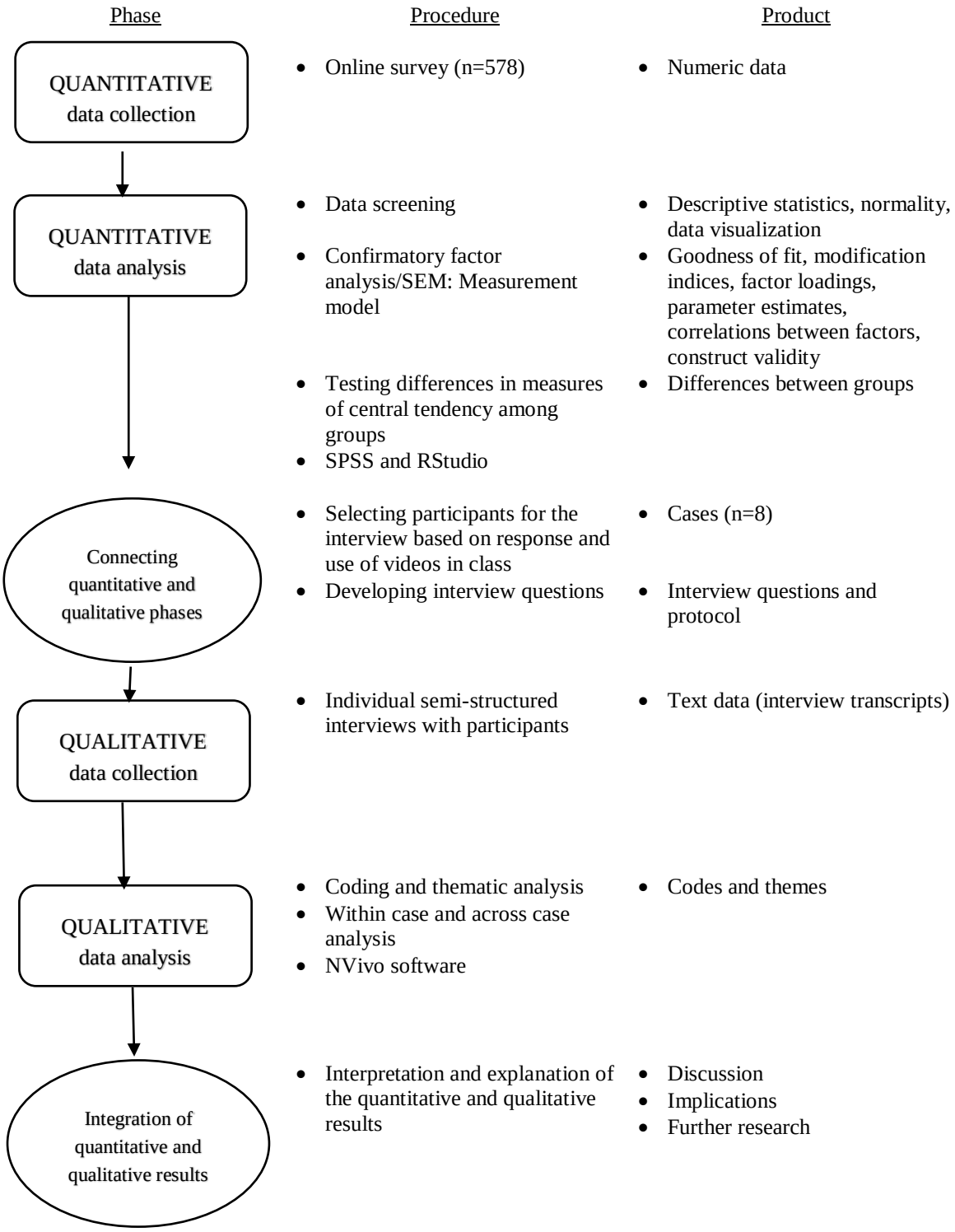


Figure 1: Visual model of mixed method research in this study

1.4 Contribution

The expected contributions of this thesis are:

- Expanding the existing theory of approaches to learning in blended learning environment through quantitative and qualitative research
- Developing a reliable and valid instrument for analyzing approaches to learning in a blended learning environment
- Testing the hypothesis on correlations between each of the approaches to learning and key characteristics and concepts: experience with e-learning, control, anxiety and social influence when using LMS and experience with teaching and learning environment
- Providing the possibility to expand other research and models of student learning or online resource use with the outcomes of this research
- Providing the opportunity to apply this research methodology in investigating the experience of students and their approaches to learning in a fully online learning environment, which is an important area

There is a practical contribution of this thesis; research results can be used in analyzing blended learning environments and when developing teaching-learning environment, taking into account students perceptions.

1.5 Thesis structure

This thesis is organized in five chapters.

The first chapter provides a general introduction and overview of the research problem, goals, hypothesis, sample, gathered data, and methods of analyzing the data.

The second chapter looks at the theoretical framework and a literature overview on core elements of this study, first investigating the main terms in blended learning, advancements and research in the area, then moving to approaches to learning, and finally looking at the literature review on blended learning and approaches to learning.

The third chapter covers research methodology, starting with general overview of a mixed method approach and why it was selected for this study. Then, the methodology for the quantitative part of the research is clarified, including the sample, instrument, methods of data analysis. Finally, details on qualitative research methodology are outlined, including sample, protocol, and methods of data analysis. The pilot research is also referenced in the third chapter.

The fourth chapter covers the results of this study, first looking at the quantitative part, which includes instrument validation and then all following methods and then looking at qualitative parts with core themes that emerged in the qualitative analysis. Finally, results are brought together.

In chapter five, results and contributions of the thesis are discussed. Limitations and implications for further research are laid out.

2 LITERATURE REVIEW

The purpose of literature review in this thesis is to share the results of other research related to this study, relate this study to a larger dialogue in the literature and fill in the gaps, provide a framework for establishing the importance of this study, and form a benchmark for comparing the results with other findings (Creswell, 2014, p. 60). In mixed methods study, it is recommended to use a literature "in a way that is consistent with the major type of strategy and the most prevalent approach in the design" (Creswell, 2014, p. 63). In this research, quantitative is the prevalent design and literature will be used deductively to advance research questions and hypothesis (Creswell, 2014, p. 63).

Literature review is divided in three sections, as per guidelines for presenting the review in mixed methods research: (1) blended learning, (2) approaches to learning, and (3) approaches to learning in a blended learning environment.

Steps followed to conduct the literature review are outlined in chapter 3 Research methodology.

2.1 Blended learning

In this chapter, definition and scope of blended learning, its benefits and challenges, as well as perspectives on blended learning from different actors/stakeholders are presented. Then, specific elements and considerations on blended learning uncovered during literature review and earlier research are explored further.

2.1.1 Definition and scope

Thorough changes in technology, educational practices, and society have impacted the development of learning supported by information and communication technology, also defined as e-learning. (Begičević & Divjak, 2006) define e-learning as "type of learning supported by information and communication technology (ICT) that improves quality of teaching and learning". (Bolliger & Wasilik, 2009) claim that online teaching has become an expectation and an element of instructors' regular teaching loads", a fact that is still true today, ten years from publishing their work. Still, research has shown that e-learning alone often cannot address the needs and challenges of students, who prefer the face to face component of their learning experience, particularly when it comes to communication and building interpersonal relationships (Paechter & Maier, 2010). With that, researchers have been focusing on blended learning, its success factors, and impact it can make on students and teachers.

(Graham, 2006) states:

> *"The foundational challenge of blended learning research is seeking to understand (1) what humans do very well and (2) what machines do very well, so that the strengths of both can be maximized as they are blended in the service of learning."*

Knowing the above, blended learning has become the prevalent way of teaching in modern educational institutions, and yet, does not have only one definition. Generally, there is an agreement on blended learning involving a combination of face to face and online learning (Graham, 2013).

(Graham, Woodfield, & Harrison, 2013) highlight four key issues related to definition of blended learning:

1. **"What is being blended?"** In his previous work, (Graham, 2006) identified three most common answers to the question: blending online and face to face instruction (most commonly used), blending delivery media, and blending instructional methods.

2. **Seat time** - researchers have been debating whether defining a learning environment as blended automatically means reduced time in seat; i.e. less face to face time. This would mean that the online component is not simply added on top of traditionally taught courses but in fact replaces some of it.

3. **Proportion of online learning** - the question posed is: what proportion of a traditionally taught course must be online for it to be defined as a blended course? Having a threshold on a criteria that is not easily quantifiable is challenging; a difference in one percentage point might differentiate a traditional course from a blended one while in practice there might not be a significant difference in the way the course is delivered.

4. **Quality** - the transformational impact of new technology and way of teaching can only be achieved if it is implemented in a "thoughtful" way (Garrison & Kanuka, 2004). The challenge is to implement blended learning in a way that in fact advances the educational practice.

In this study, the term "blended learning" is used to describe "learning activities that involve a combination of face-to-face interactions and technologically mediated interactions between students, teachers and learning resources" (Bliuc, Goodyear, & Ellis, 2007; Caravias, 2015). In fact, many blended learning programs today are built around traditionally taught courses now enriched with the online component, "leveraging the positive impact of blended learning on

teaching and learning“ (Bralić & Divjak, 2018; Gilbert & Flores-Zambada, 2011; Morris, 2014; Sharpe, Benfield, Roberts, & Francis, 2006).

When analyzing blended learning in Croatian institutions, it is useful to look at the wider context of embedding information-communication technology in class and related findings. Ministry of Science, Education and Sport (MSES) and University Computing Centre (SRCE) conducted a national survey on applying ICT and e-learning technologies in educational processes in HEIs, between March and May 2013, results of which were made available to the research team of project “Development of a methodological framework for strategic decision making in higher education - a case of open and distance learning implementation”, analyzed and published in (Bralić, 2016).

Some of the key results include (Bralić, 2016):

- 76% of participating institutions’ governance says that the contribution of ICT to improving the educational process is crucial or essential
- Overall attitude of teachers towards the above is extremely positive or positive (64%)
- 83% of participating institutions’ governance feel that attitude of students towards e-learning is positive or extremely positive
- Majority of HEIs questioned do have an LMS in use. However, LMS usage varies between constituent units in different universities

However, “the emphasis in a Croatian HEI is still on the static component of e-learning (such as delivery of material) and often providing a supplement for traditional classroom teaching, rather than opening new aspects of teaching and collaboration that e-learning offers” (Bralić, 2016).

2.1.2 Benefits and challenges of blended learning

The categorization of blended learning benefits is adapted from (Caravias, 2015) and expanded:

- **Greater flexibility of time** (when applicable and supported) (Bouhnik & Marcus, 2006; Demetriadis & Pombortsis, 2007; Sitzmann, Kraiger, Stewart, & Wisher, 2006), specifically in research on benefits of integrating MOOCs (Brahimi & Sarirete, 2015; Caravias, 2015; Edginton & Holbrook, 2010; Graham, 2006; Lock, 2006)
- **Time for reflection, freedom for students to express thoughts and ask questions** (Caravias, 2015; Chamberlin & Moon, 2005; Liaw, Huang, & Chen, 2007)

- **Meeting different needs and learning styles** (Caravias, 2015; Ho, Lu, & Thurmaier, 2006)
- **Reducing drop-out rates** (López-Pérez, Pérez-López, & Rodríguez-Ariza, 2011; Moskal, Dziuban, & Hartman, 2013)
- **Positive impact on performance, exam marks, and learning outcomes** (Baepler, Walker, & Driessen, 2014; Caluza & Funcion, 2018; Kiviniemi, 2014; López-Pérez et al., 2011; Means, Toyama, Murphy, Bakia, & Jones, 2009; Ravenscroft & Boyle, 2010; Sergis, Sampson, & Pelliccione, 2018)
- **Increased satisfaction and motivation to learn** (Baepler et al., 2014; Kim, Kim, Khera, & Getman, 2014; Kiviniemi, 2014; Klein, Noe, & Wang, 2006)
- **Increased faculty satisfaction** (Moskal et al., 2013)

When compared to fully online learning experience, blended learning brings the richness of interaction from the face-to-face part of the learning (Graham, 2006; Paechter & Maier, 2010; Tayebinik & Puteh, 2013).

It is important to acknowledge that blended learning, as anything, comes with a set of **challenges** that need to be addresses to ensure a good implementation and strategic benefits. For example, (Hogan & Mcknight, 2007) conducted a study on burnout among online instructors within a university and found that online instructors achieve "an average score on the emotional exhaustion subscale, high degree of depersonalization, and low degree of personal accomplishment", indicating that the online element of the blended learning environment needs to be carefully examined in regards to the impact to teachers. Indeed, without a full institutional support, the full benefits of blended learning might go uncovered. Not all teachers have the possibility to introduce this format, depending on the type of content, available technology, time, and institutional support. To make a blended program work, it is necessary to have these aligned.

(Graham, 2006) has highlighted two areas of blended learning that require further attention: (1) student and faculty satisfaction with blended learning has been demonstrated in multiple studies, but more research is needed to connect the satisfaction with specific features of blended learning, and (2) flexibility and access are often cited as reasons for adopting blended learning but little research has actually quantified the impact of blended learning.

Finally, there is research that did not support the earlier mentioned claims on blended learning being the superior form of a learning environment. For example, (Price, Arthur, & Pauli, 2016)

explored student satisfaction across online, hybrid, and traditional courses and found that there was no significant difference among these courses, in terms of the satisfaction and performance, which is unforeseen. The authors claim that it is possible that earlier studies that found hybrid comparing favorably with online courses were in fact showing differences in instructor, text, or course design. Similar result is obtained by (Olitsky & Cosgrove, 2014); results of their research on effect of blended coursework on student learning outcomes indicate no significant effects of blending on student learning.

2.1.3 Perspectives on blended learning

Blended learning has been relatively well researched. Overview of previous research here is categorized in three groups: blended learning and its relation with (1) students, (2) institutions, and (3) faculty/teachers, as these groups tend to be main actors in building, deploying, leveraging, and evaluating blended learning environment. Similar classification has been shared by authors researching the frameworks for evaluating blended learning (Chmiel, Shaha, & Schneider, 2017).

2.1.3.1 Students

In previous sections, key benefits of blended learning for students were outlined: greater flexibility (when the course unit and curriculum structure among other elements allow it), time for reflection, meeting different needs and learning styles, reducing drop-out rates, positive impact of exams and marks, stronger learning outcomes, and increased satisfaction and motivation to learn.

Significant amount of research focused on elements and prerequisites that make a blended learning environment successful for students. Indeed, with its growing popularity, it is important to deeply understand why a blended learning environment is/would be a better solution than a traditionally taught course or a fully online learning environment. (Zhao, Lei, Yan, Lai, & Tan, 2005) compared the effectiveness of web based training and a blended course and found that the involvement of instructor in blended learning environment makes a significant impact on the effectiveness, making blended environment more favorable. Further, (Means et al., 2009) found that classes with online learning (either fully online or blended) on average "produced stronger student learning outcomes than did classes with solely face-to-face instruction". Still, (Graham, 2006) who analyzed the above articles is rightly saying that it is unclear what aspects of instructor's role in these types of environments are most important.

Several authors emphasize the importance of communication and/or collaboration among students and teachers as one of the key elements in achieving learning goals, satisfaction, and/or creating a deep learning experience (Bates, 2015; Hacker & Niederhauser, 2000; Jones DeLotell, Millam, & Reinhardt, 2010; Lee & Rofe, 2016; So & Brush, 2008).

(Barnard, Lan, To, Paton, & Lai, 2009) built an instrument that measures "a student's ability to self-regulate their learning in environments that are wholly or partially web based". Elements of this instrument are: environment structuring (time and place), goal setting, time management, help seeking, task strategies (strategy for approaching resolving a task), and self-evaluation (self-awareness, communication). There are several elements of self-regulation in this instance; all researched with the importance of self-regulation for students in learning contexts in mind, with significant paths. This research reiterates the importance of self-regulation in new learning environments.

Commonly mentioned example of integrating technology in learning processes is flipped classroom, with similar benefits for students. (Kim et al., 2014) define a typical flipped classroom approach as providing students the access to online materials prior to coming to class to ensure time spent in classroom is spent on higher-order activities. (Kim et al., 2014) have applied the Revised Community of Inquiry framework and analyzed three flipped classroom designs, showing different potential designs of a flipped classroom program. Research showed that students were overall satisfied with the activities, with many acknowledging the value of the class time interaction, as well as that "the flipped classroom activities were more student oriented than traditional class activities." Further, (Sergis et al., 2018) investigated the impact of flipped classroom environment on students' learning outcomes, as well as satisfaction and self-determination for their learning. They found that implementing the flipped classroom model lead to an increase in the cognitive learning outcomes of students, as well as that the students in the experimental group (exposed to flipped classroom) had significantly higher level of satisfaction and self-determination., compared to the control group.

Regardless of which technology is chosen for creating a blended learning environment or how it is built, the principles of building the environment for active learning and leveraging technology to meet the students' requirements, remain the number one priority (Bower, Dalgarno, Kennedy, Lee, & Kenney, 2015).

2.1.3.2 Faculty/teachers

(Fryer & Bovee, 2016) state:

> *"Perceived teacher support had a broad array of adaptive effects on future motivations for studying online."*

For teachers, the experience of implementing a blended learning environment, as well as their satisfaction with it, depends on several factors. (Chmiel et al., 2017) highlight several aspects important when evaluating blended learning, from a teacher's point of view: faculty development, time investment, usability of tools, and quality of support.

(Bolliger & Wasilik, 2009) have studied faculty satisfaction with course redesign. Authors found that instructor-related factors (for example promoting positive student outcomes, recognition, intrinsic motivation, access to technology) directly impact instructor satisfaction but were less important than student related factors (for example student performance and satisfaction, interaction). The third set of factors, institutional factors (for example institution valuing the online teaching and has policies to support the faculty) had a low reliability in the study. (Vo, Zhu, & Diep, 2017) have studied the instructors' perceptions of elements of blended learning through a semi-structured interview and a questionnaire. Authors found that collaborative facilitation and general communication are more important when blended learning was more intensively implemented. There was no difference in the importance of blended learning components between hard and soft disciplines. However, there was a difference based on gender, with male instructors placing more importance to instructor-student interaction and feedback to groups (this can be biased because of a higher number of male instructors employing higher levels of blended learning in the sample).

Furthermore, the effort that a teacher has to put to build a blended learning environment and enrich the current learning practice is not insignificant, and the impact on teachers and instructors might be large, also mentioned in section on challenges with blended learning. Still, there are authors that worked on strategies for staff to implement the environment in a consistent matter and outlined that, in fact, "any short-term increase in workload can be offset by longer term efficiencies, along with potential improvements to student understanding and satisfaction (Willis, Kestell, Grainger, & Missingham, 2015).

2.1.3.3 Institutions

It is important to consider the role of an institution in the overall blended learning framework.

Significant changes in societal demands, funding, competition, technology, and student demographics pose a challenge to higher education institutions, administrators, and policymakers (Garrison & Kanuka, 2004). When observing blended learning as a means to enhance the teaching and learning process, a clear institutional policy and direction is needed to ensure its successful adoption (Garrison & Kanuka, 2004).

(Graham et al., 2013) list a few elements of blended learning structure within higher education institutions that impact the adoption and implementation of blended learning: technology, ownership, definitions and seat time, incentives, and evaluation. Same authors have also built the three stages of adoption of blended learning on institutional level: awareness/exploration, adoption/early implementation, and mature implementation/growth. The case made is that blended learning implementation often starts on faculty level. However, to truly benefit from the impact it can have on institution, teachers, and students, an institution level strategy needs to be in place, to address policy, structures, and support (Graham et al., 2013). Similarly, (Moskal et al., 2013) highlight that successful implementation of a blended learning program requires ”alignment of institutional, faculty, and student goals“ (...) “Operationalizing blended learning must resonate with the context of the institution and aligns with its goal and objectives while at the same time maintaining consistency with organizational capacity.”

(Betts, Hartman, & Oxholm, 2009) have laid out demographic and financial factors that are confronting colleges and universities in the United States of America (USA) that drive online and blended learning. Although some of these factors are related to specificities of the USA educational systems, some can be observed globally, such as demographic changes in student population, population shifts, diversity (for example gaps in attainment), increasing number of adult learners, global competition, and employment expectations.

(Weaver, Spratt, & Nair, 2008) have researched students’ and teachers’ use of a learning management system and found that, “due to a perceived lack of institutional support and adequate resourcing, many staff are forced to adopt a teacher centered approach in their online teaching.”

Finally, (Ginns & Ellis, 2009) conclude in their research that the more e-learning in general is integrated in the university structure, the more challenging it might become to identify which

parts of the university correlate to the students' perception on their experience with e-learning, showing again the importance of synergy and institutional strategy and action.

With this, it is clear that students, teachers, and institution have their own priorities, challenges, and interests in implementing blended learning and leveraging its power; these go hand in hand.

2.1.4 Considerations when building blended learning environment

After reviewing the literature, there were several elements and phenomena that emerged in various research, across all three groups of stakeholders (students, teachers, and institutions); these were either ways of building and deploying a blended learning environment, or ways of assessing student experience with this type of learning environment.

Among other ways, blended learning environments can be created by embedding custom educational videos and off the shelf videos (for example massive open online courses) in curriculum. The created blended learning environment is often distributed through a learning management system. It is important to evaluate the experience with e-learning that students have, and address the challenges of controlling the learning experience as well as leveraging the advantages of online available resources.

With that, the following topics are here further considered.

From a technological standpoint:

- Educational videos
- Massive open online courses
- Learning management system

From users' point of view:

- Experience with e-learning
- Learner control

2.1.4.1 Educational videos

When enriching the classroom teaching with online elements, instructors/teachers (from now on "teachers") might decide to develop educational videos that are then made available to students. These videos can follow the curriculum and be an additional way for students to understand the content of the course unit and access all relevant information, potentially anywhere, any time. According to (Koumi, 2006), video can add value in education by leverage its distinctive strengths, grouped in three categories: assisting learning and skills development, providing experiences, and nurturing motivations and feelings.

For a teacher, it is important to consider three elements to make sure that the video is used effectively as an educational tool: managing cognitive load, maximizing student engagement, and promoting active learning from the video (Brame, 2016). (Kay, 2012) conducted literature review on use of video podcasts (includes multiple video files used in education) between 2002 and 2011, reviewing 53 articles. Key benefits of using video podcasts included: control over learning, positive attitudes of students (useful, helpful, stimulating, easy to use), and increased learning performance. (Kelly, Lyng, McGrath, & Cannon, 2009) have researched the use of educational videos developed for class in an undergraduate module and found that the overall feedback is that the videos are best used in conjunction with, not as a replacement for lecturer demonstration. Some core topics emerged from open ended questions and are aligned with other research highlighting the upsides and the challenges of using video in class: students highlighted the option to watch the content repeatedly until they can understand it, as well as learning/watching it in their own time. Students also mentioned the videos in context of preparation for class. One of the challenges students reported was not being able to ask questions, an observation that the authors use to support having a tutor/expert present (Kelly et al., 2009), which is also aligned with the benefits of having face to face time in blended learning setting, highlighted above. (Lloyd & Robertson, 2012) have studied the effect of screencast tutorials on learning outcomes and found "positive gains for students using a supplemental screencast tutorial in an undergraduate statistics course, especially on higher-order conceptual knowledge."

(Brame, 2016) has laid out examples of ensuring high success with learning on video, along with key recommendations to maximize the benefits from educational videos, including: keeping videos brief and targeted on learning goals, using audio and visual elements to convey key messages, and using a conversational, enthusiastic style to enhance engagement. Similar guidelines were provided by (Thomson, Bridgstock, & Willems, 2014); to create an effective video, one must: give context and align purpose, tell a story, present with authenticity, and keep it short and to the point.

Some of the challenges in developing and using educational videos can be technical problems, some students having preference for lectures, and reduced class attendance in some cases (Kay, 2012). Further, developing, deploying, and updating custom material takes time and resources, both often limited in higher education world.

2.1.4.2 Massive Open Online Courses

In certain situations, integrating an existing material to enrich learning experience and achieve learning goals might be more prudent. Teachers have been incorporating massive open online courses (MOOCs) with more or less success in a traditional classroom setting to support various learning preferences, introduce this new way of learning to students, and to make learning available to those who might not be able to follow traditional instructions (Bralić & Divjak, 2018). Some of the benefits of creating a blended learning environment with MOOCs include "replaying lectures, augmenting or replacing secondary materials, filling gaps in expertise, exposing students to other styles of teaching and class discussion, reinforcing key skills, and teaching students how to teach online" (Griffiths, Mulhern, Spies, & Chingos, 2015). Further, including MOOCs formally in a traditionally taught course can help diminish downsides usually reported by researches, such as low completion rate (Koller, Ng, Do, & Chen, 2013).

Series of research describing the integration of a MOOC in a classroom course has been published in recent years (Bralić & Divjak, 2018; Bruff, Fisher, McEwen, & Smith, 2013; Firmin et al., 2014; Ghadiri, Qayoumi, Junn, Hsu, & Sujitparapitaya, 2013; Griffiths et al., 2015; Holotescu, Grosseck, Crețu, & Naaji, 2014), generally outlining good impact on students.

Recommendations on embedding MOOCs in traditionally taught course include (Bralić & Divjak, 2018):

- "sourcing several interesting MOOCs for students and allowing them to choose one they are most interested in, which positively affects motivation
- ECTS load should be carefully examined before suggesting and finalizing online portion of the content to ensure reasonable workload and expectations from students
- learning outcomes should be taken into considerations to properly connect online and offline learning and to create an environment that ensures achieving those outcomes
- if completion of a MOOC is required, it tackles the problem of high drop-out rates in online learning, which could also motivate students and empower them to complete further MOOCs."

Objections to embedding MOOCs in class are various. Some research has found that teachers do in fact believe in the ability of technology to transform education but do not appreciate the commercial considerations of platform such as MOOCs (Brahimi & Sarirete, 2015), embedding material that was originally built as a standalone material carries its challenges, and finally, all

the challenges of creating a blended learning environment are replicable when it comes to integrating MOOCs as well.

2.1.4.3 Learning management system

Learning management system (LMS) is a web-based application consisting of several tools that enable centralization and automatization of different aspects of learning (Morrison, 2003) in (Ćukušić & Jadrić, 2012). LMSs have multiple capabilities, including communication, content development and delivery, assessment, user management (Coates, James, & Baldwin, 2005). Many higher education institutions have implemented these systems to manage the learning processes, despite high complexity of this implementation. For example, one national research in Croatia showed that 75% of surveyed institutions does have an LMS (Bralić, 2016).

Based on (Coates et al., 2005) main drivers for LMS implementation include opportunities to:

- increase the efficiency of teaching
- enrich the learning experience for students
- address new student expectations
- stay competitive.

An existing challenge however is the fact that detailed analysis of ways in which an LMS is used and how it benefits the students and teachers on an institution level is often missing. Indeed, "it is vital to maintain the educational perspective rather than emphasize any technological determinism which takes specific characteristics of online systems or teaching for granted" (Coates et al., 2005).

It makes sense therefore to include the use of these systems when analyzing blended learning environments as it is expected that a significant portion of developed blended learning environments are in fact built by leveraging the LMS.

(Weaver et al., 2008) surveyed teachers and students on the use of LMS in their institution and found that students reflect on the use of technology by teaching staff. For example, students who experienced a well-designed unit, feedback, and good interaction with staff reported a positive experience with the technology.

(Simeonova, Bogolyubov, Blagov, & Kharabseh, 2014) applied Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003) to identify and test the underlying factors influencing students' acceptance and use of Virtual Learning

Environments (VLE): performance expectancy, attitude towards using technology, social influence, facilitating conditions, self-efficacy, and anxiety. (Raman, Don, Khalid, & Rizuan, 2014) have also looked at UTAUT and LMS use and found that performance expectancy, social influence, and facilitating conditions have positive effect on behavioral intention. Same results were obtained by (Ain, Kaur, & Waheed, 2015) whose research also supported the hypothesis on the influence of performance expectancy, social influence, and facilitating conditions on behavioral intention to use the LMS; authors have also introduced a new construct, learning value, to address the perceived value of LMS and also found that it influences the behavioral intention. (Saadé & Kira, 2006) have researched anxiety in regards to using an online learning system as a part of an extended technology acceptance model. Authors found that anxiety negatively influences the perceived ease of use of the online learning system as well as that students feel affect and anxiety in the same time when using the online learning system in mandatory setting. Findings of (van Raaij & Schepers, 2008) were similar: there is a direct negative effect of anxiety on perceived ease of use. This research is interesting because it includes and confirms positive effect of personal innovativeness in the domain of information technology on anxiety. (Chuo, Tsai, Lan, & Tsai, 2011) have also confirmed the influence of anxiety on perceived ease of use, as well as on perceived usefulness. Finally, (Alenezi, Abdul Karim, & Veloo, 2010) found that computer anxiety, among other predictors, significantly influenced the students' intention to use e-learning.

2.1.4.4 Experience with e-learning

E-learning, whether it is a custom educational video, a MOOC, or another mode, that has been embedded in building blended learning environments can have impact on other elements of learner journey. It is important to understand the complementary role of e-learning in students' university experience and ensure there is appropriate place and contribution to developing student understanding (Ginns & Ellis, 2009).

(Ginns & Ellis, 2007) have researched the quality of e-learning, when online activities are used to complement face-to-face teaching and learning and outlined four distinct dimensions of an e-learning experience: good e-teaching, good e-resources, appropriate workload, and student interaction. Authors found that positive perceptions of key aspects of the learning environment tend to be correlated with deeper approaches to learning. Further, (Ginns & Ellis, 2009) have researched the matter further and explored combining the e-learning scale with the Student Course Experience questionnaire to evaluate the quality of student e-learning experience when learning is predominantly on campus.

(Kassab, Al-Shafei, Salem, & Otoom, 2015) have examined the relationships between different aspects of students' course experience (experience with e-learning), self-regulated learning, and academic achievement of medical students in a blended learning curriculum. Authors have used the e-learning scale (Ginns & Ellis, 2009) and found that the experience with e-learning "affected students' peer learning and critical thinking and indirectly affected metacognitive regulation".

When it comes to blended learning, (Ginns & Ellis, 2009) suggest that to evaluate the blended learning quality, one must relate the part of the online learning to the whole of student experience. No matter how a blended learning environment is built, the usefulness, purpose, and value to students and teachers should be a priority.

2.1.4.5 Learner control

Learner control is an important element of the student experience with online and blended learning and is found to have direct benefit on online learning (Taipjutorus, Hansen, & Brown, 2012). Majority of the research looks at control in e-learning, which fits in this research knowing that blended learning has the online or e- component. (Sorgenfrei, Smolnik, Hertlein, & Borschbach, 2013) outline: "E-learning has the ability to provide learners with control of not only how and what they learn, but also of when and where to learn – a perspective that has seldom been conceptualized". Similarly, (Kay, 2012) outlined key elements of control when using video podcasts as reported by students: students enjoyed control over where and when they learned, what they needed to learn, and the pace of learning. In her doctoral thesis, (Taipjutorus, 2014) looked at learner control through several components: browsing, searching, connecting, collecting, generating (in this order, these represent levels of learner control, from the lowest to the highest level) and found that there is a positive relationship between learner control and online learning self-efficacy; learner control embedded in online learning program positively influenced learner self-efficacy. Also, learner control turned out to be a good predictor of self-efficacy. Furthermore, the relationship between learner control and online learning self-efficacy was stronger for distance learners than for internal learners meaning that distance learners studied with higher levels of learning control.

(Sorgenfrei et al., 2013) have studied learner control and have derived a "conceptual framework as a reference model, based on cognitive and motivational learning theories." The authors aimed to answer two research questions: "What is the role of learner control regarding the effectiveness of e-learning systems? Which factors determine the effectiveness of learner control in e-learning?" The authors conducted a literature review and have identified two

categories of articles related with the research questions: the first one covered the research on "effectiveness of learner control in e-learning by evaluating the relationship of learner control and perceived learner control, learning activities, and learning outcomes" and the second category "extended the capacity of learner control effectiveness and included individual and contextual characteristics as moderators of the learning process". The study was further presented in a journal article by (Sorgenfrei & Smolnik, 2016), outlining more detailed results, paricularly around positive relations between learner control dimensions and some of the learning processes and outcomes. In this research, the learner control dimensions were derived from e-learning dimensions: control over time and pace, control over location, control over navigation and design, control over interaction, control over content and task selection. Same authors claim that "there is strong evidence that learner control is associated with positive emotional reactions toward a course and the e-learning system, irrespective of the level and dimensions of control provided" (Sorgenfrei & Smolnik, 2016).

(Van Laer & Elen, 2017) studied "attributes of blended learning environments that support learners' self-regulatory abilities" and have conducted a literature review on 95 articles to source these attributes. The authors found seven attributes, one of which is learner control. 18 articles that covered learning control were studied by the authors; the publications consider learner control as a concept that "describes the degree of control that learners have over the content and activities within the learning environment". Some of the examples of learner control are control over the pace of the course, the content used, learning activities in which the content is presented and content sequencing which allows the learner to determine the order in which the content is provided.

(Price et al., 2016) explored factors affecting student performance and satisfaction with instructional format across three delivery methods: online, hybrid, and traditional courses. The authors found that higher levels of perceived learner control are associated with higher levels of student satisfaction and performance, across all delivery methods and across all instructors and disciplines. Also, there was no significant difference in the perceived learner control between online, hybrid, and traditional courses.

Finally, (Hung, Chou, Chen, & Own, 2010) developed a scale to evaluate learner control as a part of assessing overall learner readiness for online learning. There are several key findings from this research, including the fact that teachers might need to help students develop self-directed learning and learner-control skills and attitudes, particularly when it comes to online learning context (in which this research was conducted).

2.2 Approaches to learning

In this section, definitions and scope of approaches to learning are covered, including some of the most highlighted perspectives in research to date.

2.2.1 Definitions and scope

Approaches to learning are one of the key concepts and theories describing learning. Ference Marton and his research team were investigating this concept by asking students to read an academic article and then asking them questions about it. Students were first asked to describe the author's main message, with responses varying from misunderstanding to a good understanding. After, they were asked how they have gone around the task. The outcomes indicated two approaches to learning, deep and surface approach (Entwistle, 2009, p. 33). The researchers claim that "students who did not get the point failed to do so simply because they were not looking for it" (Entwistle, 2009, p. 33; Marton & Säljö, 1997, p. 43). Other research on approaches to learning include the work of Noel Entwistle (Entwistle & Ramsden, 1983) and John Biggs (Biggs, 1987) whose work has primarily been focused on the student component and their experience and strategies in learning.

The early research on approaches to learning employed various methods, one of which was interview: Noel Entwistle and Paul Ramsden, pioneers in approaches to learning research, have conducted a series of interviews to explore approaches to learning among 57 students. The authors claimed that "a potentially richer and more accurate picture of the links between student learning and its context and content" would be the main reason for working with qualitative approach (Entwistle & Ramsden, 1983, p. 131), while also recognizing the weaknesses of this approach, mainly the danger of bias. The authors examined the relationship between "content and perceived context of the students' work and their approaches to academic tasks, as well as between approaches and degree results" (Entwistle & Ramsden, 1983, p. 132). For the interviews, the authors have chosen students with extreme scores on the approaches to studying inventory, e.g. students with an expressed strong deep approach to learning. Three groups of questions were developed: the focus of the first group was on reading and essay writing (for arts and social science students) and on problem-solving and report writing (for science students), the second covered assessment strategies and the perceived outcome of the course, and third covered the learning context (teaching, assessment, relationships) (Entwistle &

Ramsden, 1983, p. 133). (Entwistle & Ramsden, 1983) developed *Approaches to study inventory (ASI)*, a questionnaire to evaluate approaches to learning.

Based on this and other research, deep and surface approaches were defined.
Overview of deep and surface approach below is taken from (Entwistle, 1997, 2009, p. 36):
Deep approach to learning assumes "seeking meaning by:

- Relating ideas to previous knowledge and experience
- Looking for patterns any underlying principles
- Checking evidence and relating it to conclusions
- Examining logic and argument cautiously and critically
- Using rote learning where necessary"

The result is being aware of one's own understanding and becoming more actively interested in the course content.
Surface approach to learning assumes "reproducing by:

- Treating the course as unrelated bits of knowledge
- Routinely memorizing facts or carrying out set procedures
- Studying without reflecting on either purpose or strategy"

The result is finding difficulty in making sense of new ideas, seeing little value or meaning in either the courses or the tasks set, and feeling undue pressure and worry about work.

In interviews conducted by (Entwistle & Ramsden, 1983, p. 137), **deep approach** was categorized by:

- Personal experience: *"integrating task with oneself"*, comparing the task with personal experience, indicating interest to learn, see a task with as a part of one self's personal development, indicating a wish to "use the knowledge forming part of the task outside its immediate context".
- Relationships: *"integrating the parts into a whole"*, relating the parts of the task to each other, thinking about relationships between different parts of the material, relating material from different sources, seeing connections between materials that are previously studied and the materials studied now.
- Meaning: *"integrating the whole with its purpose*", showing intention to establish meaning, thinking about the intention of the whole task, thinking about the underlying structure.

In interviews conducted by (Entwistle & Ramsden, 1983, p. 137), **surface approach** was categorized by:

- Unrelatedness; *"defining the task as separate of its parts"* , express the intention to treat a task as an isolated bit, approaching materials as separate from other ideas and materials, focus on the elements of the task rather than the whole
- Memorisation: *"defining the task as a memory task*", indicating the intention to memorize the material
- Unreflectiveness: *"defining the task in an external way*", passive approach to a task, indicate no intention to seek and extract meaning, see the subject matter as external to one self.

The third approach, called **strategic or organized**, was added in years to come, taking into consideration the formal assessment aspect. It was noted that there was a strong impact of assessment on approaches to learning and the strategic (or organized) approach was added to the equation, characterized by the intention to achieve high grades, driven by motivation or responsibility (Entwistle, 2009, p. 38). It is also important to note that some researchers have debated that the term "approach" is actually not appropriate for strategic or organized behavior as organized effort can be applied to either a deep or a surface approach to learning by the same student (Entwistle, 2009, p. 38). For the purpose of this research, three approaches to learning are studied, with implications for further research highlighted at the end of this thesis.

It is important to note that the same student can adopt different approach to learning in different situations/course units/when dealing with a task. The adopted approach depends on a variety of external and internal factors at a given moment.

2.2.2 Considerations on approaches to learning

Approaches to learning have been well researched by using the original instrument *Approaches to study inventory* (ASI) or using the later developed variations of it, for example *Revised approaches to study inventory (RASI) and Approaches and Study Skills Inventory for Students (ASSIST)* (Entwistle, Tait, & McCune, 2000).

Much research addressed the approaches to learning focusing on influencing factors of the approaches and repercussions the approaches might have on educational practice. For example, it was found that the approach to learning is influenced by motivation, threat, anxiety, where

intrinsic motivation, absence of threat, and absence of anxiety are associated with the deep approach, while threat, anxiety, and absence of intrinsic motivation are associated with the surface approach (Fransson, 1977; Marton & Säljö, 1997).

The approaches to learning concept has been a popular research topic globally too. (Valadas, Gonçalves, & Faísca, 2010) have administered a Portuguese version of ASSIST and obtained results consistent with the existing theory on approaches to learning. (Jukić Matić, Matić, & Katalenić, 2013) studied approaches to learning in Croatia with ASSIST; results showed that majority of students in this course unit chose strategic approach, as well as that teaching and course types that support understanding correlated positively to deep and strategic approaches to learning. In Serbia, (Lazarević & Trebješanin, 2013) focused on Biggs's research and found that deep approach is more represented than the surface one. (Parpala, Lindblom-Ylänne, Komulainen, & Entwistle, 2013) examined the use of a modified Experiences of Teaching and Learning Questionnaire (ETLQ) in the Finnish context; ETLQ appeared to be sufficiently robust and reliable, similar as (Diseth, 2001) who looked at adapting ASSIST for Norway.

Based on the above mentioned research, it is clear that several elements impact the approach to learning. In this study, the teaching-learning environment and student characteristics will be further considered.

2.2.2.1 Approaches to learning and teaching-learning environment

Earlier mentioned project "*Enhancing Teaching-Learning Environments in Undergraduate Courses" (ETL)* was focused on approaches to learning and experience with teaching-learning environment. Several questionnaires were developed during this project: *Learning and Studying Questionnaire (LSQ)* and *Experiences of Teaching and Learning Questionnaire (*ETLQ), and finally *Shortened Experiences of Teaching and Learning Questionnaire (SETLQ)* (ETL Project, Universities of Edinburgh, 2005). These questionnaires, in a more or less detailed way, examine the experience with teaching and learning environment and approaches to learning in a single instrument.

One of the key findings of the earlier mentioned ETL project is that "the students' perceptions of the teaching and assessment procedures, rather than the methods themselves, that affect student learning most directly (Entwistle et al., 2002)". Teaching and learning environment has been one of the key perspectives in researching approaches to learning. Earlier, (Trigwell et al., 1999) have developed a questionnaire for evaluating the approaches to teaching and have noticed the relationship between approaches to teaching and approaches to learning: when

teachers describe their approach to teaching as teacher-focused, students are more likely to report that they adopt the surface approach. When teachers report adopting the student-focused teaching, students report adopting the deep approach. Some of the common elements of a teaching and learning environment examined in the context of approaches to learning are aims and congruence, teaching for understanding, choice in learning, feedback, assessing understanding, staff enthusiasm and support, student support, and interest and enjoyment (ETL Project, Universities of Edinburgh, 2005).

Indeed, the relationship between the learning environment and approaches to learning has been widely researched. (Fryer & Ginns, 2018) looked at the relationship between students' perceptions of the learning environment and their approaches to learning. The results supported reciprocal relationships between perceptions of teaching quality and approaches. Authors further conclude that, combined with other findings, diminishing the surface approaches might be a way to improve learning and learning outcomes, rather than seeking to promote deep approaches. (Campbell et al., 2001) conducted a research on approaches to learning and perceptions of their classroom environment and found that students with deep approaches to learning generally demonstrated a more advanced understanding of available learning opportunities and teaching strategies influenced students' perceptions. When teachers focused on engaging students, students with both approaches to learning focused on student-centered aspects; when teachers focused on traditional explanatory methods, students with both approaches focused on reproducing knowledge.
(Lizzio, Wilson, & Simons, 2002) looked at relationship between approaches to learning and a number of other factors including the teaching-learning environment and concluded that:

- Perceptions of heavy workload and inappropriate assessment impacts students to adopt a more surface approach to study. Perceptions of workload were not systematically related to students' deep approach.
- Perceptions of a good teaching and learning environment impact students to move towards deep approach, while students' perceptions of a poor teaching and learning environment influence the surface approach.

The relationship between approaches to learning and examination was also examined by (Karagiannopoulou & Milienos, 2013); it was found that students who score high on deep approach to learning seem to prefer the open-book exam but seem to be unorganized in their study to a similar degree as students who adopt a surface approach to learning.

2.2.2.2 Student characteristics

Under "student characteristics", year of study, gender, and area of study is looked at in this review.

Several authors have concluded that students move towards adopting a deep approach to learning as they progress through their studies (Asikainen, Parpala, Lindblom-Ylänne, Vanthournout, & Coertjens, 2014; McDonald, Reynolds, Bixley, & Spronken-Smith, 2017; Richardson, 1995; Senemoğlu, 2011). Still, there is research that found that there is no change in approach to learning based on year of study. For example, (Asikainen & Gijbels, 2017) conducted a systematic review on how students' approaches to learning evolve during higher education, given the assumption in some studies that the approaches develop to a more deep approach throughout higher education. Authors found that "there is no clear empirical evidence for the assumption that students develop towards more deep approaches during higher education".

(Cebeci, Dane, Kaya, & Yigitoglu, 2013) looked at approaches to learning among different groups of students (law and medicine); authors found that both law and medicine students scored higher on the deep and strategic scores than on surface score, as well as that third year students preferred surface approach more than first and second year students did (not aligned with similar research). Authors claim that surface approach can be undertaken when students might feel overwhelmed by class demands and when they feel like it is the right approach given other inputs. (Senemoğlu, 2011) looked at approach to learning across different disciplines and found a difference in scores on deep approach to learning based on area of study with humanities students scoring higher on deep scale than pre-school and math and science students. (Smith & Miller, 2005) have also studied and acknowledged the difference in approach to learning based on discipline.

(Andreou, Vlachos, & Andreou, 2006) found that there is an effect of gender on strategic approach, where male students perceive themselves as having clear goals related to their studies. (Senemoğlu, 2011) on the other hand found that female students are more inclined to strategic approach. (Lazarević & Trebješanin, 2013) found that female students score higher on deep approach scale, while male students score higher on the surface approach scale. (Cebeci et al., 2013) found no statistically significant difference in approach to learning between male and female students in their research.

2.3 Approaches to learning in a blended learning environment

There has been some research on approaches to learning in a blended learning environment, often including the role of an instructor/teacher and the teaching-learning environment, given the importance of these in the adopted approach to learning.

(Mimirinis & Bhattacharya, 2007) focused on the relationship between approaches to learning and studying, and perceptions of use of a virtual learning environment (VLE). Authors found a correlation between strategic approach and use of the VLE. A weak correlation between deep approach and the willingness to attend other modules that use VLE and a preference towards face to face contact were also established. On the contrary, surface approach was slightly correlated with the idea of having a tutor replaced by a VLE. A few years later, (Mimirinis, 2016) conducted three case studies on students' approaches to learning in blended learning environments and computed correlations between the overall scores on the three scales of approaches to learning and the usage of LMS functions. Although there were some correlations on individual course level (for example strategic approach moderately correlated with the use of LMS in the Management module), there were no consistent patterns identified. Author suggests that the variability itself is an indicator that approaches to learning in a blended learning experience depend on the level and quality of the face to face and online instruction.

Further, (Jelfs & Colbourn, 2002) studied students' perception of using ICT for a virtual seminar series, as well as adopted approaches to learning and how this affected their adoption of the electronic medium. Findings include a weak correlation between approaches to learning and perception of ICT. There are also examples of creating specific environments that would support a deeper learning approach. For example, (Gibbs, 2002) studied *coMentor*, a virtual learning environment developed to support debate, discussion, group work and resource sharing among students. Results showed that students who used *coMentor* more than others scored higher on deep and strategic learning scales.

(Karaoğlan Yilmaz, Öztürk, & Yilmaz, 2017) looked at approaches to learning in a structured and flexible-structured flipped classroom model, as well as in a traditional learning environment, and included the analysis of their academic success. Authors found that there was "no significant difference between the academic achievement scores of the students with deep and surface learning approach in structured and flexible-structured environments."

Networked learning has also been studied in the context of approaches to learning and blended learning. (Goodyear, Asensio, Jones, & Steeples, 2003) looked at relationships between

students' views of the experience with networked learning courses and their conceptions of learning and approaches to study; authors found that there were no strong links between these concepts, indicating that it might be reasonable to expect students might have positive experience with well-done networked learning course, regardless of their conceptions and approaches. (Buckley, Pitt, Norton, & Owens, 2010) looked at the same relationships; this group of authors however found significant positive associations between deep and strategic approaches to study and students' perceptions of networked learning, and negative associations with a surface approach, suggesting that engaging surface approach students in networked environments can be facilitated by developing insights into the ways they interact online and providing support mechanisms for effective online communication.

Considering the role of a teacher and general learning environment, it is not surprising that some research has been directed in that direction. (Ellis & Bliuc, 2016) worked on developing measures to understand the exchange between student approaches to inquiry (term that encompasses a number of approaches that include problem-based, case-based, project based learning and more) and their approaches to using online learning technologies (includes approaches to learning framework). Authors found that there are "positive and logical associations among the pairs of deep variables, and the pairs of surface variables across both questionnaires". This is a good step forward to connecting the two concepts, particularly for teachers who need to consider the students' approaches when developing inquiry based learning within a new learning environment. (González, 2012) developed a questionnaire on approaches to e-teaching to study teachers' experiences of teaching using e-learning, concluding that the analysis showed it can be used as a preliminary instrument to evaluate the teachers' approaches, as well as that "student-focused approaches to teaching are needed for significant use of digital technology to emerge". Earlier mentioned work of (Ginns & Ellis, 2007) was expanded in this area as well, outlining that student focused teaching methods are indeed possible in blended learning and that the key aspects: "quality of online teaching, resources, workload, and student interaction" are related with students' approaches to study.

2.4 Summary of literature review

In the literature review, current research and some perspectives and considerations with regard to blended learning, approaches to learning, and approaches to learning in a blended learning environment were presented.

The term "blended learning" in this study is used to describe "learning activities that involve a combination of face-to-face interactions and technologically mediated interactions between students, teachers and learning resources" (Bliuc et al., 2007; Caravias, 2015). It was explained that this mode of teaching and learning is becoming prevalent in modern education systems and that there is a series of benefits as well as challenges related to blended learning. Further, perspectives on blended learning from each of the three stakeholders: students, teachers, and institutions were shared. From the literature review and research on blended learning, several key considerations arise, e.g. use of videos, MOOCs, LMS, as well as student experience with e-learning and learner control; they play a significant role in building, deploying, using, and evaluating blended learning.

Next, approaches to learning as a theoretical concept were shared, including key research to date in building this concept as well as in evaluating the impact of key elements on approaches to learning, such as teaching-learning environment and (demographic) characteristics of students.

Finally, research to date on blended learning and approaches to learning is discussed, including, but not limited to the relationship between approaches to learning and perceptions of use of a VLE, a structured and flexible-structured flipped classroom model, and networked learning.

There are a few key points to highlight as revealed in the literature:

- Blended learning environment is important, it is present in higher education institutions, and it is relatively well researched
- There are multiple advantages for different stakeholders of implementing blended learning in a solid way
- It is important that, no matter how a blended learning environment is built, it is focused on addressing the needs of the students
- Three key stakeholders of blended learning are students, teachers, and institutions
- There are several elements and phenomena that emerged in various research, across all three groups of stakeholders

    - Educational videos and MOOCs can both be included in traditionally taught courses to enhance the learning process
    - Learning management systems are widely available in higher education institutions, and used to greater or lesser extent
    - Experience with e-learning and learner control is an important part of a student journey in a blended learning environment
- Approaches to learning are defined as deep, surface, and strategic and have been rather well researched in traditional educational systems
- Approach to learning is impacted by several factors and in particular by teaching-learning environment, as indicated in in earlier research
- Some research exists on approaches to learning in relation to year of study, gender of a student, and area of study
- Some research brings together the approaches to learning and blended learning by looking at perceptions of use of VLE or ICT in a virtual seminar series, experience with networked learning or by reviewing flipped classroom model

After reviewing the literature, the author found certain gaps in the existing research and is aiming to fill in these gaps with the research presented in this thesis. The main gap is noticed when looking at the few elements that emerged as important for students and other stakeholders, including factors affecting the use of LMS, experience with e-learning, and learner control. It is unclear how do these factors relate to approaches to learning, and given their importance, the author believes these factors need to be researched further to place approaches to learning in a blended learning environment. With this, teaching-learning environment needs to stay included in the research as the relation between this factor and the approach to learning has been supported in various research. Further, if educational videos and MOOCs make a common way of enriching traditionally taught courses, the relation of having these embedded in class and the approach to learning with students needs to be further addressed. Finally, there is existing research on the relation between gender and area of study and approach to learning, looked at in this research, too. In this study, student status is also looked at. With that, the following eight constructs will be operationalized and researched in following chapters: each of the approaches to learning, teaching-learning environment, experience with e-learning, learner control, factors affecting the use of LMS (social influence, anxiety), all to bridge the gap between important factors in student blended learning journey and approaches to learning.

3 RESEARCH METHODOLOGY

As a foundation for this study, a research plan was developed based on guidelines for educational research (Creswell, 2012, p. 8). Here, six key steps in the research process are presented:

1. **Identifying a research problem -** specifying an issue that will be studied, developing a justification for studying this issue, and highlighting the importance of the study for select audiences.
2. **Reviewing the literature –** locating, selecting, and summarizing resources based on their relevancy for the research. Steps for reviewing the literature were adapted from (Creswell, 2014, p. 64)
3. **Specifying a purpose for research –** identifying the purpose statement and narrowing it to research questions and hypothesis
4. **Collecting data** – selecting the participants, getting the needed permissions and gathering information
5. **Analyzing and interpreting the data** – breaking down, representing, and explaining data
6. **Reporting and evaluating research** – deciding on audience, structuring and well writing of the end report (in this case the thesis)

Steps 1-6 are explained in different parts of this thesis as its structure was created based on these steps. Here, only steps two (literature review) and three (purpose statement) will be clarified further.

The actual **literature review** and a theoretical framework are presented in chapter 2 Literature review. The objective of literature review is to "understand and integrate the current research in the field, organize it into series of related topics, and summarize the literature by pointing out the central issues (Creswell, 2014, p. 61)."

Steps for reviewing the literature were adapted from (Creswell, 2014, p. 64) and shown in table 2.

Table 2: Literature review steps

Literature review step	Explanation of this step in this study
Identify keywords – keywords may emerge in identifying a topic or may result from preliminary reading	Keywords searched in this study after preliminary reading: approaches to learning, approaches to teaching, learning environment, learning outcomes, open and distance learning, blended learning, learning management system, e-learning OR online learning, Massive Open Online Courses OR MOOC, learner control, learning management system OR LMS, experience with e-learning, LMS anxiety, LMS social influence
Begin searching the catalogues and databases	Following catalogues were included, based on relevancy and availability: Web of Science, SCOPUS, EBSCO, Hrčak (for Croatian papers). Previous PhD thesis in Faculty of Organization and Informatics were also reviewed.
Set a priority on journal articles and books and try to locate a certain number of items that fit the research goals	This thesis is covering a fast changing research area; knowing that relevant work might have been published in conference proceedings, conference papers were also included in this selection. Results were filtered to English only (except in Hrčak)
Skim the group of articles and duplicate those central to the topic	Results were sorted by relevance. First 500 results were taken in consideration. During the first read, it was assessed whether this item is relevant for this study. The inclusion criteria was that the item covers higher education setting. Items covering any other area (K-12, corporate learning setting) were excluded from analysis
Begin drafting summaries of the most relevant articles	Summaries of relevant articles were drafted
Assemble the literature review, structuring it thematically or organizing it by important concepts	This thesis used an explanatory sequential approach in mixed methods research. For this, the literature is laid out following the guidelines from (Creswell, 2014, p. 78): introduction, topic 1 (blended learning and elements of it), topic 2 (approaches to learning), topic 3 (approaches to learning in blended learning environment), summary.

Next, as (Creswell, 2012, p. 9) highlights, the research purpose "conveys the overall objective or intent of the research". Based on the findings in the literature review, a **research purpose statement** was constructed with guidance of (Creswell, 2014, p. 178):

This study will address approaches to learning in a blended learning environment. An explanatory sequential mixed method design will be used, and it will involve collecting quantitative data first and then explaining the quantitative results with in-depth qualitative data. In the first, quantitative phase of the study, survey data will be collected from students in undergraduate studies in social science programs in 3 universities in Croatia to assess whether specific learning environment concepts relate to approaches to learning. The second, qualitative phase will be conducted as a follow up to the quantitative results to help explain the

quantitative results. In this exploratory follow-up, the tentative plan is to explore approaches to learning with students at Faculty of Economics Split.

This chapter is further organized as follows: first, the mixed method approach and methodology is explained, with key factors influencing the selection of instruments and procedures for quantitative and qualitative analysis. Then, both quantitative and qualitative parts of the research are explained in depth, separately.

3.1 Mixed method design

In this research, mixed methods explanatory design was implemented. In this design type, the researcher first conducts quantitative research, analyzes the results and then builds on the results to explain them in more detail with qualitative research (Creswell, 2014, p. 44). There are certain advantages and disadvantages of this approach; some of which are outlined in table 3, adapted from (Johnson & Onwuegbuzie, 2004):

Table 3: Strengths and weaknesses of a mixed method approach.

Strengths	Weaknesses
Words can add meaning to numbers, numbers can be used to add precision to words	Can be difficult for a single researcher to carry out both qualitative and quantitative research
Can provide qualitative and quantitative research strengths	Researcher has to learn about multiple methods and approaches and understand how to mix them appropriately.
Can answer a broader and more complete range of research questions because the researcher is not confined to a single method or approach	More time consuming
For sequential methods, Stage 1 results can be used to develop and inform the purpose and design of the Stage 2 component)	Some of the details of mixed research remain to be worked out fully by research methodologists (e.g., problems of paradigm mixing, how to qualitatively analyze quantitative data, how to interpret conflicting results)
Can provide stronger evidence for a conclusion through convergence and confirmation of findings	
Qualitative and quantitative research used together produce more complete knowledge necessary to inform theory and practice.	

Similarly, (Creswell, 2014, p. 47) outlines characteristics of a mixed method approach. Researchers applying mixed method approach tend to use pragmatic knowledge claims. When it comes to specific methods, typically both open ended and closed ended questions, as well as quantitative and qualitative analysis are applied. As for the research practice, both quantitative and qualitative data is gathered, rationale for mixing is developed, and data is integrated in different stages of inquiry.

(Ivankova, Creswell, & Stick, 2006) outline three key issues with these types of studies:

1. **Priority** – which of the approaches (quantitative or qualitative) a researcher gives "more weight or attention throughout the data collection and analysis process in the study"? In explanatory sequential studies, priority is most often given to the first stage, quantitative research, as it comes first and often represents the "major aspect of the mixed-methods data collection process" (Ivankova et al., 2006).
    - In this thesis, priority was given to the quantitative part of the research, taking into account research objectives and research questions, and the fact that the quantitative results inform the qualitative research. The quantitative phase focused on evaluating the relationships between each of the approaches to learning and key concepts: learner control, experience with e-learning, factors affecting the LMS use (anxiety and social influence), and teaching-learning environment by surveying a large sample of students. The goal of the second, qualitative phase was then to follow-up on some of the results and perspectives with only a small subset of students through interviews
2. **Implementation** – do quantitative and qualitative data collection and analysis come in sequences or are done in parallel (Ivankova et al., 2006)?
    - In this thesis, the data collection and analysis happened sequentially, first the quantitative part then the qualitative part; researcher wanted to have an overview of the results before engaging in follow-up interviews with students and have the questions fully adapted to what will get the most insights to help answer the research questions
3. **Integration** of the quantitative and qualitative approaches – when and how does the integration of quantitative and qualitative parts happen? Integration can happen either at the beginning or at the interpretation phase of the study (Ivankova et al., 2006). (Creswell, 2016) outlines that integration means connecting the results from the initial quantitative phase to help plan the follow up qualitative data collection phase; the plan would include

what questions need to be further probed and what individuals can help best explain the quantitative results. In the sequential explanatory design, a researcher "typically connects the two phases while selecting the participants for the qualitative follow-up analysis based on the quantitative results from the first phase" (Creswell, Plano Clark, Gutmann, & Hanson, 2003) in (Ivankova et al., 2006).

- In this thesis, the quantitative and qualitative parts were connected during intermediate phase while finalizing the interview questions after completing the quantitative research and selecting the participants for the interviews. Finally, both stages were connected during the interpretation and discussion of analysis.

Ensuring validity in mixed method studies has been researched with a few new perspectives, mainly looking at legitimation (Johnson & Onwuegbuzie, 2004; Onwuegbuzie & Johnson, 2006). (Creswell, 2016) highlights that it is recommended to report three types of validity: quantitative, qualitative and mixed methods. In same publication, Creswell outlines that there are several key methodological or validity issues in mixed methods design: moving from quantitative to qualitative part of the research, sampling for qualitative research, and qualitative follow-up questions.

(Papadimitriou, Ivankova, & Hurtado, 2014) list eight issues to consider when ensuring quality for meta-inferences in mixed-methods sequential explanatory design that were also taken in consideration when developing procedures of this study. In this thesis, validity was looked at in each stage of research (qualitative and quantitative) with appropriate validity approaches.

There are two main reasons why a mixed method approach was chosen in this study: research questions and personal experience (Creswell, 2014, p. 49). First of all, the research question in this thesis is quite specific and it calls for a quantitative research to make an effort to generalize the results to population, but also for a deeper understanding of specific elements of this quantitative research, namely experience with e-learning, LMS, educational videos, and control. It was important for the researcher to analyze the concepts together through quantitative research, leveraging all the strengths of one, and then deep-dive with a few students to understand their position on the topic. Next, researcher's personal experience can influence the selection of the research approach. Although mixed method research requires extra time as there are multiple types of data sources, this type of research suits researchers that enjoys the structure of quantitative research and the flexibility of qualitative research (Creswell, 2014, p. 51).

Finally, it is good practice to provide a visual model of the mixed method design, including procedures and product; the visual model in this thesis, shown in figure 2, was constructed based on rules for drawing visual models in (Ivankova et al., 2006).

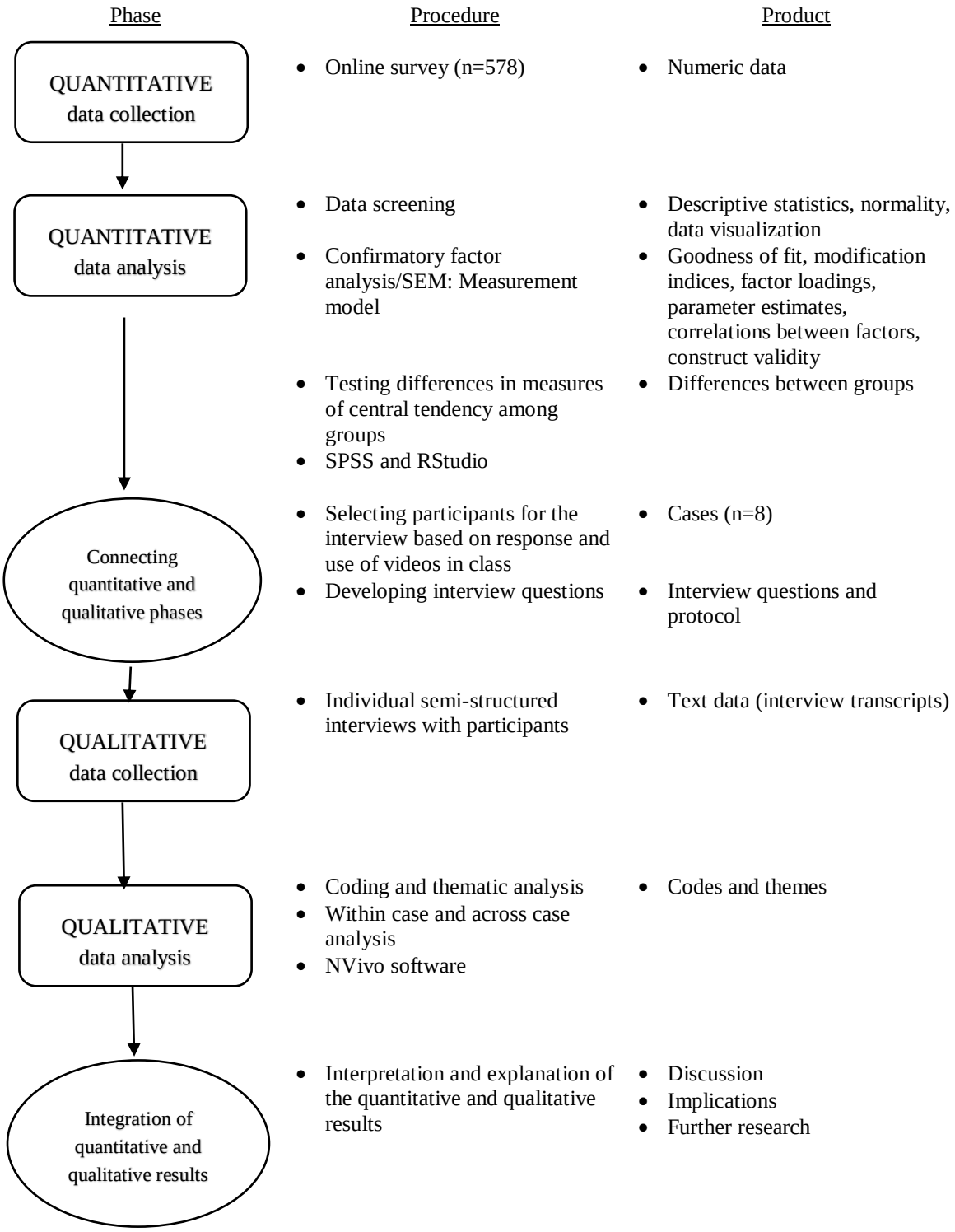


Figure 2: Visual model of mixed method research in this study

As shown in the visual model, in quantitative research, survey method was used to gather the data; in qualitative interview was used. There are advantages and disadvantages of both of these methods.

When it comes to **survey**, biggest advantages of using a survey in a research according to (Cohen, Manion, & Morrison, 2007, p. 206) are:

- Gathering data at once so it is economical and efficient
- Representing a wide target population
- Generating standardized information and numerical data
- Providing descriptive, inferential and explanatory information

There are also downsides of using a survey, two main ones being:

- Method is quite inflexible, meaning that after the data is collected, there is no easy way to clarify specific questions or thoughts
- There is a high dependency on respondent's honest responses and reflections and the correctness of their self-evaluation.

There are advantages and disadvantages with **interviews** (Creswell, 2014, p. 241), as well: interviews are helpful when participants cannot be observed, participants can provide historical information, and interviews allow the research to control the line of questioning. On the other hand, interview provides information filtered through the views of interviewees, information is gathered in a specific place, not in the natural setting, researcher's presence might affect the responses, and not everyone is equally articulate.

An example of using interviews as a research method in approaches to learning research is in the research of (Entwistle & Ramsden, 1983, p. 132). The authors used interviews to leverage the strengths of an explorative research approach; they chose students with extreme scores on the approaches to studying inventory and asked them key questions on how they approached a certain task, for example: "How did you go about it? Why are you reading it? Did you do it differently from another task of the same sort? " (Entwistle & Ramsden, 1983, p. 133). The interviews used semi-structured approach, meaning that a certain structure was followed to ensure that key points are noted, but order of questions might have changed and the interviewer was taking care of noting any additional comments from students, which could be important for the research. (Entwistle & Ramsden, 1983, p. 134). There are other examples of interviews in researching approaches to learning (Faranda, 2015). With this, let us deep dive in the quantitative research.

3.2 Quantitative research

In this chapter, methods in the scope of quantitative research will be outlined.
Quantitative research is set to:

- answer the first research question: *"What is the relationship between gender, student status, use of MOOCs and educational videos in class, experience with e-learning, learner control, teaching-learning environment, and factors affecting the use of LMS (anxiety and social influence) and deep, strategic, and surface approaches to learning?"*
- provide evidence to accept or reject the set hypothesis
- serve as an input to qualitative phase of the research

3.2.1 Quantitative sample and data collection

Research questions indicated that the sample will cover students that operate in some level of blended learning environment.

In this study, the focus was on students participating in study programs in Croatian language, in social sciences area, in four largest non-integrated universities (Zagreb, Split, Rijeka, and Osijek). Social science area was chosen given its importance in overall education system, number of students, and wide reach. The focus was on non-integrated universities as these in general have strategies on e-learning serving as guidelines for constituent units (Bralić, 2016).

Before stepping in the main research, a **pilot research** was conducted in January 2018 at two faculties in social sciences, with the goal of analyzing the reliability of questionnaire and noticing any opportunities to improve the research. The pilot sample included 513 students, and after removing cases with missing data the final sample included 392 students from three course units: 126 male and 266 female, which was similar to the main research. 59.7% respondents came from the undergraduate course, 15.1% from the graduate course, and 25.3% from the vocational course (Bralić, 2018).

In the **main research**, great care was taken to include a good sample of students in social sciences. Still, the convenience sample explained here means that participants were chosen based on their convenience and availability in the moment of conducting a research (Creswell, 2014, p. 204), and primarily based on the willingness of their teacher to participate in the study. More on limitations of this type of sampling that is in fact non-probability sampling for this research is available in the last chapter.

At the moment, it is challenging to determine the level of e-learning application as there is no standardized method of tracking this across different universities in Croatia, although there have been successful efforts to standardize these levels on a single university level. As the researcher wanted to cover various universities and areas of study, focusing on a certain level of e-learning applied in classroom was not possible. Similarly, there was no feasible way of locating course units that consistently involve educational videos or MOOCs in class. With that, researcher decided that course units such as Informatics, Introduction to Informatics, Business Informatics, and similar, most often conducted in the first year of undergraduate study will be approached, as it can be assumed that e-learning is implemented in some level on courses of this type.

Researcher reviewed all eligible study programs in the Directory of accredited study programs in the Republic of Croatia[1] in May 2018 with the following criteria:

- Social sciences
- Undergraduate and integrated undergraduate and graduate programs
- Four target universities (Split, Zagreb, Rijeka, Osijek)
- University and professional study programs

For these eligible study programs, it was then reviewed whether they have an "Introduction to Informatics", "Business Informatics" or alternatively named subject in winter semester of academic year 2018/2019. From now on, terms subject and course unit are used interchangeably.

Finally, 29 subjects/course units were shortlisted: 10 in University of Zagreb, 4 in University of Osijek, 7 in University of Rijeka, and 8 in University of Split. For each shortlisted course unit, researcher reviewed the available study plan and curriculum to ensure that the subject truly covers preferred topics (in the area of introduction to informatics).

While reviewing the study plans, the shortlisted number of 29 relevant subjects/course units dropped to 18 because:

- one subject was removed from sample as the study plan/curriculum could not be located
- based on researcher's review, there was some overlap in shortlisted course units; for example subject "Information Technology" in Faculty of Economics in Split is conducted in three study programs

[1] https://mozvag.srce.hr/preglednik/pregled/hr/pocetna/index.html

Researcher then prepared a list of teachers for each of those subjects by reviewing the school's websites, and sent an invitation to participate in the research, available in Appendix C. An email follow up was sent around 2 weeks after the original invite.

Out of the 18 invited subjects/course units, teachers from 8 of them have expressed their interest to participate in the research. Teachers from the rest of the units had different reasons for not participating in the research:

- they explicitly expressed they have no interest in participating in the research without providing a reason, or
- outlined that they do not use any form of blended learning in their class, or
- tools used in the class are not relevant for this research, or
- are connected with the researcher and did not see fit that they participate in the research (in case of FOI), or
- did not respond to the email invite.

After confirming the interest for participating in the research, researcher worked with the teachers to get the approval from the appropriate contacts and bodies within the school for conducting the research. During this process, one of the subjects dropped off from research as the approval was not received in time.

In the end, the seven participating subjects from three universities are:

1. University of Osijek, Faculty of Economics in Osijek, *Informatics* (in Croatian: "Informatika")
2. University of Split, Faculty of Philosophy in Split, *Informatics* (in Croatian: "Informatika")
3. University of Split, Faculty of Philosophy in Split, *Introduction to Computing* (in Croatian: "Uvod u računarstvo")
4. University of Split, Faculty of Economics in Split, *Information Technology* (in Croatian "Informatičke tehnologije")
5. University of Split, Faculty of Economics in Split, *Basics of Information Technology* (in Croatian "Osnove informatike")
6. University of Rijeka, Department for Informatics, *Basics of Information Technology* (in Croatian: "Osnove informatike 1")
7. University of Osijek, Faculty of Philosophy Osijek, *Basics of Information Technology* (in Croatian: "Osnove informacijske tehnologije")

Finally, **578 students in these 7 subjects/course units participated in the research**.

To collect the data, an online web tool was used. A unique link for each subject/course unit was provided to the teacher who then shared the link with the students who answered the question on their computers/mobile phones. A unique link enabled the researcher to be able to analyze each subject/course unit separately and do comparisons between groups without asking the students to provide this information. After students completed the questionnaire in each unit, and in accordance with the teacher, the collector for that subject/course unit was closed.

Final sample structure is outlined in table 4 below, with number of female and male students, part and full time students, and finally, distribution of students across the seven subjects.

Table 4: Quantitative sample

Gender	
Female	356
Male	222
Missing	1
Status	
Part time	51
Full time	527
Missing	1
Course unit/subject	
Faculty of Economics in Osijek, *Informatics*	81
Faculty of Philosophy in Split, *Informatics*	41
Faculty of Philosophy in Split, *Introduction to Computing*	24
Faculty of Economics in Split, *Information Technology*	226
Faculty of Economics in Split, *Basics of Information Technology*	88
Department for Informatics Rijeka, *Basics of Information Technology*	83
Faculty of Philosophy Osijek, *Basics of Information Technology*	36
Missing	0

3.2.2 Pilot research

Before going through the rest of the methodology for the quantitative research, let us review the pilot briefly referenced in previous subchapter. Pilot research was conducted on the Faculty of Organization and informatics in Varaždin and Faculty of Economics in Split, on three course units, in January 2018, with the goal of analyzing the reliability of questionnaire and noting any opportunities to improve the research.

The first course unit was a part of an undergraduate study (level 6 of European qualifications framework), second of a graduate study (level 7 of European qualifications framework), and third of an undergraduate vocational study (level 6 of European qualifications framework). In the undergraduate course units, educational videos on using software tools were created for the purpose of this course unit and students approached the videos through an LMS. Within the graduate course unit, students used LMS for different parts of studies, and MOOCs were also used.

Overall, 513 students participated in the research. After removing missing data, the final sample included 392 students from three course units, 126 male and 266 female students. 59.7% respondents came from the undergraduate course, 15.1% from the graduate course, and 25.3% from the vocational course (Bralić, 2018). The original instrument contained 57 items, in addition to a several descriptive questions. The item-respondent ratio was 6.88:1, with 57 items and 392 students, after removing students with missing data.
In pilot research, good reliability was found for all constructs (above 0.70), except for learner control (Cronbach alpha = 0.59). This construct was expanded in the main research.

In the pilot research, anxiety and social influence as factors affecting the use of LMS were not included; only a general overview of the way that students use the LMS was incorporated. It was decided after further reading and literature review, as well as after reviewing the pilot research results, that these two constructs will be introduced in the analysis.

Key results in the pilot are compared with the results of the main research in chapter 5.1 Discussion.

Additionally, as the focus for use of LMS changed from pilot research, the results below are not comparable with the main research but stand as key findings in the pilot and for further research:

- there was a significant difference in adopted approaches to learning between students with different use of LMS
- there was a positive correlation between use of LMS in class and experience with e-learning
- students with high use of LMS in specific parts of class, scored higher on deep and strategic approach scales, than the students who had low use of LMS in specific parts of class.

3.2.3 Questionnaire

In this subchapter, the characteristics of the questionnaire and methods of establishing validity and reliability are explained.

3.2.3.1 Questionnaire characteristics

Questionnaire was built based on the literature review and outlining the key areas that will need to be researched in order to answer the research questions.

Table 5 covers the source of each of the scales used in the questionnaire, as well as why this particular scale was chosen.

Table 5: Questionnaire scales

Construct	Scale source	Number of items	Reason for using this scale
Deep approach to learning	(ETL Project, Universities of Edinburgh, 2005)	9	Shortened Experiences of Teaching and Learning Questionnaire (SETLQ) examine the experience with teaching and learning environment and approaches to learning in a simple, single instrument. After reviewing available questionnaires, it was decided to use this instrument for its brevity and focus, given it is a part of a larger instrument in this case, as well as because it integrates the approaches to learning and the teaching-learning environment in a similarly concise manner. Teaching-learning environment consists of several small size subscales.
Surface approach to learning	(ETL Project, Universities of Edinburgh, 2005)	4	
Strategic (organized) approach to learning	(ETL Project, Universities of Edinburgh, 2005)	4	
Teaching-learning environment	(ETL Project, Universities of Edinburgh, 2005)	25	
Experience with e-learning	(Ginns & Ellis, 2009)	5	The authors in this research share that, "to evaluate the blended learning quality, one must relate the part of the online learning to the whole of student experience". As the focus of this scale was to measure the experience with e-learning as a part of the overall experience, the researcher here was interested in using this scale as the standpoint is similar: any technology used needs to be blended carefully in the learning experience. This scale was also well tested and established and authors of the research stated that connecting the experience with e-

			learning and approaches to learning can be one of the directions of further research.
Learner control	(Hung et al., 2010)	4	As learner control can mean different concepts, it was rather challenging to find an appropriate scale that measures it. This scale was published in a respectable journal and since then used in other publications to evaluate the learner control. Original scale measured the experience in an online setting which aligned with the objectives of this research. In original research, there are three items characterizing this concept; in this study, a fourth item was added in effort to improve reliability after an extensive literature review.
LMS: anxiety	(Simeonova et al., 2014; Venkatesh et al., 2003)	4	When looking at specific factors that affect the use of LMS, there is a long list of potential research topics. Research has shown that the deep approach to learning is generally related to less anxiety, and social impact is an interesting element to observe, both from the approaches to learning perspective and from the teaching-learning environment perspective. These two subscales explained these elements of learning experience well and they are based on well-established theoretical framework.
LMS: social influence	(Simeonova et al., 2014; Venkatesh et al., 2003)	4	
Total		**59**	

In addition to responding to these scales, students were asked if they use educational videos and MOOCs in class, as well as if these represent a part of their final grade. In the last section, students were asked to share how often they use some of the functionalities of LMS and for which purposes.

Questionnaire was translated to Croatian in partnership with a certified translator and tested during pilot research.

Approaches to learning, teaching-learning environment, learner control, and experience with e-learning scales were included in the pilot. The LMS anxiety and LMS social influence scales were added after the pilot research, more details explained in *chapter 3.2.2 Pilot research.* In the pilot research, when it came the LMS related perspective, only ways of using LMS were evaluated. It was concluded, after further reviewing the literature, that the LMS anxiety and social influence factors would be a valuable addition to this research. Before the main research,

these two scales were further looked at with the PhD mentor to evaluate their appropriateness and translation for this research.

3.2.3.2 Questionnaire validation

Instrument validation entails evaluating three elements: content validity, construct validity, and reliability.

Content Validity

Content validity is an issue of representation, where the main question is whether the instrument contains appropriate measures that truly capture the essence of the construct (Straub, Boudreau, & Gefen, 2004). In short, out of all the possible measures for a construct, were the right measures chosen? There are several techniques that can be used to establish content validity, some of which are literature review, expert panels or judges, content validity ratios and Q-sorting (Straub et al., 2004). Same authors further state that content validity is highly recommended, but not mandatory practice in information science research, as there seems to be a lack of clear consensus on methods and means of determining it.

For this study, content validity was established through a detailed and structured literature review, outlining the most appropriate scales to measure the selected constructs. In addition to that, before the main research, a consultation with the academic advisor was done to assess some of the constructs and potential threats to content validity.

Construct validity

Construct validity is an issue of operationalization or measurement between constructs, where the main question is whether the measures fit together in a way that captures the essence of the construct (Straub et al., 2004). Under construct validity, there are multiple validities that a researcher can look at and establish: discriminant validity, convergent validity, factorial validity, nomological validity, predictive validity, common method bias (Straub et al., 2004).

In this study, factorial validity and nomological validity were utilized; factorial validity seems to be favored technique in IS research, while nomological validity is a recommended technique as a supplement to conventional construct validity approaches (Straub et al., 2004). Similarly (Hair, Black, Babin, & Anderson, 2014, p. 125) outline that validity should be assessed in terms of: convergent validity scale correlates with other like scales, discriminant validity scale is

sufficiently different from other related scales, and nomological validity scale "predicts" as theoretically suggested.

Factorial validity assesses discriminant and convergent validity and can be examined with various techniques, one of which is confirmatory factor analysis in Structural Equation Modeling (SEM); "SEM facilitates the examination of factorial validity through a Confirmatory Factor Analysis (CFA) by examining the "correctness" of the measurement model (specifying for each item its corresponding construct) that the researcher specified." (Straub et al., 2004). The fit statistics provide a good indication whether measurement model is supported by data. This approach was used in this study and is explained further in chapter 3.2.4.1.4 Assessing the measurement model validity.

Nomological validity comes from an established theoretical research background. (Straub et al., 2004) outline that if the theoretically derived constructs have been measured with validated instruments and tested with different groups of people, in different times and settings, then the point of valid constructs becomes more compelling. In this study, all constructs were adapted from previous research, some of which were more tested with various groups of people around the world. Some of the key findings also support the well accepted relationships between specific constructs, supporting the validity.

Reliability

Reliability is an issue of measurement within a construct where the main question is the extent to which the respondents answer the same or similar questions the same way each time (Straub et al., 2004). Some of the reliability measures are internal consistency, split half, test-retest, alternative or equivalent forms, inter-rater reliability, unidimensional reliability, manipulation reliability (Straub et al., 2004).

In this study, internal consistency was evaluated. Internal consistency measures a construct through a variety of items within the same instrumentation (Straub et al., 2004). (Hair et al., 2014, p. 123) outline a few diagnostic measures to assess internal consistency:

- Measures for each separate item, including the item-to-total correlation
- Cronbach alpha as a reliability coefficient
- Reliability measures derived from confirmatory analysis, such as composite reliability (CR) and average variance extracted (AVE)

Here, Cronbach alpha and composite reliability are reported. Cronbach alpha is most often used to evaluate internal consistency; this statistic is sensitive to number of items in a scale meaning that a scale with large number of items will often result in a high alpha. Values of Cronbach alpha can be between 0 to 1; higher values showing higher reliability. (Hair et al., 2014, p. 90) state that values of .60 to .70 deemed the lower limit of acceptability. In practice, threshold of 0.7 is commonly used.

Further, composite reliability is "a measure of internal consistency of the construct indicators, depicting the degree to which they 'indicate' the common latent (unobserved) construct" (Hair, Anderson, Tatham, & Black, 1998). To indicate good reliability, the value of composite reliability of a construct should be larger than 0.7 (Segars, 1997).

In pilot research, reliability of scales was also evaluated by Cronbach alpha.

3.2.4 Data analysis

In this study, various data analysis techniques were used to review the data, answer the wider research questions, and test the hypothesis.

This chapter is organized as follows:

- First, general tests and methods are listed, to provide an overview of how the researcher explored the data and built a general understanding of it, as well as how specific tests were selected
- Then, structural equation modeling (SEM) is explored separately, through a framework provided by (Hair et al., 2014, p. 565), to provide an overview of how the research approached this set of methods.

For data analysis, trial version of SPSS software[2] and RStudio[3] with appropriate packages were used.

Table 6 provides an overview of general data analysis techniques, with their planned outcomes, tests, methods, and measures employed, as well as their description.

[2] https://www.ibm.com/analytics/spss-statistics-software
[3] https://www.rstudio.com/

Table 6: Overview of general data analysis techniques

What	Outcomes, tests and methods, measures	Description
Data screening	Frequencies	Frequency is a number of times a data value occurs in a dataset / study (Field, 2009, p. 18)
	Dispersion: variance, standard deviation, and interquartile range	Variance is the average error between the mean and the observations made (Field, 2009, p. 37) Standard deviation is the square root of the variance (Field, 2009, p. 37) Interquartile range represent the limits within which the middle 50% of observations fall (Field, 2009, p. 99)
	Asymmetry: skewness	Skewness is a measure of the symmetry of a distribution; in most instances the comparison is made to a *normal distribution.* A positively skewed distribution has relatively few large values and tails off to the right, and a negatively skewed distribution has relatively few small values and tails off to the left. Skewness values falling outside the range of -1 to +1 indicate a substantially skewed distribution“ (Hair et al., 2014, p. 34)
	Peakedness: kurtosis	Kurtosis is a measure of the peakedness or flatness of a distribution when compared with a normal distribution. A positive value indicates a relatively peaked distribution, and a negative value indicates a relatively flat distribution (Hair et al., 2014, p. 33)
	Measures of central tendency: mead, mode, median	Mean is the average score (Field, 2009, p. 22) Mode is the score that occurs most frequently in the data set (Field, 2009, p. 21) Median is the middle score when scores are ranked in order of magnitude (Field, 2009, p. 21)
Data screening: assessing normality of distributions	Kolmogorov-Smirnov and Shapiro-Wilk test	These two tests calculate the level of significance for the differences from a normal distribution. However, due to their usefulness and significance in different sample size, researchers are recommended to use the graphical plots and statistical tests to assess the actual deviation from normality (Hair et al., 2014, pp. 71–72). In this study, both of the tests were conducted to evaluate the normality; graphical plots and skewness and kurtosis analysis were used in addition to tests to evaluate the normality of distribution.
	Skewness and kurtosis analysis	Statistic value z can be calculated for both skewness and kurtosis. “The critical value is from a z distribution, based on the significance level we desire. The most commonly used critical values are ±2.58 (.01 significance level) and ±1.96, which corresponds to a .05 error level“ (Hair et al., 2014, p. 71).

<table>
<tr><td rowspan="3"></td><td></td><td>In this study, ±1.96 value was used to assess the normality of distribution in addition to standard used tests.</td></tr>
<tr><td>Q-Q plot, histogram, boxplot</td><td>Graphical representation is useful when assessing the normality of distribution, mainly histograms and Q-Q plots.
The normal Q–Q chart shows the values a researcher would expect to get if the distribution were normal (expected values) against the values actually seen in the data set (observed values). If the data is normally distributed, then the observed values should fall exactly along the straight line (meaning that the observed values are the same as you would expect to get from a normally distributed data set) (Field, 2009, p. 147)

In this study, Q-Q plots as well as histograms were evaluated to assess the normality of distribution.</td></tr>
<tr><td colspan="2">If based on the above, it was determined that the distribution was not normal,
- for SEM an estimator that accounts for non-normality would be used, and
- for other statistical tests, a parametric tests would be additionally checked with a non-parametric version of the test.</td></tr>
<tr><td>Difference in measures of central tendency between groups</td><td>For normal distribution of dependent variable: t test and one-way ANOVA
For non-normal distribution of dependent variable: Mann-Whitney and Kruskall-Wallis tests</td><td colspan="2"><table>
<tr><th>Distribution</th><th>Number of groups</th><th>Test (all for independent groups)</th></tr>
<tr><td>Normal</td><td>2 groups</td><td>t-test: used to test whether two group means are different (Field, 2009, pp. 324–326); including Levene's test to test the assumptions of variances and scores Table 25 outlines the t-test significance for deep approach between groups, including Levene’s test: test that tests the null hypothesis that the variances in different groups are equal (i.e. the difference between the variances is zero) (Field, 2009, p. 150)</td></tr>
</table></td></tr>
</table>

		Not normal	2 groups	Mann-Whitney test: non-parametric equivalent of a t-test, used when there is deviation from normal distribution (Field, 2009, p. 540)
		Normal	More than 2 groups	One-way ANOVA compares several means coming from different groups of people (Field, 2009, p. 388)
		Not normal	More than 2 groups	Kruskal-Wallis test: non-parametric version of one-way ANOVA, testing differences between groups when there is a deviation from normal distribution. Includes post-hoc test.

3.2.4.1 SEM and its stages

SEM is a family of statistical models that seek to explain the relationships among multiple variables (Hair et al., 2014, p. 546). In this research, SEM was employed to analyze the data and address the hypothesis.

(Hair et al., 2014, p. 565) have outlined six stages in structural equation modeling:

Stage 1: Defining individual constructs

Stage 2: Developing the overall measurement model

Stage 3: Designing a study to produce empirical results

Stage 4: Assessing the measurement model validity

Stage 5: Specifying the structural model

Stage 6: Assessing structural model validity

3.2.4.1.1 Defining individual constructs

In stage 1, *defining individual constructs*, researcher explores the constructs that should be included in the model based on theoretical assumptions. Then, the chosen constructs are

operationalized by selecting an existing measurement scale or creating a new scale. Constructs in this study are explained in chapter 3.2.3.1 Questionnaire characteristics.

3.2.4.1.2 Developing the overall measurement model

In stage 2, *developing the overall measurement model*, latent constructs to be included in the model are identified and the measured indicator variables (items) are assigned to latent constructs. Measurement model specifies the indicators for each construct and enables an assessment of construct validity; measurement model represents the first of the two major steps in a complete SEM (Hair et al., 2014, p. 544).

3.2.4.1.3 Designing a study to produce empirical results

In stage 3, *designing a study to produce empirical results*, researcher must assess the adequacy of the sample size, select the estimation method, and approach to missing data approach.

Sample size is important for conducting specific statistical analysis, including the analysis in SEM. There are several rules of thumb in literature (Wolf, Harrington, Clark, & Miller, 2013).

In this study, (Bentler & Chou, 1987) criteria for ratio between parameters and sample size was followed: 5:1 for normally distributed variables and 10:1 for arbitrary distributions, i.e. 5-10 observations per estimated parameter. The goal was to have at least 5:1 ratio. Before removing missing data, ratio was 9.8 : 1. After removing entries with a certain part of missing data (see below), ratio was 8.8 : 1, which is still acceptable for analysis.

Earlier, in the pilot research the ratio was 9:1 for the whole sample (513 students, 57 items), and 6.88:1, with 57 items and 392 students, after removing entries with missing data.

Missing data is common in field research. Acceptable percentage of missing data is discussed in literature (Dong & Peng, 2013); there are different thresholds defined in for an acceptable percentage of missing data in a data set for valid statistical inferences. Some authors claim that missing more than 10% of data can result in subsequent statistical analyses maybe being biased (Bennett, 2001), while others state that a missing rate of 5% is acceptable (Schafer, 1999) in (Dong & Peng, 2013). (Hair et al., 2014, p. 54) looked at methods for imputing missing data and state that for under 10% of missing data, any of the imputation methods covered can be applied, although the complete case method has been shown to be the least preferred.

In this study, linear interpolation was used as the imputation method on cases that have one missing value. All cases with two or more missing values were excluded from the research (Meyers, Gamst, & Guarino, 2006). There were 57 cases like this, leaving the final number of cases at 521 students.

Earlier, in the pilot, all entries with any missing data were removed from the analysis, no imputation technique was used. The approach has changed from the pilot to the main research based on theoretical recommendations and as the wealth of data was needed to be kept; this imputation method was also used in recent thesis in the area of approaches to learning (Dobi Barišić, 2018).

Estimation method that will be used to identify estimates for each free parameter (Hair et al., 2014, p. 575) is an important research decision. In real life, distribution is rarely perfectly normal. There are three classes of robust procedures in the SEM literature concerning the normality of data: (a) ML estimation with 'robust' standard errors, and a 'robust' test statistic for model evaluation, (b) GLS with a weight matrix (Γ) based on the 4thorder moments of the data, and (c) case-robust or outlier-robust methods (Rosseel, 2017). If the observed data have at least five ordered categories, and are approximately normal, use of ML estimation techniques does not result in severe levels of bias in fit indices, parameter estimates, or standard errors" (Finney & DiStefano, 2013, p. 277). Indeed, maximum likelihood continues to be the most widely used approach and „has proven fairly robust to violations of the normality assumption" (Hair et al., 2014, p. 575)

In this study, MLM estimator was used; this is a maximum likelihood estimation with robust standard errors and a Satorra-Bentler scaled test statistic[4]

As the pilot research focused on an exploratory factor analysis, no estimation method was used then.

3.2.4.1.4 Assessing the measurement model validity

In stage 4, *assessing the measurement model validity,* it is needed to evaluate the goodness of fit and construct validity of measurement model.

Goodness of fit (GOF) indicates "how well the specified model reproduces the observed covariance matrix among the indicator items" (Hair et al., 2014, p. 576). There are multiple goodness of fit indices, grouped in three groups: absolute fit indices, incremental fit indices, and parsimony fit indices.

Absolute fit indices

- Chi square ($\chi 2$) is one of the key GOF indices. "The difference in the observed and estimated covariance matrices is the key value in assessing the GOF of any SEM model"(Hair et al., 2014, p. 577). Chi square is considered satisfactory when non-

[4] http://lavaan.ugent.be/tutorial/est.html

significant ($p > .05$), however it is highly dependent on sample size. Hence, authors have suggested to use it in combination with other indices (Hair et al., 2014, p. 582), as well as looking at alternative indices, including $\chi 2$/degrees of freedom ratio (Byrne, 2010, p. 77)

- Normed Chi square: ratio of $\chi 2$/degrees of freedom. (Carmines & McIver, 1983) state that ratios in the range of 2 to 1 or 3 to 1 are indicative of an acceptable fit, aligned with (Hair et al., 2014, p. 579) stating that 3:1 or less are associated with better-fitting models.
- Root mean square error of approximation (RMSEA): RMSEA "tries to correct for both model complexity and sample size by including each in its computation. Lower RMSEA values indicate better fit" (Hair et al., 2014, p. 579). Cutoff value of 0,05 and 0,08 has been flagged in earlier research, however (Hair et al., 2014, p. 579) lay out concerns with having a cutoff. RMSEA works well with larger samples
- Standardized root mean residual (SRMR) is a standardized version of root mean square residual indicator; lower SRMR value represents a better fit. Less than 0.08 is acceptable (Hair et al., 2014, p. 584), while (Hu & Bentler, 2009) flag that values below 0.09 are acceptable.

Incremental fit indices

- Tucker Lewis Index (TLI): a comparison of the normed chi-square values for the null and specified model; as it is not normed, its value can be below 0 or larger than 1. Model with higher value indicates a better fit (Hair et al., 2014, p. 580)
- Comparative fit index (CFI): normed goodness of fit indicator, ranging between 0 and 1, with higher values indicating a good fit. "Because the CFI has many desirable properties, including its relative, but not complete, insensitivity to model complexity, it is among the most widely used indices. CFI values above .90 are usually associated with a model that fits well."(Hair et al., 2014, p. 580).

When evaluating goodness of fit, it is important to note that "more complex models with larger samples should not be held to the same strict standards as more simple models, and so when samples are large and the model contains a large number of measured variables and parameter estimates, cutoff values of .95 on key GOF measures are unrealistic". (Hair et al., 2014, p. 589) Further, **modification indices** could be looked at to improve the fit of the model; modification index is calculated for every possible relationship that is not estimated in a model (Hair et al., 2014, p. 621). This is an important to tool to detect potential misspecifications and locate potential improvements. However, it is important to flag that no changes to the model should

be done solely based on the results of modification indices, but only based on sound theoretical background that supports any potential changes.

In this study, in this phase, following steps were followed:

1. The original measurement model was first evaluated to assess goodness of fit measures, factor loadings and general parameter estimates.
2. Modification indices were run next to detect any potential improvement to the model that has theoretical grounds.
3. Second model was constructed after removing the items with small factor loadings and adding indices.
4. Goodness of fit measures, factor loadings, and parameter estimates were calculated for the second model.
5. Goodness of fit of the measurement model served as input to evaluate construct validity (Hair et al., 2014, p. 544). Here, reliability was also calculated.
6. Finally, correlations between factors were analyzed, to accept or reject proposed hypothesis.

3.2.4.1.5 Specifying the structural model

In stage 5, s*pecifying the structural model*, researcher „assigns relationships from one construct to another based on the proposed theoretical model.“(Hair et al., 2014, p. 585).

3.2.4.1.6 Assessing structural model validity

Finally, in stage 6, *assessing structural model validity* researcher evaluates the overall structural model goodness of fit.

Stages five and six are not presented in this thesis as the hypotheses here are built around correlations between factors. However, researcher did conduct SEM stages five and six for publishing the work covered in this thesis.

3.3 Qualitative research

In this section, qualitative part of the study will be analyzed. Based on recommendations for mixed methods research, a qualitative research question was developed, the second research question in this study: *"How do students describe their experience with blended learning and the use of the online materials and their approaches to learning? "*

3.3.1 Qualitative sample and data collection

When thinking about participants (cases) in the qualitative part of the study (Ivankova et al., 2006) claim that "there are no established guidelines as to how researchers should proceed with selecting the cases for the follow-up qualitative analysis or the steps to follow". (Papadimitriou et al., 2014) on the other hand state that the researcher should "use systematic statistically grounded process for selecting participants for qualitative follow-up phase". (Creswell, 2007, p. 125) outlines that in qualitative research, purposeful sampling is used, meaning that the researcher "selects the individuals and sites for study because they can purposefully inform an understanding of the research problem and central phenomenon in the study."

When quantitative research was under way, teachers in participating course units were asked to share an invite to participate in the interviews with students participating in survey. As locally dispersed courses units were covered, it was not feasible to have physical presence during surveying to invite students to participate in the follow up activity. There was no expressed interest among students that participated in the survey to participate in the second stage of the research. For this, the researcher decided to focus on students in one course unit that had educational videos integrated in their class, based on (Ivankova et al., 2006; Papadimitriou et al., 2014) and the importance of studying further the use of video and a more advanced use of LMS in class. The results from the quantitative part of the study informed this decision.

Based on the above, during the week of January 7th 2019, researcher attended the scheduled lectures for course units "Business informatics" and "Basics of Informatics" in Faculty of Economics in Split, in accordance with the lecturer. Researcher personally invited interested students to participate in the interview by explaining the duration, purpose and expectations from students. Eight students expressed their interest in participating in the interview; the interviews were conducted immediately on the premises in a calm library setting. Four students were interviewed individually and four in pair (two pairs of two students) as they felt more comfortable participating in the interview with a peer.

3.3.2 Interview and phases of interviewing

Interview is a qualitative research method, with purpose often to "clarify meanings, to examine concepts or to discover areas of ambiguity" (Wellington, 2015, p. 154). There are also examples of the use of interview in different research areas, including educational research (Wellington, 2015, p. 137)

Phases of interview process

There are several stages of interviews and here three different ways of looking at interviews are presented:

- (Brinkmann & Kvale, 2015, pp. 128–129) in (Pažur Aničić, 2017) outline seven key stages of interviews: (1) thematizing the interview project, (2) designing, (3) interviewing, (4) transcribing, (5) analyzing, (6) verifying, (7) reporting.
- (Wellington, 2015, p. 144) looks at four main stages in preparing and carrying out interviews: (1) preparing the interview schedule, (2) piloting, (3) selecting the subjects/sample, and (4) the interview itself.
- (Creswell, 2007, p. 132) offers key steps for conducting interviews, mostly on specific key actions needed to ensure success with the interview itself: (1) identify interviewees, (2) choose the type of interview, (3) choose adequate recording procedures, (4) design and use an interview protocol, (5) refine the interview questions and the procedures, (6) determine the place for conducting the interview, (7) obtain consent from the interviewee, (8) follow best practices during the interview.

In the next paragraphs, the design of the interview, the process of interviewing, transcribing and analyzing the data, and validation and reliabilty methods will be shared. These loosely represent phases 2-6 from (Brinkmann & Kvale, 2015).

3.3.2.1 Designing the interview

In this research, interview questions were developed based on the quantitative results and overall research questions. The interviews were primarily set to answer the second research question: "How do students describe their experience with blended learning and the use of the online materials and their approaches to learning?" Also, as interviews followed as a part of the mixed method approach, it is expected that the interviews will address the results of the quantitative research question: "What is the relationship between gender, student status, use of MOOCs and educational videos in class, experience with e-learning, learner control, teaching-learning environment, and factors affecting the use of LMS (anxiety and social influence) and

deep, strategic, and surface approaches to learning?". Based on the above, key areas were looked at and questions developed to address them; the areas were researched in the quantitative part of the research as constructs, and also represent the term "blended learning" from the second research question. Each of the areas was analyzed in the literature review chapter.
Table 7 outlines interview questions, as well as the key area that is to be addressed with the question. It is expected that some of the answers will land in other areas researcher is interested in. Interviews were conducted in Croatian.

Table 7: Interview questions

Question	Area
As a start, I would like to ask you to describe me your experience with e-learning on this course unit. By e-learning, I mean the educational videos you used and the materials from Moodle. Let's start with educational videos.	Experience with e-learning
• Describe me how you use materials from Moodle on this course unit. • Is it the same for other course units?	Experience with e-learning + use of LMS
• Describe me how you focused on learning when learning from materials on Moodle on this course unit • Is it like that on other course units? • What about educational videos? How did you focus on learning when watching those? • Is it like that on other course units?	Learner control
When we say teaching, we refer to the help of the teacher in the process of acquiring knowledge and developing skills. How did teaching in this course unit differ from teaching in other course units?	Teaching and learning environment
Remember the first test/exam on this course unit. Describe me how you prepared for it. Do you prepare in same way for other tests/exams in your studies?	Approach to learning

Qualitative data analysis process might be different than in quantitative research; in qualitative research data analysis will proceed hand in hand with other parts. For example, researchers may be analyzing an earlier interview earlier or writing memos while interviews are in process (Creswell, 2014). With this in mind, given that during the interview process students were mentioning topics outside of planned questions, further questions were developed to address some of these topics:

- Do you and how often use mobile phones to work on some of the assigned work in LMS?

- Have you used any videos outside of the educational videos in this course unit (on Youtube, other websites)?
- Can you think of other course units where this video based approach might be useful?

3.3.2.2 Interviewing

The process of interviewing itself was constructed based on (Creswell, 2007, p. 132). First of all, the **interviewees** were identified (see chapter 3.3.1 Qualitative sample and data collection). Then, **the type of interview** was selected. Interviews can be fully structured, semi-structured, and unstructured (Wellington, 2015, p. 141). In a structured interview, there is a set of questions determined for every interview conducted in a research. There are no deviations between questions asked in different interviews, which ensures consistent data. On the contrary, in an unstructured interview, there are no set questions and the interviews in a study will vary from one case to another. This type of an interview can be beneficial in initial stages of a research but can represent an issue in the later stages as there is a lower level of confidence in data quality (Parsons, 1984; Wellington, 2015). A semi-structured approach can be used as a compromise between these two types of interviews (Wellington, 2015, p. 141). For this thesis, a semi-structured interview, given its advantages, was selected.

Next, **adequate recording procedures** were selected. For this purpose, audio recording was selected, given its advantages, such as preserving actual natural language, being an "objective" record, recording interviewer's contribution that can be assessed after the interview, and allowing interviewer to concentrate, maintain eye contact and observe body language (Wellington, 2015, p. 153)

After this, the **interview protocol** was designed, with open ended questions and planned introduction time to explain the purpose of the research and the role of the student.

Next, (Creswell, 2007, p. 133) suggests **refining** interview questions and the procedure in pilot testing. This qualitative research did not have a pilot phase, however, some of the questions were noted and added in the protocol as these topics were often mentioned by students.

The **place** for conducting the interview was secured onsite, in a quiet room within the library of the school, ensuring students will be focused and relaxed.

Consent was obtained for each interviewee (available in Croatian in Appendix D) explaining what data will be gathered and how it is planned to be used. This step was particularly important given the audio recording and the fact that it was important for the research to be able to quote students in the thesis and part of the analysis.

Finally, during the interview, **best practices** were followed. Interviews were completed in time, interviewer was focused on listening and probing only when needed.

3.3.2.3 Transcribing and analyzing data

General inductive approach was used for analyzing qualitative data; this approach provides a convenient and efficient way of analyzing qualitative data (Thomas, 2006).

Procedures for the inductive analysis of qualitative data, and the actions in this study are listed in table 8.

Table 8: Procedures for the inductive analysis

Step	Procedure From (Thomas, 2006)	In this study
1.	"Preparation of raw data files (data cleaning): formatting the raw data files in a common format"	There is often a vast amount of data gathered in qualitative research, and the researcher needs to outline key findings and focus on smaller pieces of data. The first step in this process is to transcribe the data gathered during the. In this study, all interviews were transcribed manually by the main researcher. Each participant was classified as Participant #X (for example Participant 1) and the answers to questions were immediately grouped under case (participant) and under each question, as same open ended questions were asked of all participant, perhaps in different order. This resulted in a document of approximately 11700 words.
2.	Close reading of text until evaluator is familiar with its content and gains an understanding of themes and events	Text was closely read, first each case one by one and then comparing the cases. In this research, there was interest to compare emerging topic among students, rather than only understanding each student's point of view. The research questions behind this research were the guiding principle for comparing cases to each other and finding similar themes
3.	Creation of categories: the upper level or more general categories are likely to be derived from the evaluation aims. The lower level or specific categories will be derived from multiple readings of the raw data. In inductive coding, categories are commonly created from actual phrases or meanings in specific text segments.	The upper level categories in this study were derived from the key areas that were looking to be covered in interviews and rephrased based on initial re-reading of interviews to: - experience with videos - experience with Moodle - learner control - teaching - learning environment,

	(Elliott, 2018) clarifies that a category is a code, but of a higher order.	- approach to learning
4.	Overlapping coding and uncoded text: one segment of text may be coded into more than one category and a considerable amount of text may not be assigned to any category as it is not relevant to the evaluation objectives (Elliott, 2018) outlines that (a) multiple coding can be an issue because it might indicate that the coding system is not refined enough and that "the fact that you can assign data more than one code does not mean that you necessarily should", as well as that (b) "the consensus within the literature on data analysis seems to be that coding should not be exhaustive and is in fact a process for reducing the data".	There were pieces of text that were not coded as they did not relate to research objectives. Similarly, there were pieces of text that were mapped to more than one code in the initial analysis as they covered more than one phenomenon. Throughout refining the data, the text was left mapped to only one node. First iteration of coding resulted in 35 codes grouped under five upper level categories.
5.	Continuing revision and refinement of category system: within each category, search for subtopics, including contradictory point and new insights (…) Categories may be combined or linked under a superordinate category when the meanings are similar". For the continuing revision and refinement of category system, focused and axial coding was implemented (Saldaña, 2013, p. 209).	During refinement of coding and outlined processes, codes/nodes were renamed, merged and moved to other areas, resulting in eight categories, emerging themes, classified as most important given the evaluation objectives.

3.3.2.3.1 Coding process

Integral part of analyzing qualitative data is coding. (Creswell, 2014, p. 247) clarifies that coding "involves taking text data or pictures gathered during data collection, segmenting sentences (or paragraphs) or images into categories, and labeling those categories with a term, often a term based in the actual language of the participant (called an in vivo term)". (Elliott, 2018) defines coding as "indexing or mapping data, to provide an overview of disparate data that allows the researcher to make sense of them in relation to their research questions".

As mentioned earlier, key upper level categories were derived from objectives of qualitative research and have been explored extensively during literature review. This means that, at the time of conducting the interviews, the idea of upper level categories existed and the researcher had an overview of key ideas under each of the categories that might be emerging during the interviews. This means that the coding in this study is a combination of "deductive (searching

for the confirmation of pre- defined key process areas and practices within the interview transcripts) and inductive (identification of new practices based on the interview transcripts) modes" (Pažur Aničić, 2017, p. 142).

In this study, coding was done in the program NVIVO 12[5]

In general inductive approach, coding begins in step 2 of the overall process, as clarified in table above, and includes:

1. taking the initial reading of text data
2. identifying specific text segments related to objectives
3. labeling the segments of text to create categories (30-40 categories)
4. reducing overlap and redundancy (15-20 categories), and finally
5. creating a model incorporating most important categories (3-8 categories) (Thomas, 2006).

The procedure for coding in NVivo was:

1. The interview transcripts were prepared and added to a new project in NVivo
2. Interviews were read one by one and when a valuable point for students describing their experience with blended learning environment was recognized, it was coded, i.e a new node was created describing this code.
3. If there was no code describing the certain point by students, a new code/node was created and assigned as a subnode for any appropriate upper level categories (areas).
4. If there was already a code/node developed, the test would be assigned with that code/node.

During this process, a codebook was developed, as recommended, with main attributes of each code (Saldaña, 2013, p. 25)

After the first three phases of coding in general inductive approach, which included the initial read of the data, identifying specific text segments related to objectives and labeling the segments of text to create categories (Thomas, 2006), 35 codes were detected and grouped under five key upper level categories: approaches to learning, experience with Moodle, experience with videos, learner control, teaching-learning environment. Table 9 presents output of the first coding process, with a code derived, number of students that shared their perspective under that code and number of references for each code. For example, six students referenced deep approach to learning, 19 times across these six students.

[5] https://www.qsrinternational.com/nvivo/nvivo-products/nvivo-12-pro

Table 9: First coding process

Code/node	Students (cases)	References
Approaches to learning		
1. Deep approach	6	19
2. Interest in content	4	7
3. Relevance of content for future	3	4
4. Lack of time management	2	2
5. Strategic (organized) approach	5	8
6. Preparing for exam last minute	1	1
7. Surface approach	6	15
Experience with Moodle		
8. Comfortable using Moodle	5	6
9. Mobile use	8	17
10. Moodle for 1 way communication	6	11
11. Moodle for submitting tasks	3	3
12. Reasons for using material from Moodle	5	7
13. Usability	2	3
Experience with videos		
14. Applicable in other subjects	5	5
15. Audio, visual, sound	3	4
16. Language	1	1
17. Level of detail	4	5
18. Quality of videos	2	3
19. Motivation to complete the videos	1	1
20. Feedback on videos in class	6	6
21. Missing teacher lectures	1	4
22. Replaying videos	3	5
23. Using videos when not 100% fit	1	1
24. Previous knowledge	6	6
25. Other online videos	5	5
26. Recommendations from others for other online videos	3	3
Learner control		
27. Completing each video	1	1
28. Focusing when watching videos	3	3
29. Watching videos together in class	3	3
30. Things that affect concentration on learning	2	3
31. Online distractions	4	6
32. Video vs paper	3	3
Teaching-learning environment		
33. Atmosphere in class	2	2
34. Student support	1	1
35. Teacher presence in class	6	8
		182

Based on general inductive approach, the next step in analysis was to reduce the overlap and redundancy among categories (Thomas, 2006). (Saldaña, 2013, p. 207) introduces this as

"second-cycle coding" where first cycle codes are "reorganized and reconfigured to eventually develop a smaller and more select list of broader categories, themes, concepts, and/or assertions".

Even though general inductive approach was used to work with qualitative data in this thesis, Saldaña's second-cycle coding principles was looked at for guidance during the step of reducing overlap and redundancy among categories. Focused and axial coding were used in this phase. Focused coding "categorizes coded data based on thematic or conceptual similarity", while axial coding "describes a category's properties and dimensions and explores how the categories and subcategories relate to each other" (Saldaña, 2013, p. 209). This included: renaming some of the codes to ensure clarity for each of them, merging codes should there be an overlap, moving nodes to another key area where necessary, as well coding text on only one code when appropriate. One node was deleted as it had only one reference (piece of text) that was grouped under another node after re-reading the text.

Output of the second cycle coding was a new structure, shown in table 10, where some codes were brought together to a final categorization.

Table 10: Output of the second cycle coding

Original	Revised	Final	Students (cases)	References
Approaches to learning				**56**
Deep approach		Approach to and organization of learning	6	19
Lack of time management	Organizing learning		2	2
Strategic (organized) approach			5	8
Preparing for exam last minute			1	1
Surface approach			6	15
Interest in content	Content relevance	Impact of perceived content relevance on learning and motivation	4	7
Relevance of content for future			3	4
Experience with Moodle				**47**
Comfortable using Moodle		Ways of and reasons for using materials from LMS	5	6
Usability			2	3
Moodle for 1 way communication	Use of Moodle (teachers)		6	11
Moodle for submitting tasks			3	3
Reasons for using material from Moodle			5	7

Mobile use		Mobile (phone) use of resources from LMS	8	17
Experience with videos				**49**
Audio, visual, sound	Video characteristics	Recognized technical and quality characteristics of educational videos	3	4
Language			1	1
Level of detail			4	5
Quality of videos			2	3
Feedback on videos in class	General feedback on using videos	General feedback on using educational videos in learning process	6	6
Missing teacher lectures			1	4
Replaying videos			3	5
Using videos when not 100% fit			1	1
Previous knowledge			6	6
Applicable in other subjects			5	5
Other online videos	Other online videos		5	5
Recommendations from others for other online videos			3	3
Atmosphere in class			2	2
Student support			1	1
Teacher presence in class			6	8
Learner control				**19**
Completing each video	Focusing on videos	Focusing on educational videos	1	1
Focusing when watching videos			3	3
Watching videos together in class			3	3
Things that affect concentration on learning	Staying focused when learning	Staying focused when learning in general	2	3
Online distractions			4	6
Video vs paper			3	3
Teaching-Learning environment				
				182

After reducing the overlap and redundancy, 8 categories under 5 initial upper level categories were sourced. According to (Thomas, 2006), the final model should incorporate only the most important categories that in the evaluator's view "capture the key aspects of the themes identified in the raw data and are assessed to be the most important themes given the evaluation objectives", hence excluding the teaching-learning environment from a detailed analysis and

the following table. The core eight categories/themes in the findings of this research, along with the description of each of the categories are shown in table 11.

Table 11: Eight categories in qualitative analysis

Upper category	Category	Description
Approaches to learning	Approach to and organization of learning	Students describing: (a) ways in which they approached specific tasks in this course unit or the first exam, (b) general time management skills and organization of learning for this course unit or in general
	Impact of perceived content relevance on learning and motivation	Students describing their personal interest in content they are going through, as well as their perceived relevance of specific content for their future and how these impacts their approach to watching videos and going through materials on the LMS.
Experience with LMS (Moodle)	Ways of and reasons for using materials from LMS	Students describing ways teachers are using the LMS, when, how, and why they access the content, and how easy or difficult it is for them.
	Mobile (phone) use of resources from LMS	Students describing if, when, how, and why they use their mobile phones for accessing material on Moodle.
Experience with educational videos	Recognized technical and quality characteristics of educational videos	Students describing their perception of general quality of videos, including the language, level of detail, and the audio and visual components of videos
	General feedback on using educational videos in learning process	Students describing their general experience and feedback with using educational videos and this format of teaching and learning. This section also includes (a) presence and role of teacher and general atmosphere in class, (b) use cases and features of videos that are most helpful, (c) relevance of previous knowledge on the covered topic when watching and working with videos, (d) potential to expand to other course units, (e) using external online videos
Learner control	Focusing on educational videos	Students describing how they focus on educational videos on individual basis and comparing focusing in classroom setting and at home
	Staying focused when learning in general	Students describing what can take away their focus from learning when learning in general as well as when learning online; comparing online learning and learning from books/papers.

3.3.2.4 Verifying

Verification procedures are in important part of a qualitative research. According to (Creswell, 2012, p. 259), validating findings means that the researcher "determines the accuracy or credibility of the findings". There are different perspectives of validation in qualitative research, including how it is defined, described, and established (Creswell, 2007, pp. 202–207). Further, same author accepts that there are different types of qualitative validation and the researchers ought to choose the types that make sense for their research. Finally, Creswell suggests that the researchers apply the chosen strategies to "document the "accuracy" of their studies" and he calls these "validation strategies" (Creswell, 2007, p. 207).

There are different validation strategies for qualitative research, including triangulation, member checks, external audit, prolonged engagement and observations, peer reviews, rich descriptions, clarifying researcher bias, negative case analysis and similar (Creswell, 2007, pp. 207–211, 2012, pp. 259–260)

In this thesis, the following have been implemented:

- Triangulation
- Peer debriefings during research process
- Clarifying researcher bias

Triangulation includes using multiple and different sources, types of data, or methods of data collection to shed light on a theme or perspective (Creswell, 2007, p. 208, 2012, p. 259). In this study, different sources of information and different methods were used to yield the best results. This is shown in table 12.

Table 12: Methods and sources in qualitative research

Method Source	Description
Literature review	Literature review informed the design of this research, indirectly through quantitative part that served as an input for designing the interview, as well as directly when evaluating possible questions that were previously used in similar research. For example, evaluating the approach to learning was based on definitions offered by (Entwistle & Ramsden, 1983, p. 137)
Results of the 1st research phase	Results of the quantitative research served as an input for finalizing the questions for qualitative research and focusing on specific key areas as upper categories for analyzing data
Interview with the teacher	Teacher on these course units was interviewed to understand the background of developing this specific learning environment, goals that were to be achieved and general structure of the subject. This served as an input for analyzing the students' responses and forming the report of findings in the qualitative research

Document review	To ensure the researcher is fully aware of the teaching practices and structure of the course unit, accompanying documents explaining way of working and course unit priorities were studied.

Peer debriefings during research process

Peer review or debrief provides an external check of the research process; this person asks questions about methods, meanings, and interpretations (Creswell, 2007, p. 208). When developing the qualitative part of the research, researcher's PhD co-mentor served as a point of review of the developed questions, practices, and data analysis during regular advisory meetings.

Clarifying researcher bias

Clarifying the bias a research might have is important for the readers of a study. In this sense, the researcher comments on past experiences, prejudices, and orientations that could have shaped the interpretation and approach to the study (Creswell, 2007, p. 208). For this study, the research questions cover the experiences students might have had with e-learning, LMS, MOOCs and other ways of integrating the e-component in a classroom. It is expected therefore that this research might lean towards supporting the integration of e-resources in the classroom and will look out for approval from students during interviews. Past experience, studying business informatics and graduating on the topic of e-learning support this, too. Further, given that the researcher graduated from the same university as the one where the interviews are done, might affect the way the responses are interpreted as personal recollections could have an impact. With that in mind, great care was put in designing the open ended questions that would question the core focus areas of the research, removing personal bias towards technology and setting a specific learning environment in this specific course unit aside.

Another validation strategy mentioned by (Thomas, 2006) is **coding consistency check** that assumes completing the first coding and then including a second coder to map the text to set categories. In this research, the qualitative part is a complement to the quantitative one and hence no specific validation strategy was implemented on the qualitative research part only.

4 RESULTS

In this chapter, results of this study are presented. First, quantitative research output is outlined, then the qualitative research, and finally, the results are brought together.

4.1 Quantitative

In this chapter, results of the quantitative analysis are structured as follows:

1. Questionnaire validation
2. Measurement model and hypothesis testing
3. Difference in each of the approaches to learning between groups
4. Summary of quantitative results

4.1.1 Questionnaire validation

Questionnaire consisting of **59 items** was translated and the initial version was piloted in a pilot research before the main research. To evaluate the validity of the questionnaire, confirmatory factor analysis was conducted.

Before conducting the factor analysis, Kaiser-Meyer-Olkin Measure of sampling adequacy (KMO test) and Bartlett's Test of Sphericity were calculated to evaluate whether data is suitable for factor analysis. Based on (Kaiser, 1974), results above 0.9 are considered marvelous and above 0.8 meritorious. Results in Table 13 show that the data is suitable for factor analysis.

Table 13: Testing for suitability for factor analyis

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.913
Bartlett's Test of Sphericity	Approx. Chi-Square	15648.683
	df	1711
	Sig.	.000

4.1.1.1 First measurement model

Confirmatory factor analysis was done on a simple proposed measurement model, without any modification indices. Model in R syntax available in Appendix A.

The confirmatory factor analysis included robust statistics for CFI, TLI and RMSEA indicators since the data was not distributed normally (Brosseau-Liard & Savalei, 2014) based on tests conducted prior to the factor analysis (normality tests and skewness and kurtosis analysis). More on testing normality in chapter 4.1.2.1 Normality analysis

Goodness of fit indicators for first measurement model are shown in Table 14.

Table 14: GOF indicators for Model 1

	Estimator		Cutoff and recommended values
	ML	Robust (MLR)	
χ2	5371.70	4192.95	
df	1624	1624	
χ2/df	3.31	2.58	≤ 3:1 (Hair et al., 2014)
RMSEA	0.062; 0.060-0.065 with confidence interval		≤ 0.06 (Hu & Bentler, 2009) Recommended to report with confidence levels (Hair et al., 2014)
SRMR	0.076		≤ 0.09 (Hu & Bentler, 2009) ≤ 0.08 (Hair et al., 2014)
CFI	0.768		> 0.9 (Hair et al., 2014)
TLI	0.756		Closer to 1 indicates better fit (Hair et al., 2014)

There were two items with factor loadings on their respective constructs smaller than 0.32: item SA3 from the scale "surface approach" ("I've tended to take what we've been taught at face value without questioning it much") and item LS2 from the scale "social influence when using LMS" ("I use LMS because most of my classmates do"). These items were removed from the analysis (Tabachnick & Fidell, 2013). Table 15, below, lists all factor loadings, with those smaller than 0.32 in bold.

In addition to removing items with factor loadings less than 0.32 (SA3 and LS2), modification indices were run to evaluate the potential improvements of the model. This step was done iteratively, each factor at a time and with model as a whole. It is important to note that any modification indices that get included in the model must be theoretically supported (Hair et al., 2014, p. 626). List of added indices is available in Appendix A.

Table 15: Factor loadings in Model 1

Latent Factor	Indicator	B	SE	Z	p-value	Beta
SA	SA1	1.000	0.000	NA	NA	0.602
SA	SA2	1.204	0.132	9.112	0.000	0.724
SA	**SA3**	**-0.018**	**0.085**	**-0.212**	**0.832**	**-0.012**
SA	SA4	0.786	0.109	7.207	0.000	0.483
OA	OA1	1.000	0.000	NA	NA	0.680
OA	OA2	1.053	0.080	13.208	0.000	0.797
OA	OA3	1.063	0.083	12.859	0.000	0.706
OA	OA4	0.551	0.091	6.060	0.000	0.344
DA	DA1	1.000	0.000	NA	NA	0.517
DA	DA2	0.913	0.120	7.623	0.000	0.439
DA	DA3	1.361	0.147	9.229	0.000	0.596
DA	DA4	1.608	0.145	11.093	0.000	0.728
DA	DA5	1.281	0.122	10.484	0.000	0.647
DA	DA6	1.291	0.146	8.844	0.000	0.576
DA	DA7	0.800	0.145	5.510	0.000	0.348
DA	DA8	1.191	0.137	8.682	0.000	0.542
DA	DA9	1.035	0.130	7.943	0.000	0.501
TL	AC1	1.000	0.000	NA	NA	0.572
TL	AC2	1.020	0.067	15.243	0.000	0.602
TL	AC3	0.987	0.078	12.697	0.000	0.602
TL	AC4	1.094	0.083	13.134	0.000	0.640
TL	AC5	1.050	0.078	13.420	0.000	0.656
TL	CH1	0.724	0.094	7.743	0.000	0.418
TL	CH2	0.940	0.100	9.431	0.000	0.506
TL	TU1	1.182	0.102	11.584	0.000	0.655
TL	TU2	1.160	0.105	11.040	0.000	0.637
TL	TU3	1.151	0.101	11.393	0.000	0.619
TL	TU4	1.139	0.098	11.619	0.000	0.668
TL	TU5	1.126	0.107	10.536	0.000	0.586
TL	SF1	1.035	0.077	13.471	0.000	0.626
TL	SF2	1.114	0.090	12.389	0.000	0.688
TL	SF3	1.164	0.097	11.991	0.000	0.669
TL	SF4	1.294	0.099	13.088	0.000	0.713
TL	SF5	1.217	0.108	11.294	0.000	0.703
TL	AU1	0.785	0.098	8.007	0.000	0.462
TL	AU2	0.808	0.099	8.123	0.000	0.436
TL	SE1	1.135	0.096	11.837	0.000	0.671
TL	SE2	1.155	0.094	12.256	0.000	0.652
TL	SS1	0.730	0.095	7.679	0.000	0.429
TL	SS2	0.864	0.097	8.897	0.000	0.494
TL	IE1	1.289	0.103	12.501	0.000	0.710
TL	IE2	1.352	0.106	12.755	0.000	0.737
EL	ES1	1.000	0.000	NA	NA	0.657
EL	ES2	1.101	0.085	12.918	0.000	0.661
EL	ES3	1.279	0.094	13.640	0.000	0.722
EL	ES4	1.292	0.090	14.334	0.000	0.786
EL	ES5	1.269	0.099	12.835	0.000	0.759
LC	LC1	1.000	0.000	NA	NA	0.585
LC	LC2	1.310	0.146	8.968	0.000	0.550
LC	LC3	1.288	0.112	11.538	0.000	0.673
LC	LC4	1.461	0.141	10.350	0.000	0.666
LA	LA1	1.000	0.000	NA	NA	0.819
LA	LA2	1.172	0.056	20.904	0.000	0.862
LA	LA3	1.185	0.057	20.658	0.000	0.932
LA	LA4	1.044	0.048	21.760	0.000	0.831

LS	LS1	1.000	0.000	NA	NA	0.414
LS	**LS2**	**0.514**	**0.111**	**4.637**	**0.000**	**0.202**
LS	LS3	2.014	0.227	8.879	0.000	0.911
LS	LS4	1.778	0.208	8.538	0.000	0.811

4.1.1.2 Final measurement model

After removing items that loaded less than 0.32 (SA3 and LS2) and adding modification indices, a new, final measurement model, Model 2 was created in RStudio. Confirmatory factor analysis was run again, with goodness of fit indicators for Model 2 listed in Table 16.

Table 16: GOF indicators for Model 2

	Estimator		**Cutoff and recommended values**
	ML	Robust (MLR)	
χ2	3664.76	2866.06	
df	1482	1482	
χ2/df	2.47	1.93	≤ 3:1 (Hair et al., 2014)
RMSEA	0.048; 0.045-0.050 with confidence interval		≤ 0.06 (Hu & Bentler, 2009) Recommended to report with confidence levels (Hair et al., 2014)
SRMR	0.066		≤ 0.09 (Hu & Bentler, 2009) ≤ 0.08 (Hair et al., 2014)
CFI	0.873		> 0.9 (Hair et al., 2014)
TLI	0.863		Closer to 1 indicates better fit (Hair et al., 2014)

Goodness of fit indicators χ2/df, SRMR, and RMSEA show good fit for Model 2, meaning that the data represents the suggested factor structure well. CFI is slightly below the recommended threshold.

In Model 2, factor loadings were between 0.343 and 0.947, as seen in table 17.

Table 17: Factor loadings in Model 2

Latent Factor	Indicator	B	SE	Z	p-value	Loading
SA	SA1	1.000	0.000	NA	NA	0.603
SA	SA2	1.207	0.136	8.900	0	0.727
SA	SA4	0.781	0.109	7.192	0	0.481
OA	OA1	1.000	0.000	NA	NA	0.684
OA	OA2	1.042	0.079	13.212	0	0.794
OA	OA3	1.054	0.083	12.743	0	0.705
OA	OA4	0.546	0.090	6.036	0	0.343
DA	DA1	1.000	0.000	NA	NA	0.566
DA	DA2	0.885	0.114	7.747	0	0.466
DA	DA3	1.149	0.128	8.974	0	0.550
DA	DA4	1.458	0.123	11.823	0	0.724
DA	DA5	1.155	0.106	10.853	0	0.639
DA	DA6	1.154	0.122	9.426	0	0.564
DA	DA7	0.722	0.129	5.583	0	0.344
DA	DA8	1.118	0.122	9.196	0	0.557
DA	DA9	0.955	0.116	8.248	0	0.506
TL	AC1	1.000	0.000	NA	NA	0.556
TL	AC2	1.002	0.069	14.617	0	0.585
TL	AC3	0.982	0.080	12.275	0	0.577
TL	AC4	1.102	0.088	12.530	0	0.624
TL	AC5	1.050	0.082	12.786	0	0.642
TL	CH1	0.735	0.100	7.353	0	0.409
TL	CH2	0.970	0.108	8.992	0	0.503
TL	TU1	1.231	0.111	11.065	0	0.657
TL	TU2	1.207	0.115	10.475	0	0.639
TL	TU3	1.222	0.113	10.864	0	0.634
TL	TU4	1.213	0.109	11.116	0	0.685
TL	TU5	1.186	0.118	10.070	0	0.595
TL	SF1	1.073	0.084	12.835	0	0.625
TL	SF2	1.172	0.099	11.787	0	0.697
TL	SF3	1.198	0.106	11.330	0	0.664
TL	SF4	1.321	0.106	12.417	0	0.702
TL	SF5	1.223	0.114	10.749	0	0.681
TL	AU1	0.820	0.105	7.784	0	0.465
TL	AU2	0.853	0.108	7.925	0	0.444
TL	SE1	1.156	0.103	11.185	0	0.658
TL	SE2	1.168	0.101	11.575	0	0.635
TL	SS1	0.731	0.101	7.249	0	0.414
TL	SS2	0.876	0.104	8.393	0	0.482
TL	IE1	1.310	0.113	11.615	0	0.695
TL	IE2	1.370	0.115	11.866	0	0.720
EL	ES1	1.000	0.000	NA	NA	0.704
EL	ES2	1.014	0.077	13.135	0	0.652
EL	ES3	1.143	0.091	12.624	0	0.692
EL	ES4	1.227	0.084	14.610	0	0.800
EL	ES5	1.179	0.093	12.637	0	0.756
LC	LC1	1.000	0.000	NA	NA	0.610
LC	LC2	0.939	0.127	7.398	0	0.411
LC	LC3	1.307	0.111	11.793	0	0.712
LC	LC4	1.170	0.118	9.889	0	0.556
LA	LA1	1.000	0.000	NA	NA	0.795
LA	LA2	1.210	0.062	19.643	0	0.864
LA	LA3	1.241	0.064	19.343	0	0.947
LA	LA4	1.048	0.049	21.330	0	0.809
LS	LS1	1.000	0.000	NA	NA	0.402

LS	LS3	2.072	0.242	8.574	0	0.909
LS	LS4	1.843	0.223	8.265	0	0.816

In table 18, descriptive statistics for each item and scale in Model 2 are shown, including mean, standard deviation, skewness and kurtosis.

Table 18: Descriptive statistics for each item and scale in Model 2

	Mean	**Std. Deviation**	**Skewness**		**Kurtosis**	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
DA1	3.33	.920	-.472	.107	.166	.214
DA2	3.72	.989	-.566	.107	-.205	.214
DA3	2.93	1.086	-.055	.107	-.637	.214
DA4	3.14	1.050	-.142	.107	-.498	.214
DA5	3.25	.942	-.281	.107	-.062	.214
DA6	3.45	1.066	-.453	.107	-.309	.214
DA7	3.00	1.093	.017	.107	-.664	.214
DA8	3.21	1.045	-.143	.107	-.484	.214
DA9	3.57	.982	-.617	.107	.114	.214
Deep approach	**29.6171**	**5.60364**	**-.151**	**.107**	**.181**	**.214**
SA1	2.81	1.173	.094	.107	-.861	.214
SA2	2.74	1.174	.273	.107	-.717	.214
SA4	2.72	1.148	.081	.107	-.785	.214
Surface approach	**8.2745**	**2.63419**	**.227**	**.107**	**-.347**	**.214**
OA1	3.35	1.098	-.273	.107	-.596	.214
OA2	3.29	.986	-.224	.107	-.330	.214
OA3	3.16	1.124	-.227	.107	-.646	.214
OA4	3.47	1.197	-.512	.107	-.599	.214
Strategic (organized) approach	**13.2831**	**3.19525**	**-.246**	**.107**	**-.110**	**.214**
ES1	3.58	.976	-.465	.107	.119	.214
ES2	3.86	1.069	-.861	.107	.302	.214
ES3	3.43	1.135	-.464	.107	-.402	.214
ES4	3.62	1.054	-.551	.107	-.094	.214
ES5	3.52	1.072	-.435	.107	-.229	.214
Experience with e-learning	**18.0086**	**4.14328**	**-.390**	**.107**	**.078**	**.214**
LC1	3.79	.877	-.641	.107	.633	.214
LC2	3.05	1.222	-.109	.107	-.885	.214
LC3	3.84	.982	-.697	.107	.241	.214
LC4	3.42	1.126	-.339	.107	-.531	.214
Learner control	**14.0950**	**3.10446**	**-.069**	**.107**	**-.093**	**.214**
LA1	1.85	1.098	1.098	.107	.369	.214

LA2	2.19	1.223	.644	.107	-.665	.214
LA3	2.01	1.143	.791	.107	-.406	.214
LA4	1.93	1.130	.998	.107	.109	.214
LMS: Anxiety	**7.9779**	**4.12648**	**.800**	**.107**	**-.211**	**.214**
LS1	2.85	1.071	-.196	.107	-.285	.214
LS3	3.79	.982	-.529	.107	-.035	.214
LS4	3.92	.973	-.755	.107	.339	.214
LMS: Social	**10.5662**	**2.42105**	**-.422**	**.107**	**.428**	**.214**
TU5	3.00	1.159	-.099	.107	-.697	.214
SF1	3.75	.998	-.625	.107	.011	.214
SF2	3.47	.977	-.388	.107	.080	.214
SF3	3.44	1.049	-.401	.107	-.249	.214
SF4	3.45	1.094	-.377	.107	-.347	.214
SF5	3.35	1.044	-.359	.107	-.199	.214
AU1	3.77	1.026	-.672	.107	.037	.214
AU2	3.13	1.117	-.192	.107	-.494	.214
SE1	3.41	1.021	-.459	.107	.030	.214
SE2	3.60	1.070	-.543	.107	-.108	.214
SS1	3.76	1.027	-.558	.107	-.045	.214
SS2	3.59	1.056	-.501	.107	-.093	.214
IE1	3.20	1.096	-.275	.107	-.399	.214
IE2	3.32	1.106	-.334	.107	-.398	.214
AC1	3.76	1.054	-.832	.107	.263	.214
AC2	3.73	1.023	-.665	.107	.017	.214
AC3	3.76	.989	-.635	.107	.085	.214
AC4	3.68	1.031	-.636	.107	-.102	.214
AC5	3.69	.965	-.482	.107	.042	.214
CH1	3.78	1.044	-.672	.107	-.024	.214
CH2	3.05	1.121	-.111	.107	-.593	.214
TU1	3.07	1.089	-.093	.107	-.499	.214
TU2	3.05	1.098	-.110	.107	-.515	.214
TU3	3.14	1.121	-.285	.107	-.616	.214
TU4	3.04	1.029	-.145	.107	-.216	.214
Teaching-learning environment	**85.9904**	**16.55744**	**-.148**	**.107**	**.536**	**.214**

<u>The good fit of the measurement model:</u>

- Confirms that the empirical data fit the hypothesized measurement model well
- Confirms the factorial validity of the questionnaire
- Allows further analysis to explore the relationships between constructs

4.1.1.3 Reliability

To assess reliability of scales, Cronbach alpha and CR were calculated. There are two constructs worth reviewing further when it comes to reliability.

First, Cronbach alpha for **surface approach** is 0.62, still above the limit of 0.6 (Hair et al., 2014, p. 90), but smaller than usually accepted 0.7. Cronbach alpha is sensitive on number of items in scale; given there are three items in surface approach construct, it is expected to have a slightly lower alpha. The surface approach alpha was also below 0.7 in the original research (ETL Project, n.d.); further, there are also considerations regarding the phase of the research (Hair et al., 2014, p. 123; Robinson, Shaver, & Wrightsman, 1991) and number of items in a factor. Composite reliability for this construct is smaller than expected 0.7, which is a limitation in the research and should be looked into in further research. In pilot research, Cronbach alpha for surface approach was 0.7 and CR was 0.74, which were slightly better values.

The second construct worth reviewing when it comes to reliability is **learner control**. In the original research, Cronbach alpha for this construct was 0.59 and in another following research, the reliability with 3 items was 0.579 (Jung, Kim, Yoon, Park, & Oakley, 2019). In pilot research, learner control alpha was 0.59 so reliability was improved by adding an additional item to this scale with alpha of 0.71 in the main research. CR however is smaller than 0.7, also being one of the limitations of the research.

Table 19: Reliability of scales

	# of items	Alpha in 1st measurement model	#of items	Alpha in final measurement model	Composite reliability (CR)
Surface approach	4	0.51	3	0.62	0.64
Deep approach	9	0.79	9	0.79	0.80
Strategic approach	4	0.70	4	0.70	0.74
Teaching and learning environment	25	0.94	25	0.94	0.94
Experience with e-learning	5	0.84	5	0.84	0.85
Learner control	4	0.71	4	0.71	0.66
LMS anxiety	4	0.92	4	0.92	0.92
LMS social	4	0.69	3	0.72	0.77

It is important to highlight that a Cronbach alpha of 1 would mean that the same question is asked repeatedly. Cronbach alpha is heavily impacted by number of items where larger number of items tends to yield higher alpha score. In this research, only the core of items (except for teaching-learning environment) were included.

Earlier, in the pilot research, all factors but learner control had alpha larger than 0.7, including each subscale of the factor teaching-learning environment.

4.1.1.4 Hypothesis testing

Hypotheses are tested by capturing the correlations between factors in the measurement model. Table 20 lists correlations between factors that are hypothesized in this thesis; there are other correlations in the measurement model.

The correlation matrix indicated statistically significant correlations between some of the factors, in table 20 in bold and colored in gray.

Table 20: Correlations between constructs

	SA	OA	DA	TL	EL	LC	LA	LS
SA	1.000							
OA	**-0.154**	1.000						
DA	**-0.289**	**0.616**	1.000					
TL	**-0.513**	**0.305**	**0.622**	1.000				
EL	**-0.339**	**0.289**	**0.547**	**0.756**	1.000			
LC	**-0.296**	**0.447**	**0.513**	**0.581**	**0.725**	1.000		
LA	**0.193**	0.026	-0.015	-0.025	**-0.179**	**-0.263**	1.000	
LS	-0.040	**0.146**	**0.348**	**0.349**	**0.538**	**0.505**	**-0.250**	1.000

In table 21, correlations between hypothesized factors in this study are outlined, along with B, standard error, Z score, p-value and Beta. This table provides a detailed overview of hypothesized correlations.

Table 21: Correlations between constructs

		B	SE	Z	p-value	Beta
---	---	---	---	---	---	---
Deep approach	Experience with e-learning	0.195	0.029	6.761	0.000	0.547
Surface approach	Experience with e-learning	-0.164	0.035	-4.675	0.000	-0.339
Strategic approach	Experience with e-learning	0.149	0.032	4.686	0.000	0.289
Deep approach	Learner control	0.143	0.023	6.169	0.000	0.513
Surface approach	Learner control	-0.112	0.029	-3.899	0.000	-0.296
Strategic approach	Learner control	0.179	0.029	6.222	0.000	0.447
Deep approach	LMS: Anxiety	-0.007	0.025	-0.262	0.793	-0.015
Surface approach	LMS: Anxiety	0.119	0.037	3.176	0.001	0.193
Strategic approach	LMS: Anxiety	0.017	0.036	0.486	0.627	0.026
Deep approach	LMS: Social influence	0.078	0.016	4.945	0.000	0.348
Surface approach	LMS: Social influence	-0.012	0.019	-0.660	0.509	-0.040
Strategic approach	LMS: Social influence	0.047	0.019	2.502	0.012	0.146
Deep approach	Teaching and learning environment	0.188	0.027	6.876	0.000	0.622
Surface approach	Teaching and learning environment	-0.211	0.039	-5.417	0.000	-0.513
Strategic approach	Teaching and learning environment	0.133	0.027	4.951	0.000	0.305

Finally, in table 22, all hypotheses with results are listed in a simpler format; for each hypothesized relationship, it is outlined whether the hypothesis is supported or rejected in this research, along with the strength and direction of the correlation.

Table 22: Hypothesis testing: supported and rejected hypotheses

Hypo-thesis		p-value	Beta	Result
H1a	There is a correlation between experience with e-learning and deep approach to learning	0.000	0.547	Supported
H1b	There is a correlation between experience with e-learning and surface approach to learning	0.000	-0.339	Supported
H1c	There is a correlation between experience with e-learning and strategic approach to learning	0.000	0.289	Supported
H2a	There is a correlation between learner control and deep approach to learning	0.000	0.513	Supported
H2b	There is a correlation between learner control and surface approach to learning	0.000	-0.296	Supported
H2c	There is a correlation between learner control and strategic approach to learning	0.000	0.447	Supported
H3a	There is a correlation between anxiety when using LMS and deep approach to learning	0.793	-0.015	Rejected
H3b	There is a correlation between anxiety when using LMS and surface approach to learning	0.001	0.193	Supported
H3c	There is a correlation between anxiety when using LMS and strategic approach to learning	0.627	0.026	Rejected
H4a	There is a correlation between social influence in using LMS and deep approach to learning	0.000	0.348	Supported
H4b	There is a correlation between social influence in using LMS and surface approach to learning	0.509	-0.040	Rejected
H4c	There is a correlation between social influence in using LMS and strategic approach to learning	0.012	0.146	Supported
H5a	There is a correlation between experience with teaching-learning environment and deep approach to learning	0.000	0.622	Supported
H5b	There is a correlation between experience with teaching-learning environment and surface approach to learning	0.000	-0.513	Supported
H5c	There is a correlation between experience with teaching-learning environment and strategic approach to learning	0.000	0.305	Supported

Discussion of the results is available in chapter 5.1 Discussion

4.1.2 Approaches to learning between groups

In this chapter, differences in each of the approaches to learning based on gender, status, course unit (area of study), use of MOOCs and/or educational videos and having MOOCs/videos in the final grade are evaluated. When exploring difference in approaches to learning based on course units, course units are anonymized and showed with numbers 1-7. The order does not follow the order of course units shown in chapter 3.2.1 Quantitative sample and data collection.

4.1.2.1 Normality analysis

The first step in analyzing difference in each of the approaches to learning among groups is to determine the normality of distribution of the dependent variable.

There are three dependent variables: deep, surface, and strategic approach. Kolmogorov-Smirnov and Shapiro-Wilk tests were used to assess the normality of distribution. Both tests show that the dependent variables do not have normal distribution ($p < 0.05$), presented in table 23.

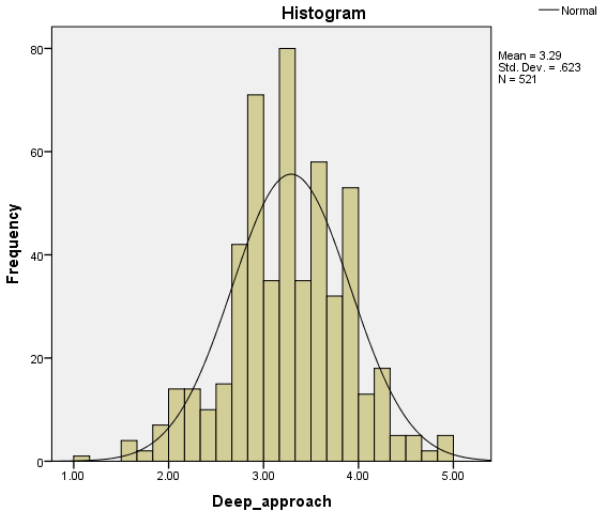
Table 23: Tests of normality

	Kolmogorov-Smirnov[a]			**Shapiro-Wilk**		
	Statistic	df	Sig.	Statistic	df	Sig.
Deep approach	.061	521	.000	.993	521	.013
Surface approach	.092	521	.000	.979	521	.000
Strategic approach	.087	521	.000	.984	521	.000
a. Lilliefors Significance Correction						

Graphical plots and skewness and kurtosis analysis were further evaluated to assess the departure from normality (Hair et al., 2014, p. 72), as these tests are affected by large samples in which small deviations from normality yield significant result (Field, 2009, p. 788).

Figures 3-10 show the distribution of the variables and Q-Q plots for each of the approaches to learning.

Deep approach



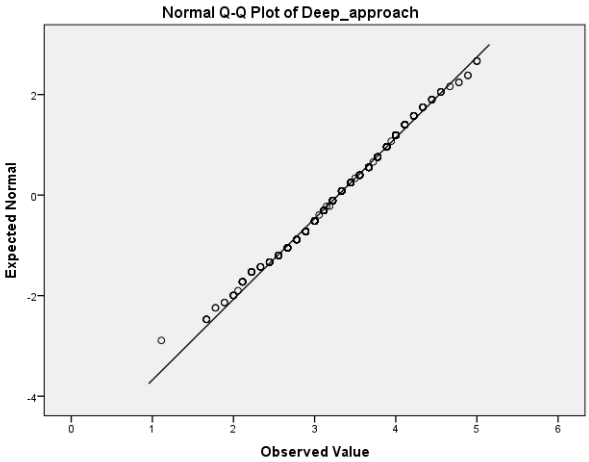
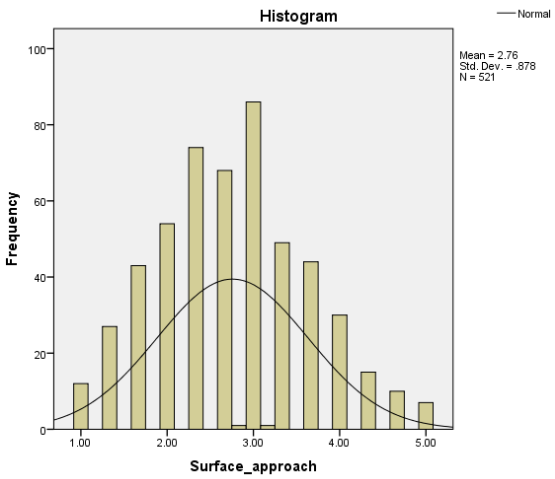


Figure 3: Histogram: deep approach

Figure 4: Q-Q plot: deep approach

Surface approach



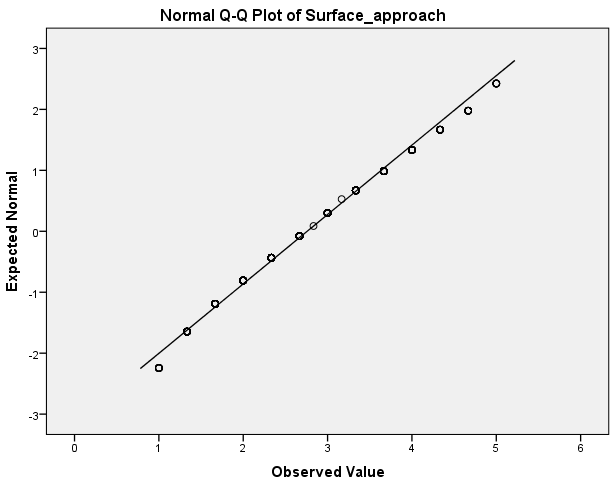
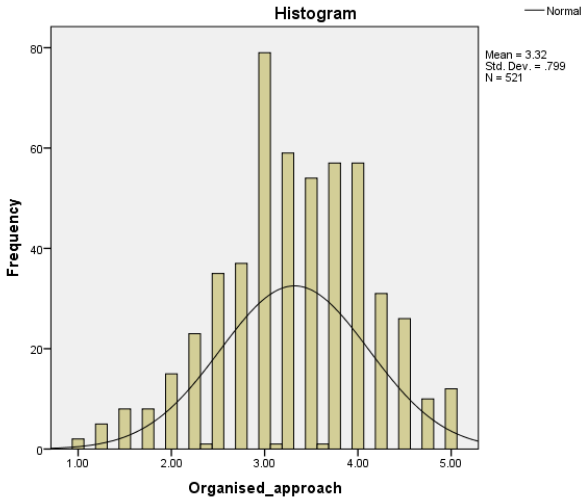


Figure 5: Q-Q plot: surface approach

Figure 6: Histogram: surface approach

Strategic (organized) approach



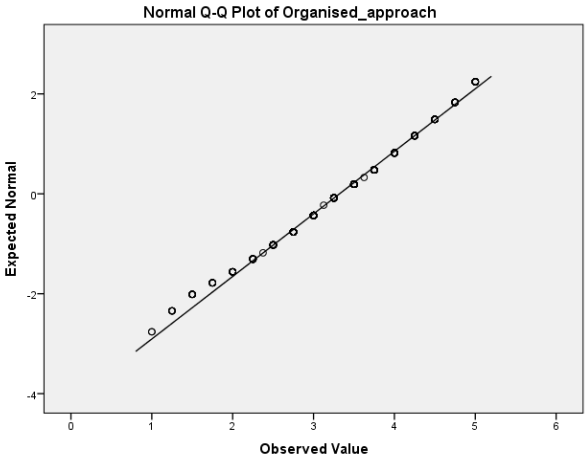


Figure 7: Q-Q plot: strategic approach

Figure 8: Histogram: strategic approach

Table 24 shows the skewness and kurtosis for each of the variables of approaches to learning, as well as the score when dividing both skewness and kurtosis with standard error to decide how best to treat the variables based on their distribution and which tests should be used.

Table 24: Skewness and kurtosis for dependent variables

	N	Mean	Std. Deviation	Skewness Std.Error: 0.107		Kurtosis Std.Error: 0.214	
				Skewness	Skewness/S.E.	Kurtosis	Kurtosis/S.E.
Deep approach	521	3.2908	.62263	-.151	1.410	.181	.848
Surface approach	521	2.7582	.87806	.227	2.121	-.347	1.623
Strategic approach	521	3.3208	.79881	-.246	2.300	-.110	.514

Based on analysis of skewness and kurtosis for the three variables, it is concluded that deep approach can be analyzed as a variable with normal distribution (1.410<1.96). Skewness and kurtosis of variables surface and strategic approach show that the variables do vary from normal distribution. Still, plots show that the deviation is small. Because of this, both parametric and non-parametric tests will be used to measure differences in these approaches to learning between groups.

4.1.2.2 Differences in deep approach to learning

First, the question: "Is there a difference in deep approach to learning based on gender, status, subject (area of study), use of MOOCs and/or educational videos and having MOOCs/videos in the final grade?" is answered. In this and all subsequent analyses, the constructs videos and MOOCs being a part of the final grade were removed from the analysis. It was noticed that students have responded to that question inconsistently. For example, all students in subjects in Faculty of Economics in Split had the videos as a part of their final grade, yet not all of them answered "Yes" when asked that question, showing that the question will need to be rephrased for any future research; more on this in Limitations.

An independent samples t-test was conducted to compare the deep approach between these groups of students:

- Male and female students - gender
- Full and part time students - status
- Students that participated in a MOOC and students who did not (Use of MOOC)
- Students who used educational videos prepared for the course unit and students who did not (Use of Videos)

Table 25 outlines the results of a t-test for equality of means, including Levene's test. Based on the output in table 25, t-test was significant for difference in deep approach between groups based on gender, use of MOOCs, and use of videos.

Table 25: t-test significance for deep approach between groups

	Levene's Test		**t-test for Equality of Means**			
	F	Sig.	t	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Deep approach and gender	.133	.715	2.12	**.034**	.11900	.05612
Deep approach and status	.007	.933	.045	.964	.00455	.10029
Deep approach and use of MOOCs	.618	.432	.699	**.007**	.29234	.10831
Deep approach and use of video	2.772	.097	.750	**.006**	.16372	.05953

Gender

Table 26: Deep approach and gender

Gender		N	Mean	Std. Deviation	Std. Error Mean
Deep approach	Female	325	3.3356	.60237	.03341
	Male	196	3.2166	.64962	.04640

There was a significant difference in score between male and female students. Female students scored higher on deep approach to learning than male students.

Status

There was no statistically significant difference in deep approach between full time and part time students (p=.964).

Use of MOOCs

Table 27: Deep approach and MOOCs

Use_MOOC		N	Mean	Std. Deviation	Std. Error Mean
Deep approach	Yes	35	3.5635	.63230	.10688
	No	486	3.2711	.61795	.02803

There was a significant difference in score between students who participated in a MOOC and students who did not participate in a MOOC. Students participating in a MOOC scored higher on deep approach to learning than students who did not participate in a MOOC.

Use of video

Table 28: Deep approach and videos

Use_Video		N	Mean	Std. Deviation	Std. Error Mean
Deep approach	Yes	365	3.3405	.64304	.03366
	No	154	3.1768	.55952	.04509

There was a significant difference in score between students who used educational video in class and students who did not. Students who used educational videos scored higher on deep approach to learning than students who did not use the videos.

Course unit

One way ANOVA was conducted to compare the deep approach between students in different course units. There was no statistically significant difference in deep approach to learning between student in different course units (F = 1.418, p=.206).

4.1.2.3 Differences in surface approach to learning

Second, the question "Is there a difference in surface approach to learning based on gender, status, subject (area of study), use of MOOCs and educational videos" is answered.

Surface approach variable had a small deviation from normal distribution so non-parametric Mann-Whitney test was conducted following the t-test to evaluate the differences between groups:

- Male and female students - gender
- Full and part time students - status
- Students that participated in a MOOC and students who did not (Use of MOOC)
- Students who used educational videos prepared for the course unit and students who did not (Use of Videos)

Table 29 outlines the results of a t-test for equality of means, including Levene's test. Based on the output in table 29, t-test was significant for difference in surface approach between groups based on gender and use of videos.

Table 29: t-test significance for surface approach between groups

	Levene's Test		**t-test for Equality of Means**			
	F	Sig.	t	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Surface approach and gender	3.173	.075	-2.108	**.035**	-.16686	.07915
Surface approach and status	2.447	.118	-.154	.877	-.02182	.14144
Surface approach and use of MOOCs	.006	.936	-1.571	.117	-.24102	.15345
Surface approach and use of videos	2.119	.146	-2.066	**.039**	-.17410	.08427

Gender

Table 30: Surface approach and gender

Gender		N	Mean	Std. Deviation	Std. Error Mean
Surface approach	Female	325	2.6954	.90534	.05022
	Male	196	2.8622	.82259	.05876

Based on t-test, there was a significant difference in score between male and female students. Male students scored higher on surface approach to learning than female students.

However, the significant difference was not confirmed in Mann Whitney test (p = .270) which showed that there is no significant difference between male and female students in surface approach. Given the small deviation from normal distribution, in this thesis, Mann Whitney results are accepted and thus no significant difference on surface approach between male and female students is to be reported.

Status

There was no statistically significant difference in surface approach between full time and part time students (p=.877)

Use of MOOCs

There was no significant difference in surface approach to learning between students who participated in a MOOC and those who did not (p=.117)

Use of videos

Table 31: Surface approach and use of videos

Use_Video		N	Mean	Std. Deviation	Std. Error Mean
Surface approach	Yes	365	2.7068	.89244	.04671
	No	154	2.8810	.83903	.06761

There was a significant difference in score between students who used educational video in class and students who did not. Students who did not use educational videos scored higher on surface approach to learning than students who did use the videos.

Mann Whitney test supported the findings (p = .010) that there is in fact difference in surface approach between students who used and students who did not use educational videos in class.

Course unit

To compare surface approach between students in different course units, one way ANOVA following the non-parametric Kruskal-Wallis test was performed. There was statistically significant difference in surface approach to learning between students in different course units, confirmed with both tests. ANOVA: $p = 0.002$, Kruskal-Wallis: $p = 0.005$.

Kruskal-Wallis test showed that there was a statistically significant difference in surface approach between students in different subjects/course units ($\chi 2 = 18.493$, $p = 0.005$) with a mean rank surface approach score for each of the subjects shown in table 32.

Table 32: Surface approach and subjects

	Course unit	Mean Rank
Surface approach	1	171.59
	2	265.31
	3	252.69
	4	273.24
	5	203.48
	6	271.96
	7	279.18

Dunn-Bonferroni post hoc method was used to determine where statistical difference is coming from through pairwise comparisons. Four significant differences were captured between course units 1 and: 2, 6, 4, 7. Students at course unit 1 scored lowest on surface approach to learning; this was one of the course units in one of the Faculties of Philosophy.

4.1.2.4 Differences in strategic approach to learning

Finally, the question "Is there a difference in strategic (organized) approach to learning based on gender, status, subject (area of study), use of MOOCs and educational videos" is answered.

Strategic approach variable had a small deviation from normal distribution so non-parametric Mann-Whitney test was conducted following the t-test to evaluate the differences between groups:

- Male and female students - gender
- Full and part time students - status
- Students that participated in a MOOC and students who did not (Use of MOOC)

- Students who used educational videos prepared for the course unit and students who did not (Use of Videos)

Table 33 outlines the results of a t-test for equality of means, including Levene's test. Based on the output in table 33, t-test was significant for difference in strategic approach between groups based on gender and use of videos.

Table 33: t-test significance for strategic approach between groups

	Levene's Test		**t-test for Equality of Means**			
	F	Sig.	t	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Strategic approach and gender	.236	.627	5.191	**.000**	.36599	.07051
Strategic approach and status	1.529	.217	.006	.996	.00071	.12867
Strategic approach and use of MOOCs	3.365	.067	1.320	.187	.18447	.13970
Strategic approach and use of videos	.035	.851	3.846	**.000**	.29172	.07585

Gender

Table 34: Strategic approach and gender

Gender		N	Mean	Std. Deviation	Std. Error Mean
Strategic approach	Female	325	3.4585	.77921	.04322
	Male	196	3.0925	.78025	.05573

Based on t-test, there was a significant difference in score between male and female students. Female students scored higher on strategic approach to learning than male students.

Mann Whitney test supported the findings (p = .000) that there is in fact a difference in strategic approach between male and female students.

Status

There was no statistically significant difference in strategic approach between full time and part time students (p=.996)

Use of MOOCs

There was no significant difference in strategic approach to learning between students who participated in a MOOC and those who did not (p=.187)

Use of videos

Table 35: Strategic approach and use of videos

Use_Video		N	Mean	Std. Deviation	Std. Error Mean
Strategic approach	Yes	365	3.4062	.78960	.04133
	No	154	3.1144	.78875	.06356

There was a significant difference in score between students who used educational video in class and students who did not. Students who used educational videos scored higher on strategic approach to learning than students who did not use the videos.

Mann Whitney test supported the findings (p = .001) that there is in fact difference in strategic approach between students who used and students who did not use educational videos in class.

Course unit

To compare strategic approach between students in different course units, one way ANOVA following the non-parametric Kruskall-Wallis test was performed.

There was statistically significant difference in strategic approach to learning between students in different course units, confirmed with both tests; ANOVA: p = 0.000, Kruskall-Wallis: p = 0.000. Kruskal-Wallis test showed that there was a statistically significant difference in strategic approach between students in different subjects/course units ($\chi 2$ = 36.435, p = 0.000) with a mean rank strategic approach score for each of the subjects shown in table 36.

Table 36: Strategic approach and subjects

	Course unit	Mean Rank
Strategic approach	1	247.29
	2	267.49
	3	285.74
	4	268.70
	5	189.00
	6	290.22
	7	178.84

Dunn-Bonferroni post hoc method was used to determine where statistical difference is coming from through pairwise comparisons. Five significant differences were captured: between course units 7 and: 2, 3, 4, 6, as well as between course units 5 and 6. Students at course unit 7 scored lowest on strategic approach to learning; this was one of the course units in one of the Faculties of Economics.

4.1.3 Summary of quantitative results

In this chapter, summary of quantitative results is covered, firstly looking at accepted hypothesis and then at differences between groups of students.

Summary of accepted hypotheses

Table 37 summarized the accepted hypothesis and shows the direction and the strength of the correlation.

Table 37: Summary of accepted hypotheses, $p < 0.05$

Hypo-thesis		Beta
Experience with e-learning		
H1a	There is a significant positive correlation between experience with e-learning and deep approach to learning	.547
H1b	There is a significant negative correlation between experience with e-learning and surface approach to learning	-.339
H1c	There is a significant positive correlation between experience with e-learning and strategic approach to learning	.289
Learner control		
H2a	There is a significant positive correlation between learner control and deep approach to learning	.513
H2b	There is a significant negative correlation between learner control and surface approach to learning	-.296
H2c	There is a significant positive correlation between learner control and strategic approach to learning	.447
Anxiety when using LMS		
H3b	There is a significant positive correlation between anxiety when using LMS and surface approach to learning	.193
Social influence when using LMS		
H4a	There is a significant positive correlation between social influence in using LMS and deep approach to learning	.348
H4c	There is a significant positive correlation between social influence in using LMS and strategic approach to learning	.146
Teaching-learning environment		
H5a	There is a significant positive correlation between experience with teaching-learning environment and deep approach to learning	.622
H5b	There is a significant negative correlation between experience with teaching-learning environment and surface approach to learning	-.513
H5c	There is a significant positive correlation between experience with teaching-learning environment and strategic approach to learning	.305

Summary of differences in approaches to learning between groups

Summary of differences detected between groups of students for each approach to learning is shown Table 38; statistically significant difference in approach to learning between the groups of students is marked with "X".

Table 38: Summary of detected differences in approach to learning between groups

	Deep approach	Surface approach	Strategic approach
Gender	X	X	X
Subject/course unit		X	X
Use of videos	X	X	X
Use of MOOC	X		

Based on this research, there is a significant difference in deep approach to learning between:

a) male and female students - female students scored higher on deep approach to learning than male students.

b) students who use and don't use MOOCs - students participating in a MOOC scored higher on deep approach to learning than students who did not participate in a MOOC

c) students who use and don't use videos - students who used educational videos scored higher on deep approach to learning than students who did not use the videos

Based on this research, there is a significant difference in surface approach to learning between:

a) male and female students – male students scored higher on surface approach to learning than female students.

b) students from different course units – table 32: Surface approach and subjects

c) students who use and don't use videos - students who did not use educational videos scored higher on surface approach to learning than students who did use the videos

Based on this research, there is a significant difference in strategic approach to learning between

a) male and female students – female students scored higher on strategic approach to learning than male students

b) students from different course units – table 36: Strategic approach and subjects

c) students who use and don't use videos - students who used educational videos scored higher on strategic approach to learning than students who did not use the videos

4.2 Qualitative

In this chapter, first the results of the qualitative analysis are clustered in categories and upper level categories. Based on this clustering, a detailed overview of the interview findings (with eight students) is presented.

4.2.1 Categories in qualitative analysis

In the qualitative phase of the research, a general inductive approach was used to analyze the qualitative data (Thomas, 2006). As outlined earlier in Table 8, phases of this approach include: preparation of raw data files, close reading of the text, creation of upper level categories, overlapping coded and uncoded text, and finally continuing revision and refinement of category system. After completing these steps, and reducing the overlap and redundancy, eight categories under five initial upper level categories were sourced. As mentioned earlier, according to (Thomas, 2006), the final model should incorporate only the most important categories that in the evaluator's view "capture the key aspects of the themes identified in the raw data and are assessed to be the most important themes given the evaluation objectives". The core eight categories/themes in the findings of this research, along with the description of the categories were shown earlier in table 11.

Here, in table 39, four upper (main) categories are outlined, further subdivided into eight categories, each with their description and an example of a quote, following recommendations of (Thomas, 2006) for writing research findings in a general inductive approach. The fifth upper level category (teaching) was omitted here as only key results abased on research questions are outlined (Thomas, 2006).

Table 39: Eight categories in qualitative analysis

Upper category	Category	Description	Example of a student quote
Approaches to learning	Approach to and organization of learning	Students describing: (a) ways in which they approached specific tasks in this course unit or the first exam, (b) general time management skills and organization of learning for this course unit or in general	*For exams I believe only few things will be necessary (in real life), but never mind, you have to learn as a whole because there is new information emerging constantly and you never know when you might apply one that you learnt.*
	Impact of perceived content relevance on learning and motivation	Students describing their personal interest in content they are going through, as well as their perceived relevance of specific content for their future and how these impacts their approach to watching videos and going through materials on the LMS.	*The only goal when focusing is that I know that this I will need this content in the future*
Experience with LMS (Moodle)	Ways of and reasons for using materials from LMS	Students describing ways teachers are using the LMS, when, how, and why they access the content, and how easy or difficult it is for them.	*It is all well thought. If you go in (to Moodle), everything is there, new notifications are shown, so you don't have to worry about anything. If you go to Moodle every day, you will not miss a thing.*
	Mobile (phone) use of resources from LMS	Students describing if, when, how, and why they use their mobile phones for accessing material on Moodle.	*When I solve quizzes, I do it on my mobile, it is the easiest way. I take the book in one hand and go through quizzes. Cannot do it differently.*
Experience with educational videos	Recognized technical and quality characteristics of educational videos	Students describing their perception of general quality of videos, including the language, level of detail, and the audio and visual components of videos	*Informatics (videos in Informatics) is great because there is a voice but it also shows (on a video) what to do.*
	General feedback on	Students describing their general experience and	*It is much easier to work with videos, a bit*

	using educational videos in learning process	feedback with using educational videos and this format of teaching and learning. This section also includes (a) presence and role of teacher and general atmosphere in class, (b) use cases and features of videos that are most helpful, (c) relevance of previous knowledge on the covered topic when watching and working with videos, (d) potential to expand to other course units, (e) using external online videos	*more efficient. For example, if we did not have time to do something in class, we come home, watch the videos, remind ourselves a bit and do the set task so no problem there.*
Learner control	Focusing on educational videos	Students describing how they focus on educational videos on individual basis and comparing focusing in classroom setting and at home	*I put on my headset and I need to be in a quiet place. If someone asks me something in any moment, I am done (as in the student loses focus) but I come back to it in 2 seconds. It really has to be quiet, headphones, focus, I follow, peace and quiet around me, definitely.*
	Staying focused when learning in general	Students describing what can take away their focus from learning when learning in general as well as when learning online; comparing online learning and learning from books/papers. .	*I usually had a problem working on a computer because… there are distractions, social media distracts you, Youtube… now you want to watch a video, now you want to listen to music, sometimes you even want to multitask.*

Table 40 shows a detailed overview of interview data for all eight students. Student quotes are written up for each of the categories outlined in the above table 39, as recommended by (Thomas, 2006). If there is a blank cell, it means that a student did not respond to the question or did not share particular thoughts on the item.

Table 40: Qualitative results: interview data analysis

	Student 1	**Student 2**	**Student 3**	**Student 4**	**Student 5**	**Student 6**	**Student 7**	**Student 8**
Approaches to learning								
Approach to and organization of learning	**Deep:** I find the quizzes to be an excellent preparation (for the exam). Quizzes are more difficult and when you solve that quiz and get the needed points, exam will not be such a problem because you already went through everything. Perhaps, it would be good to have quizzes and exam even more similar	**Deep**: When you read something you say „Oh this makes sense“. I know this was connected to the other thing, I remember this from another page...“ **Surface:** You have the motivation of completing the task as soon as possible	**Surface:** Quizzes shouldn't be mandatory. It's a pain to solve them ** The only motivation when watching videos is knowing I won't have to watch them at home ** (When answering the question “What could make the videos better“). Nothing. The videos		**Deep:** On other subjects I have a book and a script so I compare these and write in my notebook. I have to have my notes if I make a conclusion so I can connect things ** I like to learn out loud so I know what I'm talking about, also if I can shorten something and change its form, but keeping the meaning	**Deep:** When I learn for exams, I solve the quizzes in parallel, so it is not difficult. All the material is contained in them. I like that concept of how it's done so we can establish the material through quizzes and see if we made a mistake or missed to learn anything	**Deep:** Sometimes I watch the videos. I understand things well so it's not a problem for me (...) I explore a lot sometimes. **Surface**: I want to go home and have a coffee. Motivation is to do it as soon as possible and go do whatever is my priority that day. **	**Deep:** I used to have informatics in high school and now I've built on that knowledge ** I solve quizzes on my mobile, that's the easiest way. I take the book and solve the quizzes. Can't do it differently ** I would read the whole

	Surface: If you ask me, to pass this exam you had to know the material but then again you forget it all within a week after. **Strategic:** What motivates me mainly is knowing there will be an exam (…) Mostly I prepare like that and so far it's been successful. If I go through everything from beginning to the end, I go	because you can leave early and grab a coffee Yes, I'm motivated internally, if I don't learn, I'll fail and that's it. ** The quizzes helped a bit. There is a lot of questions (...) there are 5 similar responses and you have to guess which one is which. (...) Quizzes didn't really help a lot because you need to establish the	are what they are, nothing to add or remove. **Strategic**: I am not really organized. I keep postponing everything. I'll do it tonight, I'll do it tomorrow, for the weekend, before the exam…		**Surface:** Sometimes I solve the quizzes with pure luck, I click on a few things and press randomly; sometimes I get more points that way then when I'm reading from the book and looking for answers ** For exams; I learned and not. Mostly I remembered some things from quizzes and some told me you can solve some things with luck, so I was reading and		I really didn't (learn), the content is too big so you literally go and solve it with luck. ** (When asked if quizzes helped in preparation for exams): There is too much of it (content) so it's not a huge help because you won't have the same question probably to there is not too much point. **Strategic**	lesson and then underline what I thought was most important. That's how I would build my knowledge **Strategic** I always plan it out. I know when I'll wake up, when I'll do this, when I'll do that (...) I know exactly when I'll eat lunch and when I'll study.

	through lectures and practices and solve all examples I surely have 80% achievement. Whatever I have solved from beginning to the end, I had 80% then. (…) Usually it happens that I don’t have the time to learn. I start learning 2-3 days before and then think I have X hours to learn. Problem is; most of that time I don’t spend learning (…)	course material and through quizzes you can either learn by heart (...) they can offer a little bit, not too much			whatever I remembered, remembered, some things I addressed with logical thinking and conclusion. It has to be in my hands (the learning material) to I can write on it and memorize it in my head. **<u>Organized</u>** I'm not that organized. I tell myself during the day “Now you need to learn” and then it fails so I’m left with evenings. I am and I’m not organized. Depending on what I need for what subject		If I'm practicing some tasks then I'll watch the videos if I forgot something; their purpose is to remind us. Now, if they are attractive to me – now they are not. It's just easier to learn like that if I don't know something I can remind myself than I don't know...	

	As for the practices…I think they're great (...) you're rewarded for consistency, you get additional points if you have this or that							
Impact of perceived content relevance on learning and motivation		These PowerPoint, Word, and Excel that we do it practice units will surely be needed in our future work.	I don't like the content; it was a pain to do it all.			The only goal when focusing is knowing that I will need this in the future (...) I don't do this carelessly so I can go and drink coffee. I go to learn and do everything properly. So when I finish university I know what I've done and that I will need this in my future work	It's not really interesting or fun so I think you lose the will to attend the class. (...) Sometimes I watch it if it's interesting.	On lectures...I didn't go a lot. I only went a few times in the beginning (...). It is probably very interesting for people who are interested in these things (...) This will be useful in

								life, the practices in Word and Excel would be useful in our life but this will not be useful.
Experience with LMS (Moodle)								
Ways of and reasons for using materials from LMS	I also like that some professors put attendance on Moodle, I looked at that; they also upload scripts. It's important, if you don't have a script with you, you can do it on mobile; I go in, download the script and I can learn anytime anywhere. That's why I	For other course units it's not very interactive. It is interactive because they (teachers) upload the presentation s that they go through during class so if we didn't go through something enough we have the material available	Although, it's quite unclear, especially when we first started, I really couldn't find my way around. (in Moodle) ** We're not afraid of anything (when using Moodle)	For any other subject we don't really use it (Moodle) Only for announcements . ** To me it's ok (using Moodle)	I think we use it (Moodle) the same (in different subjects), just that the other subjects don't have these videos but it's mainly for uploading tasks. Mainly it's for announcements . There are two subjects where we're required to upload tasks (…) When I go to Moodle... I use	Sometimes I would watch them (videos) at home to prepare for what we'll do in class. I like the principle of Moodle because there we get all announcement s for exams, about classes, exam results... ** If it happens sometimes that I'm sick, the professor adds the lectures on	If you're interested and if you need it, it's great you can access content from home.	I go to Moodle only for Informatics . Others tell me when there is an exam so I have no need to go in (…) I don't use it all to be honest. In the end of the practices they (teachers) say when there is an

	like Moodle. Most of us have access to internet wherever we are and you can access Moodle and download material and learn something. ** I feel very comfortable (using Moodle) (…) There is nothing you can do right or wrong. Regarding Moodle, it is really well made.	and of course I used that a couple of times when I wasn't paying attention so it's very useful (…) Some teachers also put up examples of exams so we can find our way around it, to ease our life. (…) For other subjects I only use Moodle to see the date of the exam and materials from lectures in case I			it to see if I uploaded all my tasks, if they're graded. I check quizzes to see if there is anything new uploaded. I'm not on Moodle that often, but I do log in. (…) I go in to see announcements ; each time someone added something new. ** Mostly I'm scared I'll miss an announcement. For example, sometimes a subject might have an announcement and there isn't a notification next to it and then I have to	Moodle and I have an insight into what they were working on in class and which tasks were worked on and that can help me tremendously. I really like that.		exam (test) so I don't need to go in. Sometimes, maybe, I see how many points I had on a test ** I feel completely comfortable (when using Moodle)

		missed something and for this course unit for everything I mentioned earlier.			go in each subject. Perhaps that's my biggest fear, and for uploading tasks etc. I'm ok, I "caught the rhythm"			
Mobile (phone) use of resources from LMS	I am on laptop, I can't do it (solve the quizzes) on mobile	I solved quizzes at home. Perhaps I solved them twice in a café on my phone (…) It's good, the user interface is good.	If it's on mobile…I don't know, I get texts. It was the same with book assignments, it is impossible from a phone or something, from a screen (…) Something will pop up (…) I solve the quizzes on my mobile	I can't learn from my phone, no way. (…) I solve those (quizzes) on a computer (not on phone) (…) It's clearer on a computer. On my phone it's too small.	Yes, sometimes I used to solve those (exams) (on mobile), if I'm with someone, but mostly I solved them at home on laptop (…) I could go in every once in a while on my phone but mostly on laptop.	Sometimes I solve quizzes on phone, sometimes on laptop, it depends (…) Depends on my mood: "Will I turn on the laptop, no I won't just for the quiz so I'll do it on my phone" or if I'm in my bed and I don't want to get up. Depends on my mood.	My phone annoys me for these things. I don't know. I really use it just for texts and calls. I wouldn't work on it. It's too small. Computer feels better (…) I used phone twice for it (for solving quizzes)	Yes, when you're on your phone, texts keep coming, you lose focus.

			(computer is not in this student's room so mobile use provides privacy)					
Experience with videos								
Recognized technical and quality characteristics of educational videos	When you watch it (video) it really shows the simplest way to do something, no complications, because when you visually saw how someone has done something, it's much easier to relate to it when you're doing it. (…) It's great that it's not just picture (visual) but	I think the audio recording…it has a much stronger impact than the visual ones. (…) It's hard to miss something; everything you need is there (…) The narrator is a bit strange. I haven't run into it during my education but I'm		It is literally shown exactly where you need to do what, it'll stay in your mind for sure.		First what I like is the concept of this, so screen capture and whichever small thing is done, screen zooms in. It's not like everything is unrefined or confusing. It really directs you to what you need to do, not that we need to do things alone and then mess it up or no do it properly		

	also the voice (audio), which helps me a lot (…) I like that it's detailed, you can hear everything well, it is in Croatian, which I really like because I don't have to think about translating it.	willing to adapt (…) You usually hear voices on TV, radio, and then you hear the Dalmatian accent and you think "This is not the place for it" but you get used to it, it's fresh						
General feedback on using educational videos in learning process	I really like this. When you're in class, professor is not on your back; sometimes students want to do other things without getting caught by the professor.	This is completely enough. I never knew Visio, Power Point and Word I did a little bit, with Excel I didn't work a lot because I didn't need it (…) but I think the	(When asked about what they think about this way of learning) Good, the best way really. Because we can go back (replay). Better than having someone	I think it is the best way to learn (…) I wouldn't know how to do things shown in videos It's simpler to have video than having papers and looking at	What we do with videos helped me when working (…) Before we write the tests in Word I watch them and they're useful, they really help (videos). Also, if I need anything later,	E-learning has helped me personally and contributed to my knowledge; it directed me in how I need to do things. For example, we had Excel 2-3 weeks ago and I didn't know how to do anything in	I am not sure it's practical that way, when a person doesn't really explain it to you. You get used to it but I'm not fond of the approach.	**<u>Other videos</u>** I've never used it. I heard about Toni Milun but I don't find it appealing. **<u>Other subjects</u>**

	Here it's just you. You can pause and continue it (video) (…) Most importantly, when you go home you don't have to go through your incomplete notes but you can just go on a computer, watch it, read it and do it all over again and it's really easy to learn. (…) If I didn't have the videos, I'd do most of the things the wrong way or in a more difficult way (…)	videos will be useful, although I used Word, Excel and PowerPoint I didn't know everything so of course it helped. I never did graphs and they were explained in detail in videos. It's (…) This way, when you sit on your computer and have all the instructions, it's easier. Even if you're not 100% yourself that	explain it. (…) For everything that's done you don't need the video. (later student sharing that they still watch the video) **Other videos** Toni Milun's videos, everyone watched that (…) That's what's best, when you can replay it. **Other subjects** Accounting,	those how to solve it. Video is 100% times better. **Other subjects** Accounting, statistics	I take a look (…) Test was in PowerPoint I wasn't preparing at all because… I had it in high school, I've done it so many times so it was about perhaps watching a few videos just like that… Word also…I didn't watch a lot, perhaps just a few in case I needed something. **Other videos** No, I haven't (watched). It's not that I don't need it, it's just that I don't find that way appealing and I	Excel. After I watched the videos, everything was clear. It's not difficult at all and I think it helps majority of students, I really think so. (…) I just really like how the professors imagined that concept to ease it all explain how it's done to us students who didn't encounter this earlier. **Other videos** For Informatics I haven't watched any other videos but for	It's silly, you don't have a feeling like you have someone on the subject. It's all available, nothing special. I'm more for the old way when someone is explaining something. Here, if you don't understand something, it's more difficult to get it clarified. I'm talking about this subject. It depends on what's done in which subject. In	It's not necessary

	When we have the exam from the things we do in practical part, I watch the videos again (…) not all of them but for things I don't know. For example last time I didn't do it and the first two times I did. When I did it I had all points and when I didn't half of them. **<u>Other videos</u>** From what I've noticed, people mainly watch Toni Milun's videos. I don't do it because	day you can solve it. It might take a bit longer but…	statistics		don't think it helps me much. I tried watching that math videos but it's easier for me when I do it on my own or when someone else explains it to me. Informatics is great because we have the voice and they show us… But that…I just don't like that way.	mathematics … When we had our first test; I'm not good in mathematics so I watched Toni Milun's videos and it really helped me a lot. There was another channel, can't remember which one, there is a guy explaining it on paper and that also helped me a lot because I wouldn't have anyone that could explain it to me and this way I can search for it online by myself and watch it. It's not difficult at	"normal" subjects, you have to get it explained (…) you need to add some liveliness in it. This is quite autonomous . Some people need more time to figure some things out, it's not enough just to see it on a video and that's it. **<u>Other videos</u>** Yes for English and similar there is a lot of stuff. For languages there's a lot	

	usually there is enough content in a book to get a good grade. **<u>Other subjects</u>** Accounting would be useful. To write down what we write in class and explain why things go where they go. But I think what we do now is effective (…) It's not needed but it would be ok.					all to learn. As I sad, we live in a technological era and we have everything available, why not leverage it **<u>Other subjects</u>** Definitely mathematics (…) There are people like me for who it's a weak point so it'd be much easier. Or if we were on practical part or in class and we didn't catch what the professor said, we can come home and say "Nothing to worry, I have the video on	of it (websites with videos), but also for other things. .	

						Moodle to watch"		
Learner control								
Focusing on educational videos	I think the main problem today is distraction and no focus. When we're in class we're more or less focused but when I come home…unless you turn off all technology… What's good about these videos is you have to download majority of things so you won't interrupt it half way through. I mainly watch the whole video and	When I'm in class it's not a problem (focus) because… it's a medium of some sort, you have students there, you have a professor to supervise you although they're not strict (…) you have motivation to complete your task because you can leave then but usually it's a problem for me and sometimes it					It's easier to focus (in class), the surrounding is like that, and everyone around you is on it. Similar like in a library. If everyone around you is on it you have to be as well. When there is people around you it's different. A lot of things is distracting (when there are not)	As for videos, I turn off the sounds and turn on some music and watch it and follow what she's doing (the narrator). That way is easier for me

	then I respond to things. For videos I put headphones and then it's much easier. When she (narrator) is talking you won't wander around; that's great that it's not just picture but voice too, it helps me a lot.	was necessary so I really had to force myself						
Staying focused when learning in general	On my mobile for example I can't focus because I have distractions but on laptop there is nothing else to do. I have Word open		It was the same when reading a book assignment, impossible from a mobile phone. (Asked why) Because		When I solve the quizzes and want to get a certain number of points, I do it in the evening when it's quiet and then on my laptop I do a lot of research and it has to be		I move everything away from me and keep the focus on it (the material). Have to stay strict and turn off everything	We think we learned something but we didn't. We lose focus after 10 mins of study time. I study and then I look

	(…) If I turn on the internet (browser) I know I'm doing something wrong. (…) I throw my phone in a room and work on laptop. That saves me. And now notifications have started to pop up on my laptop and I don't know what to do! I need to log off Facebook and turn everything off and then… (…) Really all technology should be		something will pop up.		quiet. ** If there is anything, I have to print it out. I can't study on mobile or laptop, I have to have it in hands. When I study, I have to walk, talk with myself.		else, and Facebook and that's it. You can't do it differently because there is a lot of distractions especially if you're on internet and then 500 ads open and similar nonsense. You really have to have a strict focus on it otherwise you won't do anything. ** I'm more of a book person. I have this feeling of pleasure.	at TV and then… If there were no mobile phones… I'd be an engineer. I study and then look at my mobile…

	moved to another room and study.						You remember more when you turn pages than when you scroll. This way, you have it in your hands to take notes. I mean you can do notes that way but it's better like this (on paper)	

In addition to what is included in table 40, students shared also interesting perspectives on the teaching-learning environment. Students shared that they appreciated the structure of the blended learning environment in which they are autonomous and watch videos at their own pace, but have the support from a teacher assistant should they need it; five out of eight students highlighted that in their interviews.

4.2.2 Summary of qualitative results

After reviewing the categories that emerged in the qualitative research (outlined in table 39) and the interview data (outlined in table 40), in this subchapter, a summary of qualitative results is presented in table 41. For each of the categories a description is given (extracted from table 39), and a summary of findings as expressed by eight students (in detail presented in table 40).

Table 41: Summary of qualitative results

Category	Description	Summary
Approaches to learning		
Approach to and organization of learning	Students describing: (a) ways in which they approached specific tasks in this course unit or the first exam, (b) general time management skills and organization of learning for this course unit or in general	Majority of students demonstrated different approaches to learning, which is in line with theory that the same student can adopt different approaches depending on several criteria. There was one student that showed only surface approach in combination with strategic efforts, and one that showed deep approach with strategic effort. Generally, students don't feel that they are well organized in learning and they tend to approach tasks too late but are motivated by completing a task.
Impact of perceived content relevance on learning and motivation	Students describing their personal interest in content they are going through, as well as their perceived relevance of specific content for their future and how these impacts their approach to watching videos and going through materials on the LMS.	Students are driven by the need of the content in the future and tend to reflect on whether the content will be needed for them. Students are more appreciative of the content that they perceive as relevant for the future.
Experience with LMS (Moodle)		
Ways of and reasons for using materials from LMS	Students describing ways teachers are using the LMS, when, how, and why they access the content, and how easy or difficult it is for them.	Students go in Moodle for announcements, updates, and exam schedule and results. Overall, Moodle seems to be used for 1-way communication. Students feel comfortable using Moodle; except from one student that shared that in the beginning it was challenging to find his/her way around. It seems like students appreciate having the resources available anytime

		anywhere and accessing these when they need them, also from home.
Mobile use of resources from LMS	Students describing if, when, how, and why they use their mobile phones for accessing material on Moodle.	It seems that students are aware of mobile availability and leverage it when they need it for any type of material; however, there is a strong feeling on whether they want to use mobile or desktop access with some students being clear that they can only use phone or only desktop access
Experience with educational videos		
Recognized technical and quality characteristics of educational videos	Students describing their perception of general quality of videos, including the language, level of detail, and the audio and visual components of videos	Students appreciate the level of details in videos, having them available and well made. Details such as zooming in when covering a specific part of software or accent of the narrator are noticed. Students also appreciate having the visual and the audio component in one
General feedback on using educational videos in learning process	Students describing their general experience and feedback with using educational videos and this format of teaching and learning. This section also includes (a) presence and role of teacher and general atmosphere in class, (b) use cases and features of videos that are most helpful, (c) relevance of previous knowledge on the covered topic when watching and working with videos, (d) potential to expand to other course units, (e) using external online videos	Generally, students are happy with this way of learning as it provides the flexibility to watch videos on their own pace and freedom to replay the content when they need it. The level of detail was important for those that do not know the material. There was one student that did not appreciate the blended learning format, mainly because they missed the teacher actually teaching. When asked about other subjects that might benefit from this way of teaching/learning, students thought of subjects that had tasks included in curriculum. When asked if they watch other online videos, students shared the same name of a teacher posting mathematics videos online; some students heard of it and use it, some heard of it and don't use it although they appreciate the educational videos built for this class
Learner control		
Focusing on educational videos	Students describing how they focus on educational videos on individual basis and comparing focusing in classroom setting and at home	Earlier mentioned possibility to replay and re-access videos when needed was mentioned as one of the key benefits of videos. When talking about keeping the focus on videos,

		students mentioned that it helps when videos are watched together in a classroom as they're motivated by their peers focused on the same thing, as well as having the sound with the picture (audio, visual) helps; one student plays music in background and leverages the visual steps
Staying focused when learning in general	Students describing what can take away their focus from learning when learning in general as well as when learning online; comparing online learning and learning from books/papers. .	General feedback is that it is not easy to stay focused when learning because of technology that surrounds the students. Interestingly, students outlined the benefits of technology making the videos and material available anytime anywhere but struggle with keeping it under control when learning. Social media needs to be turned off, mobile phone should be left in another room, all notifications should be turned off and then learning may begin.

4.3 Integrating the outcomes

Integrating quantitative and qualitative parts of a mixed study serves to answer the mixed study research question, in this case: *how do the outcomes of the interviews contribute to understanding the results gained through quantitative research?*

In this subchapter, the outcomes of quantitative and qualitative study are integrated (Ivankova et al., 2006). Full integration of findings is shown below in table 42, where the quantitative research outputs were connected to the qualitative outputs. To start, students have expressed different approaches to learning and indicated that they take a different approach depending on their interest in topic or time constraints, which is in line with theory. Level of details and option to replay videos were flagged as key advantages of using videos in a blended learning environment regardless of the approach to learning. Three students with deep approach to learning in this subject (1, 5, 6) did not mention completing videos so they can simply leave and enjoy their day, but were rather focused on the value videos brought to them, while students with dominant surface approach in this subject shared that they want to complete the videos so they can leave and do what they want (2, 3, 7). Relevance of content for future was important for students regardless of their approach to learning and students tend to be more interested in content that they perceive will be needed. Students with dominant deep approach appreciate the on demand availability of announcements and detailed materials on LMS and use the material proactively sometimes; one student with strong strategic (organized) approach noticed that there is no use going in just for notification because they get that elsewhere anyway. Students mainly feel comfortable using LMS, although one student with surface approach shared they had issues finding their way around in the beginning. Regardless of approach to learning, keeping focus on learning seems to be a challenge because of distractions and notifications. Interestingly, students outlined the benefits of technology making the videos and material available anytime anywhere but struggle with keeping it under control when learning, particularly on mobile phones where students seem to prefer one way over other (mobile vs desktop) and those with deep approach clarify how they leverage the power of each (students 5, 6, and 8 for example). Finally, students appreciated the structure of the blended learning environment in which they are autonomous and can watch videos at their own pace, but have the support from a teacher assistant should they need it; four out of eight students highlighted that in their interviews. One student that was not fond of a blended learning environment and also expressed surface approach in this subject, referred to availability of teacher as less of an

advantage because students don’t interact with them as they wait to finish up their task and leave.

Table 42: Integrating quantitative and qualitative outcomes

Qualitative upper level category	Summary of the upper level category
Approaches to learning	Majority of students demonstrated different approaches to learning, which is in line with theory that the same student can adopt different approaches depending on several criteria. There was one student that showed only surface approach in combination with strategic efforts, and one that showed deep approach with strategic effort. Generally, students don't feel that they are well strategic in learning and they tend to approach tasks too late but are motivated by completing a task. Students are driven by the need of the content in future and tend to reflect on whether the content will be needed for them. Students are more appreciative of the content that they perceive as relevant for the future.
Experience with e-learning	Students appreciate the level of details in videos, having them available and well made. Details such as zooming in when covering a specific part of software or accent of the narrator are noticed. Students also appreciate having the visual and the audio component in one. Generally, students are happy with this way of learning as it provides the flexibility to watch videos on their own pace and freedom to replay the content when they need it. The level of detail was important for those that do not know the material. There was one student that did not appreciate the blended learning format, mainly because they missed the teacher actually teaching. When asked about other subjects that might benefit from this way of teaching/learning, students thought of subjects that had tasks included in curriculum. When asked if they watch other online videos, students shared the same name of a teaching posting mathematics videos online; some students heard of it and use it, some heard of it and don't use it although they appreciate the educational videos built for this class
Learner control	Earlier mentioned possibility to replay and re-access videos when needed was mentioned as one of the key benefits of videos. When talking about keeping the focus on videos, students mentioned that it helps when videos are watched together in a classroom as they're motivated by their peers focused on the same thing, as well as having the sound with the picture (audio, visual) helps; one student plays music in background and leverages the visual steps. General feedback is that it is not easy to stay focused when learning because of technology that surrounds the students. Social media needs to be turned off, mobile phone should be left in another room, all notifications should be turned off and then learning may begin.

Experience with LMS (Moodle)	Students go in Moodle for announcements, updates, and exam schedule and results. Overall, Moodle seems to be used for 1-way communication. Students feel comfortable using Moodle; except from one student that shared that in the beginning it was challenging to find their way around. It seems like students appreciate having the resources available anytime anywhere and accessing these when they need them, also from home. It seems that students are aware of mobile availability and leverage it when they need it for any type of material; however, there is a strong feeling on whether they want to use mobile or desktop access with some students being clear that they can only use phone or only desktop access							
Quantitative	**Qualitative**							
	Student 1	**Student 2**	**Student 3**	**Student 4**	**Student 5**	**Student 6**	**Student 7**	**Student 8**
	Expresses mainly **deep** and **quite strategic** approach, with one indicator of surface approach.	Expresses mainly **surface** approach with one indicator of deep approach. Feels topics in practices would be relevant for the future so is interested in them	Expresses mainly **surface** approach and lack of strategic approach; lack of interest in content is demotivating	Does not express any direct indicator of an approach to learning	Expresses mainly **deep** approach and adaptability in strategic approach, with one indicator for surface approach	Expresses mainly **deep** approach. Focused on integrating parts in whole	Expresses mainly **surface** approach for this subject and indicates deep approach for other topics that are of more relevance	Expresses mainly **deep** approach and strong **strategic** approach. Strong feeling on relevance of content and focusing on things that will be needed in future

Factor 1	Factor 2	Correlation								
Experience with e-learning			**Experience with videos + Experience with Moodle (Ways and reasons for using materials from LMS)**							
Deep	**Experience with e-learning**	+	Appreciates the level of details in videos, appreciates having visual and audio component, appreciates videos are in Croatian language * Generally, fond of this type of teaching, appreciates flexibility of completing task and possibility to replay videos and having	Appreciates the audio component and details, notices specific accent of the narrator. Appreciates the videos for topics they do not know well. Appreciates the videos when they're not fully able to focus	Appreciates the replay functionality and finds learning with videos the best way	Appreciates this way of learning and gives advantage to video over paper Recognizes the detail of the video and having a detailed overview ensures that things are remembered	Appreciates the videos and says it helped them. Goes back to videos should they need a refresher. Only watches what is useful and what they don't know already. Appreciates the custom education videos but do not use other online available material	Appreciates the videos, references them before and after class. Appreciates the details, screen capture and technical details that ease the use of the videos. * Earlier had low knowledge of excel and appreciates the details in videos and	Not a fan of videos for learning, misses the teacher teaching content and finds the "old way" better	
Surface	**Experience with e-learning**	-								
Strategic (organized)	**Experience with e-learning**	+								

			detailed notes					their availability to learn new things, flags relevance of detailed videos for students with no experience. Watches other online videos, self-directed to learn new things		
Learner control			**Learner control (Focusing on educational videos; Staying focused when learning in general)**							
Deep	**Learner control**	+	Feels the main problem today is lack of focus. Focuses better when in class. Completes	Appreciates watching videos together in class, under supervision	Reports they get distracted by notification when using phones for completing tasks; uses mobile anyway as		Solves quizzes in the evening alone in quiet surrounding. Prefers printed material vs online material to		Easier to focus on videos in class when everyone is together; strong peer influence. To stay	Turns off the sound and plays music in the background when watching videos. Aware of difficulties
Surface	**Learner control**	-								
Strategic (organized)	**Learner control**	+								

			one video and then does a break To stay focused, need to remove phone and log off from internet		they can do tasks privately that way		connect thoughts in a written form		focused in general has to remove all technology so there are no distraction. Prefers paper over screen so can more easily leave notes	when focusing on content and gets distracted by technology
Factors affecting the use of LMS			**Experience with Moodle (Ways and reasons for using materials from LMS; Mobile (phone) use of resources from LMS**							
General experience and use of LMS			Appreciates tracking attendance on Moodle and availability of scripts on mobile * Does quizzes on laptop, can't do it on mobile	Uses materials from Moodle after class if they did not pay attention. Appreciate examples of exams. * Does quizzes at home,	Had problems when finding their way around in LMS when they first started	Uses LMS only for announcements * Adamant on mobile use; can only do quizzes on laptop	Uses LMS to review uploaded tasks, check quizzes, checks announcements. * Uses mainly laptop, mobile when	Appreciates exam announcements, exam results. Appreciates availability of material if they were sick and can	Appreciate the ability to access material from home, "if you are interested and if you need it" * Uses phone for texts and calls and	Only use LMS for this subject; all others put announcements only so there is no reason to log in. Does not like using mobile phones because of

				sometimes on mobile			reviewing material with someone	reference these later. * Uses mobile and desktop interchangeably, depending on mood	cannot work on it; used it however twice to solve quizzes	notifications
Surface	**LMS: Anxiety**	**+**	Reports that they feel comfortable using LMS		Reports no anxiety when using LMS	Reports feeling "ok" when using LMS	Reports no anxiety when using LMS but anxiety that they will miss some info on LMS			Reports feeling completely comfortable using LMS
Deep	**LMS: Social influence**	**+**	Was not explored in detail in interviews; LMS is supported and students are encouraged to use it for this course unit							
Strategic (organized)	**LMS: Social influence**	**+**	Was not explored in detail in interviews; LMS is supported and students are encouraged to use it for this course unit							
Teaching-learning environment			**Teaching-learning environment**							
Deep	**Teaching - learning environment**	**+**	Teaching – learning environment analysis was not the focus of the interview; researcher focused on other constructs based on research priorities and inductive approach recommendations.							

Surface	**Teaching - learning environment**	**-**	In general, students appreciated the structure of the blended learning environment in which they are autonomous and can watch videos at their own pace, but have the support from a teacher assistant should they need it; four out of eight students highlighted that in their interviews
Strategic (organized)	**Teaching - learning environment**	**+**	

5 DISCUSSION AND CONCLUSION

The last chapter summarizes the key results in discussion and then by showcasing the research through key contributions. After, limitations of the research as well as implications for further research are outlined.

5.1 Discussion

Quantitative research

Main goal of this research was to improve the knowledge on approaches to learning in a blended learning environment. The mixed method study started with a quantitative research.

The sample for the quantitative part of the research included 578 students from 7 course units, indicating that the subject to item ratio for conducting factor analysis is substantial (Hair et al., 1998, p. 171). Details on quantitative sample are available in chapter 3.2.1 Quantitative sample and data collection.

The questionnaire used in this research consisted of 59 items grouped from five different research resources. Validation of the instrument was conducted by confirmatory factor analysis. The measurement model from SEM was used to outline the correlations between constructs. Missing data was addressed by linear imputation where all cases with two or more missing values were excluded from the research, leaving the final number of cases at 521 students. MLM estimator was used as an estimation technique for the measurement model. After completing and reviewing the first measurement model, two items with factor loadings smaller than 0.32 were removed from the model and modification indices were added, where it made sense, to improve the model. A similar process for confirmatory factor analysis for approaches to learning was most recently followed by (Dobi Barišić, 2018) in her doctoral thesis. Detailed description of data analysis procedures and stages of SEM are available in chapter 3.2.4 Data analysis, and the actual measurement models are available in subchapters under 4.1.1 Questionnaire validation.

Results of the reliability analysis, explained in detail in chapter 4.1.1.3 Reliability showed that the scales have a high level of reliability, with surface approach scoring at 0.62, still above the limit of 0.6 (Hair et al., 2014, p. 90), but smaller than usually accepted 0.7. Cronbach alpha is sensitive on number of items in scale; given there are three items in surface approach construct, it is expected to have a slightly lower alpha. The surface approach alpha was also below 0.7 in the original research (ETL Project, n.d.) and in similar research (Parpala et al., 2013) indicating

that further work is needed to ensure a high alpha for surface approach. Also, composite reliability for this construct is smaller than expected 0.7, which is a limitation in the research and should be looked into in further research. In pilot research, Cronbach alpha for surface approach was 0.7 and CR was 0.74, which were slightly better values (Bralić, 2018). After surface approach, the second construct worth discussing on reliability is learner control. In the original research, Cronbach alpha for this construct was 0.59 and in another following research 0.58 (Jung et al., 2019). In pilot research, learner control alpha was 0.59 (Bralić, 2018) so reliability was improved by adding an additional item to this scale with alpha of 0.71 in the main research. CR however is smaller than 0.7, also being one of the limitations of the research.

The final measurement model, available in Appendix B showed good fit of empirical data with the hypothesized measurement model; goodness of fit details are available in Table 16: GOF indicators for Model 2. The good fit confirmed the factorial validity of the questionnaire and allowed further analysis to explore the relationships between constructs.

Factors in the measurement model

First, relationship between each of the three approaches to learning is established. Deep approach is characterized by an intention to understand the ideas and by connecting them with previously acquired knowledge and experience. The surface approach is characterized by the intention to cope with course requirements and reproducing knowledge by treating the course as unrelated bits of knowledge (Entwistle, 2009, p. 36). Students with strategic approach tend to approach learning with the goal of achieving a good grade and in some research an organized approach is mentioned, as an equivalent to the strategic approach (Entwistle et al., 2002).

A positive correlation between strategic and deep approach (.616) and a negative correlation between deep and surface approach (-.289) as well as between strategic and surface (-.154) approach was found. This is in line with previous research (Dobi Barišić, 2018, p. 85; Entwistle & Tait, 2013; Valadas et al., 2010) and indicates the direction of correlations of other constructs with each of the approaches to learning.

Experience with e-learning

Experience with e-learning was measured by the E-LS scale of (Ginns & Ellis, 2009), designed to evaluate the experience with information technology, online learning, and online communication, within the overall course experience.

This study has found that there is a **positive** correlation between **experience with e-learning** and **deep** (.547) and **strategic** approach to learning (.289), and a negative correlation with surface approach (-.339), $p < 0.05$. Established positive correlation between deep and strategic approach indicated this behavior; deep and strategic approaches correlating with experience with e-learning in one direction and surface approach correlating with experience with e-learning in the opposite direction.

E-learning has to have a complementary role in students' university experience (Ginns & Ellis, 2009). In this research, using the e-Learning scale (E-LS) of (Ginns & Ellis, 2009), a positive correlation between experience with e-learning and deep and strategic approach was found, meaning that higher scores on experience with e-learning are connected to higher scores on deep and strategic scales.

In pilot research, results were similar. Experience with e-learning was in pilot research observed as bad, average, and good based on overall score on the e-learning experience scale. Students with good experience with e-learning had higher scores on the deep and strategic approach scales (Bralić, 2018)

Learner control

Learner control was measured by a scale of (Hung et al., 2010) designed to evaluate learner control, including directing progress and keeping focus when learning online, as a part of assessing overall learner readiness for online learning. One additional item was added to the original scale.

This study has found that there is a **positive** correlation between **learner control** and **deep** (.513) and **strategic** approach to learning (.447), a negative correlation with surface approach (-.296), $p < 0.05$. Established positive correlation between deep and strategic approach indicated this behavior; deep and strategic approaches correlating with learner control in one direction and surface approach correlating with learner control in the opposite direction.

In earlier research, control was flagged as one of the key considerations when building a learning environment and was evaluated in different ways (Hung et al., 2010; Sorgenfrei et al., 2013; Taipjutorus et al., 2012). It was found that teachers might need to help students develop self-directed learning and learner-control skills and attitudes, particularly when it comes to online learning context (Hung et al., 2010). In this research, using the scale of (Hung et al., 2010), a positive correlation between learner control and deep and strategic approach was

found, meaning that higher level of control are connected to higher scores on deep and strategic scales.

Anxiety when using LMS

Anxiety when using LMS is one of two factors affecting the use of LMS and was measured by a scale of (Simeonova et al., 2014; Venkatesh et al., 2003) designed to evaluate whether there is fear or apprehension present when using an LMS.

This study has found that there is a **positive** correlation between anxiety when using LMS (.193) and **surface** approach to learning, $p < 0.05$. Correlations between anxiety when using LMS and other approaches to learning were not statistically significant. Earlier, it was found that approach to learning is influenced by anxiety, where presence of anxiety was associated with surface approach (Fransson, 1977; Marton & Säljö, 1997). In this research, using the scale of (Simeonova et al., 2014; Venkatesh et al., 2003), a positive correlation between anxiety and surface approach was found, meaning that higher levels of anxiety are connected to higher scores on surface approach to learning scales.

Social influence when using LMS

Social influence when using LMS is one of two factors affecting the use of LMS and was measured by a scale of (Simeonova et al., 2014; Venkatesh et al., 2003) designed to evaluate whether there is influence from peers, teachers or institution on using an LMS.

This study has found that there is a **positive** correlation between **social influence when using LMS** and **deep** (.348) and **strategic** approach to learning (.146), $p < 0.05$. Correlation with surface approach was not statistically significant. Established positive correlation between deep and strategic approach indicated this behavior; deep and strategic approaches correlating with social influence when using LMS in the same direction.

Having LMS in place in institutions and classrooms around the world, social influence of peers is an important element of the environment. In this research, using the scale of (Simeonova et al., 2014; Venkatesh et al., 2003), a positive correlation between social influence and deep and strategic approach was found, meaning that higher scores on social influence when using LMS scale are connected to higher scores on deep and strategic scales.

Teaching-learning environment

Teaching-learning environment was measured by a scale in *Shortened Experiences of Teaching and Learning Questionnaire (SETLQ)* (ETL Project, Universities of Edinburgh, 2005), that looked at common elements of the teaching-learning environment that have demonstrated to be important for students perceptions and the adopted approaches to learning: aims and congruence, choice allowed, teaching and learning, set work and feedback, assessing understanding, staff enthusiasm and support from staff and students, and interest and enjoyment.

This study has found that there is a **positive** correlation between **teaching-learning environment** and **deep** (.622) and **strategic** approach to learning (.305), a negative correlation with surface approach (-.513), $p < 0.05$. Established positive correlation between deep and strategic approach indicated this behavior; deep and strategic approaches correlating with teaching-learning environment in one direction and surface approach correlating with teaching-learning environment in the opposite direction.

In this research, using the scale from the Shortened Experiences with Teaching and Learning Questionnaire (ETL Project, Universities of Edinburgh, 2005) a positive correlation between teaching-learning environment and deep and strategic approach was found, meaning that higher scores on teaching-learning environment scale are connected to higher scores on deep and strategic scales. This correlation is in line with previous research (Campbell et al., 2001; Entwistle et al., 2002; Fryer & Ginns, 2018; Trigwell et al., 1999).

An overview of supported and rejected hypotheses, along with the strength and the direction of the hypotheses is available in chapter 4.1.1.4 Hypothesis testing, in Table 22: Hypothesis testing: supported and rejected hypotheses.

Differences between groups of students

When looking at differences between groups of students, there was indeed a significant difference in deep, surface, and strategic approach to learning between groups of students.

Gender

Female students scored higher on deep and strategic approach to learning than male students, while male students scored higher on surface approach to learning than female students.

Findings are in line with some similar research (Lazarević & Trebješanin, 2013; Senemoğlu, 2011), and different from some other research where male students perceive themselves as having clear goals related to their studies (Andreou et al., 2006) or there was no difference based on gender found (Cebeci et al., 2013)

Pilot research also did not indicate that there is a difference in approach to learning based on gender (Bralić, 2018). This could potentially be because the pilot sample included a different study area (at FOI) and a course taught at a higher study year.

Course unit

A significant difference in surface and strategic approaches to learning between students from different course units was found.

- Students from one of the faculties of Economics scored highest on surface approach and lowest on strategic approach.
- Students from another faculty of Economics scored highest on strategic approach.
- Students from one of the faculties of Philosophy scored lowest on surface approach.

For surface approach, four significant differences were captured:

- between course units 1 and: 2, 6, 4, 7.

For strategic approach, five significant differences were captured:

- between course units 7 and: 2, 3, 4, 6
- between course units 5 and 6

There are, as shown, various elements that influence the approach to learning and area of study could be one of these elements according to (Cebeci et al., 2013; Senemoğlu, 2011; Smith & Miller, 2005). Similar research on differences in approaches to learning between disciplines in social sciences was not located; above referenced articles were focused on comparison for example between humanities and math and science or law and medicine.

Table 43: Course units and surface and strategic approach

	Mean rank	
Course unit	**Surface approach**	**Strategic approach**
1	171.59	247.29
2	265.31	267.49
3	252.69	285.74
4	273.24	268.70
5	203.48	189.00
6	271.96	290.22
7	279.18	178.84

Use of MOOCs

Students participating in a MOOC scored higher on deep approach to learning than students who did not participate in a MOOC. The benefits of enriching traditionally taught courses with MOOCs have been laid out earlier in chapter 2.1.4.2 Massive Open Online Courses; adding this information is important in establishing teaching learning environment and would direct further research into establishing causality and exploring whether this correlation is influenced by other factors.

Use of videos

Students who used educational videos scored higher on deep and strategic approach to learning scales than students who did not use the videos. Students who did not use educational videos scored higher on surface approach to learning than students who did use the videos.

Pilot research indicated different outcome; there, surface approach was positively correlated with the use of educational videos. The reason for this might lie in the sample of the pilot research with a large part of the sample using educational videos.

Qualitative research

Eight semi-structured interviews were conducted with students within one faculty, participating in two course units. Data was analyzed using general inductive approach (Thomas, 2006) during which five upper categories and eight categories below them were defined.

Here, a brief description of key findings is outlined.

Majority of students demonstrated different approaches to learning, which is in line with theory that the same student can adopt different approaches depending on several criteria. Generally, students don't feel that they are well organized in learning and they tend to approach tasks too late but are motivated by completing a task. Students are more appreciative of the content that they perceive as relevant for the future and feel motivated to go through it. Students log in to LMS (Moodle) for announcements, updates, and exam schedule and results. Overall, Moodle seems to be used for one-way communication and students feel comfortable using it. It seems like students appreciate having the resources available anytime. It seems that students are aware of mobile availability and leverage it when they need it; however, there is a strong feeling on whether they prefer to use mobile or desktop.

Generally, students are happy with this blended learning environment created with the educational videos as it provides the flexibility to watch videos at their own pace and freedom to replay the content when they need it. The level of detail in content but also when presenting (for example zooming in and out) was much appreciated and was particularly important for those that do not know the material. The possibility to replay and re-access videos when needed was mentioned as one of the key benefits of videos. Also, having the sound with the picture (audio, visual) helps. This is in line with recommendations for developing custom educational videos (Brame, 2016; Thomson et al., 2014). When talking about keeping the focus on videos, students mentioned that it helps when videos are watched together in a classroom as they're motivated by their peers focused on the same thing and have also outlined that having a teaching assistant present to help answer any questions is important for their learning process. General feedback and the value of proper blending is in line with previous research, for example (Kelly et al., 2009).

General feedback is that it is not easy to stay focused when learning because of technology that surrounds the students. Interestingly, students outlined the benefits of technology making the videos and material available anytime anywhere but struggle with keeping it under control when learning. Social media needs to be turned off, mobile phone should be left in another room, all notifications should be turned off and then learning may begin.

Qualitative results of these particular course units analysis align with the literature where advantages of blended learning include:

- **Greater flexibility of time** (when applicable and supported) (Bouhnik & Marcus, 2006; Demetriadis & Pombortsis, 2007; Sitzmann, Kraiger, Stewart, & Wisher, 2006) – students in this study appreciated accessing content when and where they needed it and appreciated the freedom given to complete them during class or at home, at their own pace.
- **Time for reflection, freedom for students to express thoughts and ask questions** (Caravias, 2015; Chamberlin & Moon, 2005; Liaw et al., 2007) – having content available to be completed at their own pace was looked at fondly, where the teacher being available to answer any questions was seen as a great addition to the students' learning experience

  As mentioned earlier, the importance of communication and/or collaboration among students and teachers as one of the key elements in achieving learning goals, satisfaction, and/or creating a deep learning experience was outlined in multiple research (Bates, 2015; Hacker & Niederhauser, 2000; Jones DeLotell et al., 2010; Lee & Rofe, 2016; So & Brush, 2008).

  Similar idea is shared by students in this study: having a teacher and fellow students available to support and answer questions that might come up while watching the videos in classroom is outlined as very important.
- **Meeting different needs and learning styles** (Caravias, 2015; Ho et al., 2006) – although generally students all outlined that having material that complemented their learning with audio and visual support, some emphasized the audio component and some others the visual component. Particularly, some students did not have a lot of knowledge in the area and those tend to be the ones that appreciated the availability of content and the detail of the videos as well as the replaying options
- **Increased satisfaction and motivation to learn** (Baepler et al., 2014; Kim et al., 2014; Kiviniemi, 2014; Klein et al., 2006) – all but one student perceived the availability of video lessons as very positive, helping them on their study journey

5.2 Contribution

Each of the proposed contributions of this research will now be looked at and commented further.

- **Expanding the existing theory of approaches to learning in blended learning environment through quantitative and qualitative research**

Through literature review, key concepts in blended learning and approaches to learning theory were defined. By outlining the benefits and challenges with blended learning environment and summarizing key considerations when building a blended learning environment, including experience with e-learning, learner control, factors influencing use of LMS, as well as educational videos and MOOCs often used to build such an environment and relating each of these to approaches learning, the theory on approaches to learning was brought into this new learning environment. This was done through quantitative analysis first, following the literature review and questionnaire developed, and then through qualitative approach in which the experience with learning in a setting like this was evaluated together with approaches to learning in a semi-structured interview. The integration of outcomes provided insights in Chapter 4.3 Integrating the outcomes

- **Developing a reliable and valid instrument for analyzing approaches to learning in a blended learning environment**

Developed instrument consisted of eight key constructs that were analyzed in this research: experience with e-learning, learner control, factors influencing use of LMS (anxiety, social influence), teaching-learning environment, deep, strategic, and surface approach to learning. Reasons for including these constructs are outlined in chapter 3.2.3.1 Questionnaire characteristics. Content and construct (factorial, nomological) validity were introduced showing that the data fits the model well. Reliability was introduced to evaluate the reliability of scales showing satisfactory levels for all scales, with areas of improvement.

- **Testing the hypothesis on correlations between each of the approaches to learning and key characteristics and concepts: experience with e-learning, control, anxiety and social influence when using LMS and experience with teaching and learning environment**

Hypotheses between the abovementioned constructs and each of the approaches to learning were tested in measurement model in structural equation modeling, with full list of results in

chapter 4.1.1.4 Hypothesis testing. Results indicated that in this research there is a statistically significant positive correlation between deep and strategic approach to learning and experience with e-learning, learner control, social influence when using LMS, and teaching-learning environment, as well as a positive correlation between surface approach and anxiety when using LMS. All of the hypotheses were further commented and compared with earlier research in chapter 5.1 Discussion. This is a good first start to building a solid blended learning environment taking approaches to learning into account. Impacting positive perspectives on these concepts are good first steps in building a blended learning environment that supports deep approach to learning.

- **Providing the possibility to expand other research and models of student learning or online resource use with the outcomes of this research**

There is a series of other research in the field of technology acceptance that could be relevant for blended learning, i.e. its e-component, for example Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), or DeLone and McLean model. These models could potentially include approaches to learning and constructs covered in this research to study the relationships between these constructs and yield further conclusions, particularly knowing the correlations between each of the approaches to learning and some of these constructs. In learning, other models such as various learning styles, or more concrete, the study process research of John Biggs (Biggs, Kember, & Leung, 2001) could be further looked at and expanded knowing the results of this research.

- **Opportunity to apply this research methodology in investigating the experience of students and their approaches to learning in a fully online learning environment (important area)**

Fully online learning environments are an incredibly important part of modern education, not just for students but also for adult learners in general. Keeping the research alive in this area is of strategic importance for life-long learning projects and evaluating the experience of learners with e-learning. This, along with providing and ensuring full control over learning and mitigating the anxiety of using online systems, might yield good results in achieving deep approach in learning in online education that is traditionally burdened with drop out rates and low levels of focus.

There is additional practical contribution of this research; results can be used in analyzing blended learning environments and when developing teaching-learning environment.

When developing a blended learning environment, teachers and institutions can take into account the outputs of this research and by creating an environment in which the online component is well integrated in classroom teaching, providing the right level of control, mitigating anxiety from using LMS, supporting the use of LMS, and by building a high quality teaching-learning environment facilitate a high quality blended learning environment.

5.3 Limitations

First of all, the sample in the quantitative part of this study includes social science students in selected group of subjects. Anything that is not a completely random sample can be seen as a limitation of a research. In educational research, it is challenging to have a random sample, due to various limitations such as availability of audience and time and resource constraints. Because of not having a random sample, the researcher needs to be careful when interpreting the results of this and any similar study. In qualitative part, students were also selected in a non-fully random way so conclusions should also be interpreted with care.

Second, the topic of this research covers blended learning and approaches to learning. This is not to say that there are no other elements in blended learning that should be taken into account and added to the relationships. In this research, some technological and pedagogical perspectives were introduced, but there might be others that were not included.

In quantitative part a survey was used; students self-reporting on a scale of set items is always a limitation as an objective measure is removed from the equation; this is a known limitation of survey method. In interview, several verification methods were implemented; if this research was only focused on qualitative method, a parallel coding process would have been a solid way to re-check the outputs of the interview.

Any relationship listed in the research outputs can be impacted by other elements, so the results always need to be taken with care as there might be forces not accounted for in a research. For example, strategic approach is higher for students who use educational videos but this difference can be impacted by field of study, or course unit, or other not observed factors.

Further, exploring the differences in approach to learning based on whether videos and MOOCs are a part of the final grade was removed from the focus of the research because students were not providing clear answers. In further research, this should either be rephrased or manually added as a variable by the researcher after talking to the teacher within each of the course units.

Finally, reliability of scales show an acceptable level, but for some scales, surface approach and learner control namely, a slightly lower alpha and composite reliability score than for other scales indicate that there is room for improvement.

5.4 Implications for further research

After reviewing the contributions and limitations of the research, a list of implications for further research can be outlined.

To address the limitation of **sample**, the research should be conducted with other groups of students and results can be compared to verify the findings, both in quantitative and in qualitative part of the study. This is also needed given the fact that this is a very "local" research, focused on a small subset of student population in Croatia. Further repeated research needs to be conducted in other countries and educational systems, as well as learning environments to solidify the results and expand the idea. Differences in approaches to learning in **study areas** should be investigated further. This sample only included social sciences faculties and expanding the research in other study areas, such as humanities, natural and applied sciences or formal sciences might reveal further differences in approaches to learning, particularly in blended learning environments.

With the changing technological landscape, it is prudent to review the literature and **update** the idea of blended learning environment and its core considerations, as well as keep the existing constructs updated.

Further, the **scales** should be expanded, potentially by using another instrument for evaluating the approaches to learning and rethinking the learner control construct. The Shortened Experiences of Teaching and Learning questionnaire had four item scales for strategic (organized effort) and surface approach which created some difficulties when analyzing data and assessing reliability. By increasing item number reliability scores might be higher.

In addition to self-reported scores from students on survey, **other methods** can be used to evaluate their habits and attitudes, for example observation or LMS logs analysis for a more detailed and objective analysis.

In this thesis, only **correlations** between constructs are shared, along with their direction and intensity. The next step, structural model, was developed outside of the thesis showing interesting results on the structural model level. Further research should focus on building the structural model and adding the equations in the analysis of approaches to learning in blended learning environment. The next key aspect of this research is looking at **causality**: does deep approach to learning cause the good experience with e-learning or does the good experience with e-learning cause students to adopt a more deep approach to learning? How does this

behavior change between groups of students, courses, areas of study and among different teaching-learning environments?

In the further research, correlations and potentially causality should be further researched between **other constructs**, too, such as teaching-learning environment and experience with e-learning.

In this research, it was found that students who used educational videos scored higher on deep and strategic approach to learning scales than students who did not use the videos. Students who did not use educational videos scored higher on surface approach to learning than students who did use the videos. Further research should look at **the types of video** embedded in class and whether there is a difference in approaches to learning when embedding videos as additional resource that explains, illustrates or enriches the curriculum and when embedding videos that are, for example, class recordings.

Further, some parts of the **pilot research** were not included main research. Further research is recommended in this area; for example, it is worth looking into whether the connection between using LMS in specific parts of class and experience with e-learning as well as adopted approach to learning is present in other cases.

If **organized effort** can be applied to both deep and surface approach to learning, as suggested by some authors, further research should also look at how this relates to a blended learning environment and whether elements of this learning environment support adding organized effort to each of the approaches and if yes, how.

Finally, further polishing of this area of research is, as with any other needed. This is a beginning of research in the area with the end goal of re-imagining how we build blended learning environments with student in center.

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APPENDIX

Appendix A: Measurement model 1

```
model<-'
#measurement model - original
SA=~SA1+SA2+SA3+SA4
OA=~OA1+OA2+OA3+OA4
DA=~DA1+DA2+DA3+DA4+DA5+DA6+DA7+DA8+DA9
TL=~AC1+AC2+AC3+AC4+AC5+CH1+CH2+TU1+TU2+TU3+TU4+TU5+SF1+SF2+SF3+SF4+SF5+A
U1+AU2+SE1+SE2+SS1+SS2+IE1+IE2
EL=~ES1+ES2+ES3+ES4+ES5
LC=~LC1+LC2+LC3+LC4
LA=~LA1+LA2+LA3+LA4
LS=~LS1+LS2+LS3+LS4'
```

Indices after evaluating Model 1 (covariances)

```
DA1 ~~ DA3
DA1 ~~ DA4
DA1 ~~ DA8
DA2 ~~ DA3
DA2 ~~ DA4
DA2 ~~ DA8
DA3 ~~ DA4
SS1 ~~ SS2
TU1 ~~ TU2
IE1 ~~ IE2
AC1 ~~ AC2
SE1 ~~ SE2
AC2 ~~ AC3
AC2 ~~ AC5
AC3 ~~ AC5
AC4 ~~ AC5
AU1 ~~ AU2
CH1 ~~ CH2
SF4 ~~ SF5
AC1 ~~ AC4
SF3 ~~ SF5
TU3 ~~ TU5
SF3 ~~ SF4
ES1 ~~ ES2
ES1 ~~ ES4
ES1 ~~ ES5
ES3 ~~ ES5
LC2 ~~ LC4
LA1 ~~ LA4'
```

Appendix B: Measurement model 2

```
model<-'
#measurement model final with indices, removed factor loading less than
0,32
SA=~SA1+SA2+SA4
OA=~OA1+OA2+OA3+OA4
DA=~DA1+DA2+DA3+DA4+DA5+DA6+DA7+DA8+DA9
TL=~AC1+AC2+AC3+AC4+AC5+CH1+CH2+TU1+TU2+TU3+TU4+TU5+SF1+SF2+SF3+SF4+SF5+A
U1+AU2+SE1+SE2+SS1+SS2+IE1+IE2
EL=~ES1+ES2+ES3+ES4+ES5
LC=~LC1+LC2+LC3+LC4
LA=~LA1+LA2+LA3+LA4
LS=~LS1+LS3+LS4
DA1 ~~ DA3
DA1 ~~ DA4
DA1 ~~ DA8
DA2 ~~ DA3
DA2 ~~ DA4
DA2 ~~ DA8
DA3 ~~ DA4
SS1 ~~ SS2
TU1 ~~ TU2
IE1 ~~ IE2
AC1 ~~ AC2
SE1 ~~ SE2
AC2 ~~ AC3
AC2 ~~ AC5
AC3 ~~ AC5
AC4 ~~ AC5
AU1 ~~ AU2
CH1 ~~ CH2
SF4 ~~ SF5
AC1 ~~ AC4
SF3 ~~ SF5
TU3 ~~ TU5
SF3 ~~ SF4
ES1 ~~ ES2
ES1 ~~ ES4
ES1 ~~ ES5
ES3 ~~ ES5
LC2 ~~ LC4
LA1 ~~ LA4'
```

Appendix C: Invitation to teachers to participate in study

Invitation email below was sent to teachers in course units shortlisted to participate in the research.

******

Poštovani **IME**

Moje ime je Antonia Bralić, studentica sam na poslijediplomskom doktorskom studiju Informacijskih znanosti na Fakultetu organizacije i informatike te sam u procesu pripreme doktorske disertacije pod mentorstvom prof.dr.sc. Blaženke Divjak, Sveučilište u Zagrebu i prof.dr.sc. Wim van Petegema, KU Leuven, Belgija, a u sklopu projekta „Razvoj metodološkog okvira za strateško odlučivanje u visokom obrazovanju - primjer implementacije otvorenog učenja i učenja na daljinu – HigherDecision".

Cilj istraživanja je **unaprijediti znanje o pristupima učenju u hibridnom okruženjima za učenje** (eng. *blended learning*). Za tu je potrebu izrađen upitnik na temelju prethodnih istraživanja i istraživačkih pitanja u okviru doktorske disertacije.

Uz pristupe učenju ispitivat će se korištenje masivnih otvorenih online tečajeva (eng. Massive Open Online Courses, MOOCs) i obrazovnih videa, iskustvo s e-učenjem, kontrola u procesu učenja, faktori koji utječu na korištenje sustava za upravljanjem učenjem te iskustvo s okruženjem za učenje i poučavanje.

Pilot istraživanje provedeno je u siječnju 2018. na Fakultetu organizacije i informatike Sveučilišta u Zagrebu i Ekonomskom fakultetu Sveučilišta u Splitu, na dva predmeta u okviru kojih studenti uče u hibridnom okruženju za učenje. Pregled odabranih rezultata objavljen je u radu:

Bralić, A. (2018). Approaches to learning in a blended learning environment: preliminary results. *U Proceedings of 41st International Convention MIPRO 2018*. (pp. 853–858). Rijeka.

Glavno istraživanje provest će se **između 26.11. i 09.12.; u njega bih voljela uključiti i studente/polaznike predmeta IME PREDMETA NA FAKULTETU.** Uvjet za sudjelovanje u istraživanju je da na predmetu **IME PREDMETA** postoji e-komponenta, odnosno da u određenom obliku postoji hibridno oruženje za učenje (korištenje pripremljenih obrazovnih videa, materijala sa sustava za upravljanje učenjem, masivnih otvorenih online tečajeva...).

Istraživanje se planira provesti u online obliku, tijekom nastave/vježbi, koristeći alat SurveyMonkey. Za ispunjavanje ankete potrebno je otprilike 10 minuta.

Od općih podataka studenata će se kroz anketu prikupljati spol i status studenta (redovni/izvanredni). Godina i područje studija također će biti uključeni u istraživanje, a prikupit će se na temelju informacija o kolegiju unutar kojeg se provodi istraživanje.

U istraživanju će biti naglašeno da je sudjelovanje u istraživanju dobrovoljno i anonimno. Podaci će biti anonimizirani i u istraživanju će se korisiti kao zbirni podaci (agregirano). Prilažem uvod u anketu koji objašnjava postupke istraživanja. Kako bi se temeljito istražili pristupi učenju, kao drugi dio istraživanja planiraju se provesti i **intervjui** sa studentima koji su bili uključeni u prvi dio istraživanja. Pošto je sudjelovanje u istraživanju dobrovoljno i anonimno, predmetni nastavnici bit će zamoljeni da obavijeste studente o mogućnosti sudjelovanja u intervjuu. O zaštiti podataka vodit će se računa sukladno Općoj Uredbi o zaštiti podataka.

Ukoliko ste zainteresirani za sudjelovanje u istraživanju, molim Vas za povratnu informaciju kako bih pravovremeno pribavila dozvolu Etičkog povjerenstva Vaše institucije za provedbu istraživanja.

Ukoliko se odlučite sudjelovati u istraživanju sigurna sam da ćete imati od njega koristi za unapređenje svoje nastavne prakse. Naime, svi podaci i analize koji se odnose na Vaš predmet i instituciju kao i zbirni podaci na razini projekta bit će Vam dostupni nakon provedenog istraživanja kako biste dobili dublji uvid u situaciju i otvorili mogućnost usporedbe s drugima i eventualna unapređenja.

Unaprijed zahvaljujem na Vašoj pomoći u provođenju istraživanja kojim će se **pridonijeti boljem razumijevanju iskustva studenata u hibridnim okruženjima za učenje te strukturi hibridnog okruženja koje podupire dubinski pristup učenju.**

Za sva dodatna pitanja stojim na raspolaganju.

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Appendix D: Consent form for students

The form below was provided to students before the interview. Each students was required to read through and sign if they agree with the research procedures.

******

Hvala Vam što se pristali sudjelovati u intervjuu koji je dio istraživanja u sklopu doktorske disertacije pod naslovom „Approaches to learning in a blended learning environment in higher education“, odnosno na hrvatskom jeziku: „Pristupi učenju u hibridnom okruženju za učenje u visokom obrazovanju“.

Istraživačica (doktorandica): Antonia Bralić

Ime ispitanika:

Istraživanje se provodi u svrhu izrade doktorske disertacije i znanstvenih radova. Intervju će trajati 45 minuta. Imate pravo prekinuti intervju ili se povući iz istraživanja u bilo kojem trenutku.

Ovaj je dokument nužan kako biste razumjeli uvjete svog sudjelovanja u istraživanju. Potpisivanjem ovog dokumenta dajete svoj informirani pristanak na ovdje opisane postupke istraživanja.

- Intervju će biti snimljen; na temelju snimke će biti kreiran prijepis
- Snimka i prijepis intervjua će biti analiziran od strane istraživačice, Antonie Bralić
- Prijepis intervjua će biti dostupan istraživačici i akademskim kolegama istraživačima s kojima će eventualno postojati suradnja u sklopu ovog istraživanja
- Bilo kakav isječak iz intervjua ili direktno citiranje ispitanika koje može biti objavljeno u znanstvenom radu i/ili doktorskoj disertaciji bit će u potpunosti anonimno tako da ispitanik ne može biti identificiran. S posebnom će se brigom voditi računa o bilo kojim drugim informacijama koje bi mogle identificirati ispitanika, a koje su podijeljene u intervjuu

Molim Vas da označite izjave s kojima se slažete:

	Slažem se s citiranjem mojih izjava u ovom intervjuu prema gore navedenim uvjetima
	Slažem se da istraživačica može objaviti dokumente (znanstvene radove, doktorsku disertaciju) s mojim citatima/izjavama

Potpisivanjem ovog dokumenta slažem se s izjavama:

- U intervjuu sudjelujem dobrovoljno. Razumijem da ne moram sudjelovati u intervjuu i da se iz istraživanja mogu povući u bilo kojem trenutku
- Prijepis intervjua i citati/izjave mogu biti korišteni kao što je iznad navedeno
- Pročitao/la sam ovaj dokument
- Ne očekujem da ću dobiti nagradu za sudjelovanje u istraživanju
- Razumijem da mogu pitati pitanja o istraživanju i kontaktirati istraživačicu u bilo kojem trenutku s dodatnim pitanjima.

Potpis ispitanika

_____ _____

Datum

_____

******

CURRICULUM VITAE

Antonia Bralić was born in Split in 1990. She graduated from University of Split, Faculty of Economics in 2014; her master thesis covered the current state trends in corporate e-learning in Croatia. She enrolled in Postgraduate Doctoral Study in Information Sciences at FOI in 2015 and received scholarship from the Croatian Science Foundation as a PhD student whose research is supported under the HigherDecision project (IP-2014-09-7854).

She was awarded *Rector's award* at the University of Split in 2015 for her academic success and an *e-learning scolarship by prof. Zlata Bartl fund* for young students with a developed concept of an e-learning course in 2013. She also received the *"Best research paper"* award at the EDEN Research Workshop in 2016 for her paper "Use of MOOCs in Traditional Classroom: Blended Learning Approach".

She has been working at LinkedIn since 2014 in the Customer Success Organization, working with corporate and higher education customers on e-learning implementation, fostering strategic partnerships in developing learning and development strategies.

List of published papers:

1. Bralić, Antonia. Approaches to learning in a blended learning environment: preliminary results // Proceedings of 41st International Convention MIPRO 2018. Rijeka: Croatian Society for Information and Communication Technology, Electronics and Microelectronics - MIPRO, 2018. 853-858

2. Bralić, Antonia. Social Network Analysis of Country Participation in Horizon 2020 Programme // Central European Conference on Information and Intelligent Systems / Strahonja, Vjeran ; Kirinić, Valentina (ur.). - Varaždin : Faculty of Organization and Informatics / Vjeran Strahonja, Valentina Kirinić (ur.). 2017. 285-291

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