9-2022

A Student-Designed Learning Management System: A Mixed-Methods Analysis of Undergraduate Student Ideas for Improving the LMS

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A Student-Designed Learning Management System: A Mixed-Methods Analysis of Undergraduate Student Ideas for Improving the LMS

by

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A Dissertation submitted to the Education Faculty of Lindenwood University

In partial fulfillment of the requirements for the

Degree of

Doctor of Education

School of Education

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This dissertation has been approved in partial fulfillment of the requirements for the degree of

Doctor of Education

at Lindenwood University by the School of Education

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Declaration of Originality

I do hereby declare and attest to the fact that this is an original study based solely upon my own scholarly work here at Lindenwood University and that I have not submitted it for any other college or university course or degree here or elsewhere.

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Acknowledgements

While I may have conducted the study and wrote the document, to claim that I did so alone would be a lie. I would like to first thank my dissertation chair, Dr. Nasser, who provided me with unwavering support and a seemingly endless supply of helpful feedback and positivity. I'd also like to thank my committee members, Dr. Wisdom and Dr. Ramey. Thank you all for your encouragement throughout this process! Secondly and more importantly, I credit my spouse, Paul, who took care of literally everything while I was locked away in my office, from bills to groceries to all the meal prep. He took on so much more than he needed to. I'm not sure how many dishes he scrubbed, hugs he gave, or tears he wiped for me, but had he not, I most certainly would not have finished. He was (and is) truly my best friend and biggest cheerleader during this process. I am so excited to finally paint *the Drs. Morris* on our mailbox!

I would also like to thank my canine companions, Blue, Revere, Maggie, and Ellie, who provided fuzzy cuddles and annoyingly persistent reminders that I sometimes actually did need to exercise and play to help clear my head. I also thank my parents, Charlie and Cindy, who raised me to be a puzzling combination of curious and stubborn. I'd also like to thank my parents-in-law, Sue and Dennis, for their support as well.

Finally, I'd like to thank my eighth-grade teacher, who when discussing my performance in her class, told me she thought I should consider another career path that wasn't as hard. While that comment hurt at the time, I am grateful for it. It filled me with just enough spite and resilience to one day prove her wrong. Look at me now!

Abstract

Learning management systems (LMS) are digital tools used to comprehensively deliver education in various settings, including higher education. Using LMSs has been shown to support learner-centered instructional practices and, when used well, to support positive learning outcomes in students. While previous research has examined student use and satisfaction with an LMS, little research has explored student perceptions regarding LMS design. The study evaluated undergraduate students' perceptions and opinions of an LMS's design. The study also sought to compare students' attitudes regarding their LMS during pre-COVID and following the pandemic's onset. Forty-five students participated in a survey, and three participated in an interview. In general, students felt that the design of the LMS adequately supported their learning needs. However, the results showed differences in desired features and navigation methods between learning levels and degree programs. The study found that instructors have a critical role in designing courses to support students' learning needs. Specifically, students desired more consistency in design between courses and within each course and felt that many instructors could benefit from additional training in using the LMS effectively. Study participants also indicated a desire to customize their LMS experience, and did not seem to mind using external tools, regardless of whether they were integrated within the LMS. In general, students had similar attitudes about their LMS at the time of the study as they did before COVID. The results of the study can be applied in the selection and support of LMS at colleges and universities. Higher education institutions should consider providing more structured support and development opportunities to front-line instructors to

provide a more streamlined experience for their learners that fully support learner-centered instructional practices.

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Chapter One: Introduction

Introduction

This chapter introduces the basis for the study, outlines a brief background and discusses the purpose and importance of the study. Then, the chapter outlines the research questions for the study, and links them to the background, purpose, and importance. Additionally, the chapter outlines and defines relevant key terms. Finally, this chapter discusses limitations to the study, including those relevant to the study design and method.

Background of the Study

Recent teaching and learning practices consider a constructivist learning theory wherein learners construct their knowledge base from lived experiences and interleaved recall practice blended with application activities (Brown et al., 2014; Carey, 2015). Based on evidence from cognitive science, teaching has therefore transitioned from an instructor-focused practice via lecture to a learner-centered one (Wright, 2011). Some instructors in higher education have adopted this philosophy and are using digital tools to guide learners through the process of learning, rather than asking them to passively listen to a lecture. Today, some instructors may be just as likely to ask students to use Twitter to develop quick field notes (Bruff, 2019) or write a blog post on social media (Dogoriti et al., 2014; Gray et al., 2010) as they are to assign a traditional research paper. The stated benefits include using tools with which students are already familiar to encourage real-time learning and recall practice, and to engage both peer and instructor feedback in a meaningful and timely manner (Bruff, 2019; Carey, 2015; Means et al., 2014; Nilson, 2010; Nilson & Goodson, 2018).

One of the largest tools used in education is the learning management system, or LMS. First developed in the 1960's by the Massachusetts Institute of Technology, LMS quickly became popularized with the advent of the internet (Athmika, 2020; Hubackova, 2015; Rhode et al., 2017; Watson & Watson, 2007). LMS have a variety of features that aim to assist with administrative tasks, such as enrollment and the management and delivery of instructional materials (Coates et al., 2005; Rhode et al., 2017). As of 2014, nearly 99% of higher education institutions in the United States reported using at least one LMS, either built in-house or purchased from a commercial source (Dahlstrom et al., 2014) (Dahlstrom et al., 2014). Some research also indicates that LMS are often chosen from a faculty and administration perspective, rather than a learner-centered view. Administration often chooses the LMS based on factors like cost, the ability to track student progress, and its ability to complete administrative tasks such as enrollment and content management (Barnes, 2020; Kasim & Khalid, 2016). Learning data or learning analytics can be especially useful for the administration. For example, a student's learning data, such as grades, pages visited, assignments completed, etc. are used to develop profiles for at-risk students, leading to early intervention and retention efforts (Macfadyen & Dawson, 2010). However, when it comes to the design of the LMS, the research is scarce in terms of whether it meets learner needs and desires in the process of achieving the learning goals.

Study Rationale

Despite the widespread adoption of LMS in higher education, previous research has found a mismatch between the learner-centered teaching and learning philosophy and the way in which LMS are used. Recent studies have found that nearly half of faculty ban

technology such as laptops and mobile devices in the classroom (Galanek & Gierdowski, 2019), which effectively prohibits students from using their LMS with other digital tools, such as e-books. Additionally, the same survey found that faculty, in general, used the LMS for strictly content management, such as posting handouts or announcements, and were likely to hold a view that technology did not enhance education. A parallel survey of students (Gierdowski, 2019) found that students desired more opportunities to synchronously collaborate with their peers and instructors through the LMS and valued tools related to overall degree planning, if they were available. Based on previously available research (Coates et al., 2005; Dahlstrom et al., 2014; Rhode et al., 2017), the faculty use of LMS for one-way push of content was a persistent problem.

Earlier in their implementation, some research had cautioned against implementing LMS or other EdTech tools through a purely administrative lens or from third parties. One group cautioned that the design of the LMS has not kept pace with educational trends and that many instructors are forced to fit their instruction to the design of the tool, instead of the reverse (Coates et al., 2005). Some research supports this warning. For example, some studies found that while LMS have strong assessment capabilities for single-answer questions, they fail to fully support assessment with novel student authorship assignments, such as writing blogs, using social media, or generating other unique forms of content (Dogoriti et al., 2014; Gray et al., 2010).

With the shift in teaching and learning philosophies trending more towards a learner-centered focus, some advocates in the EdTech space are pushing to use tools external to the LMS to meet learning goals. Derek Bruff (2019), for example, in his most recent book, *Intentional Tech*, gives several examples where students move toward

applying knowledge and creating novel content through using blogs, Twitter, and web-based interactive tools. He also advocates for the creative use of these tools as they lend themselves well to gathering robust feedback from peers, instructors, and experienced professionals online. The push toward using EdTech as tools align well with our current understanding of how people learn, especially with respect to retrieval practice and application to new ideas, and timely and frequent feedback (Brown et al., 2014). However, the use of external tools may indicate that current LMS are insufficient for a student-centric teaching and learning approach. While previous studies have reviewed general student satisfaction with LMS, little research is available regarding student preferences for LMS design as it relates to meeting their own learning needs.

Additionally, with the onset of the COVID-19 pandemic, higher education has been forced to use its LMS in new and different ways as colleges and universities have altered instruction in fully online/remote or hybrid models. For example, where some traditional face-to-face classes may have only used the LMS to post final grades when it moved to a remote online-only format, the instructor may have found it necessary to post files and communicate with students using the LMS where they had not done so before. Minimal data is currently available on student preferences regarding their LMS as a result of COVID-19. In addition to the gaps identified above, the study will also ask students whether and how their attitudes and expectations for their LMS have changed as a result of COVID-19.

Purpose of the Study

While previous research has examined general satisfaction regarding the features within available LMS (Dahlstrom et al., 2014; Galanek & Gierdowski, 2019; Gierdowski,

2019; Selwyn, 2016), little research is available regarding student-driven design choices of LMS. This missing research is misaligned with learner-centered pedagogical practices, which put the learner and the act of learning as central in both curriculum and course design. Rather than simply choosing topics the instructor feels are important, most experts agree that design should begin with determining what students should learn and what evidence proves their success in learning it (Means et al., 2014; Neuhaus, 2019; Nilson, 2010; Nilson & Goodson, 2018). This process, generally referred to as "backward design" (Nilson, 2010; Wiggins & McTighe, 2005) encompasses supporting concepts and relationships, then activities to help learners understand those relationships. Additionally, most experts also agree that pedagogy should always reflect, not only the learning outcomes but those that promote learning within the student, such as using interleaving, recall practice, and instilling a growth mindset (Brown et al., 2014; Bruff, 2019; Carey, 2015; Darby & Lang, 2019; Dweck, 2016; Lang, 2016; Neuhaus, 2019). With course design and pedagogy taking a learner focus, the relationship between the instructor and the student, while still hierarchical, should reflect a two-way partnership and not a one-way giver-receiver relationship. In this partnership, the learner should have a voice in the tools used to help construct and give meaning to their learning, including the LMS. One aim of the study was to help fill the gap between a rise in learner-centered teaching design and LMS design and determine whether the learner perceives the LMS meets their learning needs.

The current research may have misaligned goals and outcomes with longstanding user-interface design theory, such as making the user interface the most useful to the broadest possible audience (Oppermann, 2002). Additionally, all users should find the

design intuitive to reduce the cognitive load and focus on learning the content, rather than learning how to use the LMS ("Chapter 30: User Experience Design," 2017). Due to possible underrepresentation of the learners' voice within the design and choice of learning management system, the learning management system may only consider half its users' needs (i.e., the instructors). The second purpose of the study was to examine student desires and needs regarding LMS design as they relate to their academic experience while enrolled in undergraduate degree programs. Specifically, the study examines the most desired functionality and organizational, or navigation structure students want to make recommendations to colleges and universities interested in promoting a learner-centered academic tool.

An additional argument is that some specific learning needs using an LMS may have changed over the last year, especially due to the shift to remote learning due to the COVID-19 pandemic. One of the central tenants of user-interface design is that it should accommodate the broadest range of use possible (Oppermann, 2002). With the recent and sudden onset of COVID-19, the learning management systems designs may not have had opportunities to adjust to meet the rapidly changing needs associated with the pandemic. If needs have changed, so, too, should the user interface, including organization, navigation, and general structure. Additionally, the study sought to determine student attitudes toward how the current LMS meets their perceived learning needs with respect to the COVID-19 pandemic.

Together, the findings associated with the study on student-designed learning management systems add to a new and growing body of evidence. The results help inform current and future educators in higher education about student preferences for the

design and function of university-chosen learning management systems. The findings can also help university administration make future choices that will have a positive impact on learning, academic outcomes, and on the overall student experience.

Hypotheses and Research Questions

The goals of the study were to examine undergraduate student attitudes and perspectives regarding the use of learning management systems at a private university in the midwestern United States. Specifically, the study asked students to identify the features and functions which are most important to them, whether they should be natively built into their current LMS, and whether and how they would choose to reorganize the structure of their LMS if given a choice. Additionally, I asked students about how their perceptions of and attitudes toward their LMS may have changed because of the COVID-19 pandemic.

The study included a mixed-methods approach that involved the collection of quantitative data via a survey. The survey included several questions that asked students to rank on a weighted scale their perceived value of different features and proposed alternative navigation methods within their learning management system. Additionally, I collected qualitative data though open-ended questions in the survey and through a scripted interview. As a result, the study contained both hypotheses and research questions.

Null Hypotheses

The null hypotheses for the study were:

- Null Hypothesis 1: There is no difference in the perceived value of LMS features.

- Null Hypothesis 2: There is no difference in the perceived value of LMS features based on learning level.
- Null Hypothesis 3: There is no difference in the perceived value of LMS features based on degree program.
- Null Hypothesis 4: There is no difference in the perceived value of proposed alternative LMS navigation methods.
- Null Hypothesis 5: There is no difference in the perceived value of proposed alternative LMS navigation methods based on learning level.
- Null Hypothesis 6: There is no difference in the perceived value of proposed alternative LMS navigation methods based on degree program.

Research Questions

The research questions for the study were:

- Research Question 1: How would students design a learning management system compared to what is provided by the administration?
    - Research Question 1A: Which LMS features and functions do students find the most valuable to their learning?
    - Research Question 1B: How would students reorganize Canvas to make it easier or more meaningful to navigate?
    - Research Question 1C: How do students feel about the use of external tools in addition to their LMS, if they use them?
- Research Question 2: How do the desired LMS features, functions, and organization differ between students in degree programs at different schools?

- Research Question 2: How has the COVID-19 pandemic altered expectations and overall satisfaction for undergraduate students using learning management systems?

Definition of Terms

I used several terms the study as follows. Educational Technology, or EdTech refers to digital software tools used for educational purposes, whether through the intended design or implementation in an educational context (Weller, 2020). I further defined EdTech tools as those which often seek to engage learners with concepts and materials in ways that apply information in meaningful ways or through social aspects. EdTech tools can include those specifically designed for education, such as learning management systems, or tools that were adapted for an educational use, such as social media.

The term “external tools” refers to websites or services that students use as part of their learning experience in the learning management system. Such tools could bring users outside the LMS entirely or be owned by a third party but are integrated into the existing LMS. For the purposes of this study, external tools are those that are not natively built into the learning management system.

During the study, participants explained their preferences for their learning management system. A learning management system is an internet-based software that is used to facilitate the administration, content curation, and pedagogical delivery of a given course or set of courses. (Watson & Watson, 2007) The term “learning management system” is abbreviated throughout this paper as LMS.

Participants for the study were undergraduate students. I defined undergraduate students as students enrolled either part-time or full-time seeking a bachelor's degree. I also evaluated learner level, which I defined based on how much experience students had as students at the university level. I split learner level into two groups: early learners, which were those who were enrolled in their first semester, and later learners, which included students who were in their second semester or greater.

I finally use the term user interface throughout this paper. User interface is the aesthetic design and overall functional and technical usability of a software program as created through the intentional design of human interaction (Norman, 2013; Oppermann, 2002). Essentially, the user interface is the visual interaction participants had when they described how they used their learning management system.

Study Limitations and Delimitations

The study had several limitations. First, the instruments for the study were written specifically for the study, which may have been a threat to their validity. While the questions reflected information I found in previous studies and surveys, I was not able to find an instrument that met all my research goals. Other studies I reviewed did not include or publish the specific questions of their survey instruments, so I could not use them. I did attempt to validate the questions somewhat by asking participants similar questions to one another between the survey and the interview.

The second limitation was the sample. The study sample primarily reflected the undergraduate population of one institution. While participants from three total institutions participated, only two participants were not enrolled at the primary institution. Because of this limitation, the survey and interview results focused primarily

on one learning management system as it was used at one institution. Because other LMSs were not well represented, the study may not be as applicable across all LMSs.

An additional limitation was the time the study was conducted. The study was conducted during three main phases: September through November 2021, January through February 2022, and in March 2022. The first two waves of the study occurred around the time of major holidays or planned breaks in the academic year, which may have influenced how participants responded. Specifically, respondents may have been less willing to respond, particularly due to other obligations, such as midterm or final examinations.

A further limitation may be related to the COVID-19 pandemic. Although the study evaluated student experiences in the past, at the time of the study, the pandemic was ongoing. Nearly two years into the study, students may have been experiencing burnout. Despite using three recruitment waves to attract participants, students did not seem willing to provide narrative comments or participate in the interview. Interestingly, some students who found the recruitment post on social media were eager to volunteer information via the messaging service about their learning management systems, particularly if there was a feature about which they had strong opinions. However, when I followed up via the messaging service in the social media platform to request an interview, they declined. If I were to repeat the study, I would attempt to recruit participants with a different social media platform. Rather than an interview, I might design the study so that willing participants could react to a post with their opinion and collect data with reaction videos or stitched videos.

Summary

As teaching trends have moved from instructor-focused to learner-focused, learners should become a primary stakeholder responsible for the learning process. Therefore, learners should have an increased role in the decisions regarding the tools that are used to facilitate their learning. One of the primary tools used in the delivery of instruction in higher education today is the learning management system (LMS). While previous research has examined general student satisfaction with their tech tools, including their LMS, research has not specifically examined student choice with the design of their LMS. The study evaluates students' attitudes regarding both the function and design of their LMS and how their perceptions of the LMS performance may have changed with COVID-19.

The following chapters explore the history of learning management systems and their role within higher education in greater detail. Specifically, I outlined how learning management systems meet or do not meet the current educational need and trend toward learner-centered teaching practices in higher education in the United States. Subsequent chapters further explore the research design and methodology for addressing learner needs in these areas.

Chapter Two: Review of Literature

Introduction

Over the centuries, educators have leveraged tools to enhance teaching and learning practices. Tools have ranged from the low tech, such as papyrus scrolls, chalkboards, and seating arrangements, to today's high-tech digital tools, like audience response systems, and social media. The learning management system, or LMS, is one tool in the history of these technologies and plays a key role in how educational institutions teach their learners across the lifespan (Gierdowski, 2019). Today, most colleges and universities in the United States use an LMS as one of their primary educational technologies and as many as half of teaching faculty at these institutions require the use of digital technology to participate in class (Galanek & Gierdowski, 2019). This chapter explores the role of the LMS in higher education, perspectives regarding its use and design, and related research.

To begin, this chapter first explores the history of educational technology, or EdTech, and how teachers have used different tools over the past few centuries to meet changing needs. Specifically, I highlighted how instructors chose and used different educational technologies based upon both available technologies of the time and problems they needed to solve. Alongside this history, Chapter Two includes explorations of how the ever-changing needs in education, such as teacher training, and advancements in the world's knowledge about learning.

Additionally, this chapter explores currently accepted teaching and learning theories and philosophies, and modern design practices. Specifically, how does an LMS's design align with and support a modern learner-centered teaching philosophy? The

chapter combines these concepts with previous research about students' interactions with and perceptions of their learning management systems in higher education. Finally, the chapter explores the recent COVID-19 pandemic and existing research on its impact with respect to teaching and learning practices in higher education, particularly as they manifest within a learning management system.

A Brief History of the LMS's Role in Education Technology

When people in the 21st century think of technology overall, they might be thinking of digital technologies. However, not all technology must be digital. For example, technology has existed for nearly as long as people have and can be loosely defined as a tool that performs a function. Cunningham (2016) defined it particularly well when he stated, "[t]echnologies are the ways individuals and groups respond to challenges" (p. 252). With this definition in mind, any tool humans use can be thought of as technology. Educational technology, therefore, is any tool used for the purpose of education. In some cases, educational technology, or EdTech, may reference digital technologies, such as social media websites or audience response systems, but could also include whiteboards or chairs with wheels (Bruff, 2019) in other contexts. This section explores the history of technologies in education that led us to our current tools of the trade.

The first recorded existence of a university was the university of Oan in Egypt where instructors lectured and students used papyrus, an early form of paper, to record their findings (Emira, 2014). Since the University of Oan was founded, paper has maintained a large role in teaching and learning practices and has often been a primary medium for various educational technologies over time. One of the key roles paper has

played in education has been through textbooks. The invention of the printing press facilitated the mass production of textbooks. Early textbooks were a teacher-only tool, which included direct instruction using a call-and-response style so that all teachers, regardless of training or education, could focus on their learners (Wakefield, 1998) This approach was helpful as early teacher training programs were highly variable, unstandardized, and not accessible to all communities, such as rural locations (Wise & Darling-Hammond, 1987). The call-and-response style, or catechism, allowed for untrained teachers to deliver education. Teachers had to simply read the questions and, as long as the students recited the correct answer stated in the book, they had proof of their students' learning.

Paper also played a key role in early distance education endeavors. Distance education methods began primarily via the exchange of letters between instructors and students; by the 1880's, several distance learning courses were available to learners of various fields of study, including mechanics and girls' finishing studies (Harting & Erthal, 2005). As textbooks became cheaper to produce, their purpose shifted from an instructor tool to a student tool, as schools could more easily obtain a copy for each student. The shift in textbooks followed a shift in teachers' roles in U.S. American schools; teacher education programs expanded, and schools evolved from the one-room schoolhouse to buildings with dedicated rooms for learners at different levels (Wise & Darling-Hammond, 1987). With a textbook for each learner, textbook authors could shift from rote memorization skills to knowledge application, where students could answer reflective questions based on the foundational knowledge that preceded them (Wakefield, 1998). The shift to more complex classrooms and instructional methods also led to new

problems for instructors. Specifically, instructors needed better ways to keep administrative tasks tidy and to inform students of plans and expectations in advance. The syllabus started to become commonplace as a way to address these logistical needs and allowed instructors to focus on the application of new knowledge and offload some administrative labor (Eberly et al., 2001).

During the early 1900s, visual instructional media debuted in education. The media included slide projectors and stereograph viewers and were kept in spaces referred to as "school museums" and were largely viewed as supplementary material (Reiser, 2001a). Visual media helped instructors supplement written text and illustrate more complex ideas to larger audiences. In the 1920s, education technology turned toward computers when an educator created the first learning machine. Students using the learning machine could answer questions that instructors pre-programmed with answers, so that students could receive feedback as they worked (Rhode et al., 2017). This form of technology was a blend of the original catechism style of the first textbooks although the types of questions were limited to single, best response multiple-choice (Rhode et al., 2017).

By World War II, audiovisual media, namely instructional videos, had taken center stage as the educational technology of choice particularly for the United States Armed Forces (Reiser, 2001a). Instructional videos allowed educators to deliver consistent and parallel educational experience to learners over large geographic areas. As long as the recipients had the means to play the videos, they could learn from them. Audiovisual educational technology further expanded during the 1950s and 1960s by using television as a synchronous delivery method; however, most instruction was simply

a televised lecture and did not become overly popular (Reiser, 2001a). Some televised education did become popular, predominantly with children. *Mister Rogers' Neighborhood*, for example, taught children social-emotional skills, with basic facts and current issues for over 30 years (The Fred Rogers Company, 2018).

From the 1960s to the 1970s, educators developed a precursor to the modern learning management system called PLATO (Rhode et al., 2017; Watson & Watson, 2007). Programmed Logic for Automatic Teaching Operations (PLATO), served the University of Illinois primarily as a learning content organizer and administrative tool containing course documentation and enrollment data (Bitzer & Braunfeld, 1962). PLATO was one of the first integrated tools that combined teaching and learning materials with administrative tools together in one system. In the mid-1980s, as micro-computers became more available to the general public, roughly half of primary and secondary educational institutions in the United States had access to at least one personal computer to assist in delivering educational materials (Reiser, 2001a).

By the early 1990s, the general population found access to the Internet with chatrooms and discussion boards. Educators also found these tools and began incorporating them into web-based bulletin board systems (BBS), where learners could communicate with one another and pose and answer questions that extended beyond single response question types (Weller, 2020). These types of tools enabled deeper thinking and created a way for students to provide a new piece of evidence for application of knowledge. By the early 2000s, what one would recognize today as the modern learning management system arrived. Blackboard and Saba were the first LMSs to appear and integrated educational materials, including visual and audiovisual

materials, administrative tools and student-instructor communication, accessible nearly anywhere via the Internet (Davis et al., 2009). Textbooks also began to shift to a more digital format as a dentistry school in the United States allowed students to purchase books on a CD-ROM the university produced for them (Heider et al., 2009).

Additionally, the easy access to the internet facilitated the beginning of the modern correspondence course, or distance-learning education through eLearning (Harting & Erthal, 2005). Teachers and students could easily use chatrooms and discussion boards locally, such as with traditional face-to-face instructional methods, or distantly using the wide variety of features found within a learning management system. Internet access broadened the geographic reach of many colleges and universities, and by 2012, Massive Online Open Courses (MOOCs) were exceedingly popular across the world (Moe, 2015).

Today, LMS remains one of the key tools for education delivery in higher education. A quick Google search reveals many open source and commercially available LMSs. They continue to take on many roles of previous technologies, including textbooks, quizzing, and administrative needs, and could more accurately call themselves learning *content* management systems (Watson & Watson, 2007).

LMS Use and Satisfaction in Higher Education Today

Since their development, corporate and educational institutions alike have found value in learning management systems and have adopted them to suit their educational and training needs. Multiple studies have since examined how faculty, students, and administration use and enjoy learning management systems. The following paragraphs

briefly review Higher Education's uptake of LMS and the current research exploring the perceptions of those who use them, including faculty, administration, and students.

The Internet's increasing availability to the general public has helped learning management systems (LMSs) become attractive and accessible to many colleges and universities. In 2007, 81% of higher education institutions offered at least one course online, with 34% of those surveyed offering full degree programs entirely online through the LMS (Falvo & Johnson, 2007, p. 41). By 2014, roughly 99% of higher education institutions had implemented a learning management system on their campus (Dahlstrom et al., 2014, p. 4). As more and more colleges and universities have implemented an LMS, they have also included them as a primary tool in their teaching continuity plans. Colleges and universities have used their LMS to continue instruction as much as possible during times of disruption, such as during natural disasters. For example, LMSs played a key role following Hurricane Katrina in 2005 and later during the COVID-19 crisis in 2020 (Gamage et al., 2020).

As LMSs have gained popularity, many researchers have focused their attention on studying their impact on both instructors and learners during regular use. While the study focuses on incorporating student voice in LMS design, information about how faculty use and perceive their LMS is also important. Without faculty, students would not use an LMS at all. Considering all types of instruction – traditional brick-and-mortar, fully online, hybrid, and HyFlex – students typically engage in education reactively, following their instructors' leads. In general, nearly all teaching faculty today have used their university's LMS to teach at least one course (Galanek & Gierdowski, 2019; Rhode et al., 2017; Schoonenboom, 2013), and interestingly, older faculty are more likely to

have taught a course fully online using the LMS than are their younger counterparts (Galanek & Gierdowski, 2019). While faculty are generally satisfied with the LMS their university provides, some studies note that faculty tend to underutilize them, either by not using them for all aspects of their teaching or by not using all available features that could benefit them (Borboa et al., 2017; Fathema et al., 2015; Schoonenboom, 2013). In some studies, students have also noted faculty underutilization of the learning management system (Arabie, 2016; Gierdowski, 2019). Other researchers' studies have found that faculty who believe they can use or can learn to use the LMSs are more likely to use the system more comprehensively than those who do not (Lao & Gonzales, 2005; Rhode et al., 2017; Schoonenboom, 2013).

Several researchers since the early 2000s have also examined student use and perceptions of learning management systems over time. Generally, students are satisfied with the LMSs their respective institutions choose for them (Arabie, 2016; Borboa et al., 2017; Cavus, 2021; Gierdowski, 2019; Naveh et al., 2010). Students view some features differently than others, however. For example, two features that students have consistently ranked as the most important include access to instructional material, such as lecture notes and readings, and access to exams and quizzes (Basioudis et al., 2007; Borboa et al., 2017; Cavus, 2021; Selwyn, 2016). Students' perception of value for these features aligns with traditional measures of academic success in the college environment: attention to instructors and material, and success on traditional exams and quizzes. Students have also highly valued feedback tools that enable them to communicate with their instructors and gain insight into their learning and success (Arabie, 2016; Lao & Gonzales, 2005). One study specifically found that students rated having a mechanism for

feedback as the most useful tool within an LMS across multiple different degree programs and fields of study (Arabie, 2016).

Students have also expressed disappointment and dissatisfaction with their respective LMSs. While students enjoy ready access to instructional materials, some noted frustration finding them, due to inconsistent LMS design across courses (Selwyn, 2016). Inconsistent design could include enabling or disabling different features between courses or differences in instructor preferences for performing different tasks. Students have also expressed frustration with the quality of materials and perceive that many faculty do not use the technology well (Borboa et al., 2017; Gierdowski, 2019; Selwyn, 2016). Specifically, students felt that simply making content available on the LMS was insufficient for their learning as it left students to synthesize large amounts of material that, as novice learners, was too challenging (Selwyn, 2016). All of these sources of dissatisfaction stem from instructor use, rather than the system's design.

Some studies have evaluated which factors predict student satisfaction with their learning management systems. For example, one study found that differences in academic performance did not correlate to different levels of student satisfaction (Cavus, 2021). That is, students who performed better or received higher scores were no more or less likely to be satisfied with their LMS when compared to their peers who performed less well. Student attitude is also not a strong predictor of LMS satisfaction; regardless of their feelings about other aspects of their education, most college students generally believe their LMS is a useful tool for their learning (Abdel-Maksoud, 2018; Arabie, 2016; Ozkan & Koseler, 2009). Instead, the most significant predictors of students' satisfaction with their LMS include instructor quality and perceived ease of use. Students

who rated instructors and their materials more highly were more likely to report higher satisfaction levels with their LMS (Ozkan & Koseler, 2009). Furthermore, students were likelier to feel satisfied with their LMS if they perceived that it was easy to use (Abdel-Maksoud, 2018; Rhode et al., 2017).

This finding is not surprising, especially given that a university education is not typically compulsory; students choose to enroll. Because students choose to participate in higher education, they are likely to be highly motivated to use their LMS. This motivation does not depend upon how well they perform. The Measures of student satisfaction are different from involving them in the design of the tool. In some cases, researchers and designers do collect objective learner feedback regarding the LMS. For example, some researchers have tracked student eye movements when performing specific tasks and compared eye movements to perceptions of ease of use (Ramakrisnan et al., 2012). Others have invited students to participate in detailed interviews regarding specific features and functions of the LMS (Zanjani et al., 2017). However, in both of these examples, student input was collected by third parties, making LMS companies unlikely to include them. Additionally, both of these types of studies focus on existing user behaviors. While information about behaviors can be helpful for designers to determine the usefulness of certain features, this information does not give them much insight into more foundational enhancements or changes to the overall design of the platform. Few studies have examined what and how students might design the LMS based on their perceived learning needs.

Today, higher education institutions have a wide variety of learning management systems, including commercially available systems, such as Canvas or Blackboard, and

open-source solutions, like Moodle. When universities choose an LMS, they must consider the needs of multiple stakeholders, including administration, instructors, support staff, and all their learners. Colleges and universities often have multiple learners, including undergraduate, graduate, professional, and other trainees. They may also want to use the learning management system to deliver compliance-based education for their employees or to deliver development opportunities for teaching faculty. Higher education institutions often consider two primary functions when selecting their respective LMSs: the ability to communicate with learners and options for instructors to organize content (Agaci, 2017; Barnes, 2020). Higher education has recently been interested in learning analytics, which became available in some commercial learning management systems over the last decade (Campbell et al., 2007). Many universities may also consider student satisfaction (Kasim & Khalid, 2016) or directly involve a small sample of students during the search process (Barnes, 2020). In these cases, students weigh in regarding their perceptions of ease of use or may provide their opinions on certain features as part of the technology selection committee.

Learning management system creators also consider these perspectives; however, they tend to market themselves toward the needs of the administration. Instructure, which owns the LMS, Canvas, directly addresses college and university administrators, on their website with promises of enhanced student engagement and better analytics (Instructure, 2021b). Moodle, an open-source LMS, addresses instructors, encouraging them to create their class website (*Moodle*, n.d.). This approach makes sense as administrators usually purchase these systems and advocate for their implementation. An inside push to adopt a new LMS will more likely come from instructors who participate in shared governance

and are likely to stay longer at the institution compared to students. Early conversations regarding the LMS's design considered students' opinions only after those of designers and administrators or left students' opinions out altogether.

Learning Theory and Common Teaching Practices in Higher Education Today

As higher education institutions have explored new technologies and begun to use learning management systems, they have also shifted their perspectives and practices in teaching and learning. Over the last few decades, many experts began supporting a constructivist learning theory, wherein humans construct knowledge based on their experiences and interactions with the world (Brown et al., 2014; Carey, 2015). Experts also began supporting the concept of growth mindsets, in which learners believe they can learn new and difficult concepts, rather than believing in static intellectual ability (Dweck, 2016). Emotions also impact humans' ability to learn, such that negative emotions, such as frustration, anger, and fear, decrease learning outcomes (Dweck, 2016; Feldman Barrett, 2018). Based on this evidence, instructors should then strive to create psychologically safe learning environments that allow students to construct models of knowledge from their own experiences.

Taken together, this evidence creates a learner-centered teaching philosophy where the process of learning and evidence-based outcomes become the primary focus of classroom activities. A learner-centered teaching philosophy shifts the role of the instructor, who then becomes responsible for helping learners to make their own understanding. The concept is not new. Wiggins and McTighe (2005), in their book *Understanding by Design*, point out:

> to have taught well is not to have used a great set of techniques or given the learner some words to give back, but to have caused understanding through words, activities, tools, guided reflection, the learner's efforts, and feedback. It is a complex interactive achievement, not a one-way set of skills. In other words, we forget, given our blind spot, that the act of teaching—in the sense of direct instruction (talking, professing, informing, telling)—is only one aspect of causing learning (and not the most important aspect, if the arguments in this book are compelling). The design work of learning is as important as—and perhaps more important than—any articulate sharing of our knowledge. (p. 228)

A learner-centered teaching philosophy also incorporates the human aspects of learners. That is, a learner-centered philosophy should acknowledge that because our learners are social and emotional beings, learning must also incorporate a safe emotional environment and be collaborative in nature (Wright, 2011). Altogether, learner-centered teaching has five key characteristics, which Dr. Weimer (2012, p. 1) summed up well: 1) that students are engaged in learning, 2) that the learning teaches skills rather than facts, 3) that students have an opportunity to reflect on the relevance of their learning, 4) students have control over the learning process, and 5) that learning is collaborative.

Instructors best meet this educational philosophy when they use strategies that allow students to become actively engaged with the content through student-controlled activities and low-stakes formative practice, rather than through primarily passive methods, such as the traditional lecture; and combine these learning designs with giving adequate guidance and thorough, timely feedback (Mellow et al., 2015; Neuhaus, 2019; Nilson, 2010; Wright, 2011).

This type of enhanced instruction can take many forms across a spectrum of digital technologies in modern classrooms. For example, some low-tech solutions include reflective and predictive activities (Lang, 2016), and higher-tech examples include using audience response systems or social media (Bruff, 2019). In an asynchronous classroom where teachers deliver instruction remotely, instructors can leverage technologies, such as discussion boards and assignments (Arabie, 2016; Darby & Lang, 2019; Nilson & Goodson, 2018). In all of these cases, instructors use the tools that their learners already know and are comfortable using, such as in the case of using social media, and offer opportunities to practice free recall and pattern recognition in a collaborative environment. However, instructors may find that using learner-centered practices is more challenging than traditional teaching methods as learner-centered pedagogy is a learned skill that takes time for instructors to learn and develop. Learner-centered techniques also take more up-front work than preparing a lecture: instructors must be prepared to create activities that guide students toward achieving the goals, creating opportunities to practice free recall, and providing rich, actionable feedback later (Brown et al., 2014; Lang, 2016). Additionally, some studies have shown that both instructors and students may struggle to shift roles, because both audiences are unaccustomed to students being more actively responsible for designing their learning experiences (Moate & Cox, 2015; Wright, 2011). Students unfamiliar with active learning may also dislike the methods, at least at first, likely due to the increased cognitive load (Deslauriers et al., 2019).

Faculty may also have difficulty shifting their focus, as for some, their only frame of reference may have been their own experiences as learners. One study found that most new faculty reported that they had not received formal training on teaching and

instruction during their doctorate programs and that they created their own style, based on their experiences as learners and teaching assistants (Oleson & Hora, 2014). While accreditors, such as the Higher Learning Commission, may require faculty development, specific details about what universities must include in their faculty development remain vague (Higher Learning Commission, n.d.). Therefore, any faculty input into the design and development of learning management systems may not necessarily incorporate evidence-informed learner-centered practices.

Instructors must use caution when attempting to adapt their teaching to meet a learner-centered philosophy, that they do not confuse learner-centered teaching with using learning styles. Unfortunately, the myth of learning styles is pervasive and tells instructors that humans have one or more unique styles in which they learn best, therefore leading instructors at all levels to the erroneous conclusion that in order to be effective, they must try to match as many learning styles in their classrooms as they can (An & Carr, 2017; Furey, 2020). However, ample evidence shows that instruction that uses the learning styles theory does not have better learning outcomes, nor produces more durable learning (An & Carr, 2017; Cuevas, 2015; Furey, 2020; Kirschner, 2017). Instead, learning depends on a learner's ability to actively engage with the material through practice and spaced repetition (Brown et al., 2014; Carey, 2015).

Unfortunately, the learning styles neuromyth is stubborn, and many employees in higher education continue to believe and use them (Betts et al., 2019; Furey, 2020; Newton, 2015). One recent study found that the vast majority (roughly 60% to 80%) of teaching faculty and instructional designers continued to believe in several neuromyths, including learning styles (Betts et al., 2019, pp. 17–19). Additionally, many well-

meaning instructors also make errors when implementing learning activities in the college classroom. One study found that, when compared with observations by a trained third party, instructors significantly overestimated the amount of time students were actively engaged in a given session (Frey et al., 2016). Students make similar misjudgments, often believing that the fluency demonstrated by a skilled lecturer meant they learned more, when in fact they learned less than their peers, whose instructors used active learning techniques (Deslauriers et al., 2019).

In addition to considering the cognitive science of how humans learn, a learner-centered teaching theory also considers the human aspects of learning. Learner-centered teaching posits that learning is a highly social and emotional process and that instructors should therefore design learning activities to be collaborative and relationship-focused (Moate & Cox, 2015). In doing so, instructors must consider other student factors, including their respective cultural backgrounds, socio-economic status, age and current life stage, and other factors related to identity.

Despite the potential for conflating true learner-centered teaching with some neuromyths, instructors should still consider students as active partners in the learning process, including the selection and design of the teaching tools. If learner-centered teaching practices value students holistically, as social and emotional learning beings, then so should the tools we use to deliver those teaching methods. When colleges and universities choose tools, such as a learning management system, they should ask whether the tools' creators have the same learner-centered goals in mind. That is, when higher education institutions consider a learning management system, they should consider the tool's ability to help instructors foster the kinds of collaborative, active, and

creative educational activities that learner-centered teaching demands. But can and do modern LMS achieve those goals?

The concern of mismatched learning goals has existed since higher education institutions began adopting learning management systems. One researcher cautioned that learning management systems:

> . . . are based on an overly simplistic understanding of the relationship between teachers, knowledge and student learning. In-built functions may not encourage awareness of or experimentation with sophisticated pedagogical practices. . . . LMS are not pedagogically neutral technologies, but rather, through their very design, they influence and guide teaching" (Coates et al., 2005, p. 27).

Throughout history, teaching and learning tools have reflected the desires and beliefs of their creators. For example, early textbooks contained moral beliefs within the instruction (Wakefield, 1998). While it is easy for instructors and university administration to think of LMS's as inanimate systems, they must remember that humans designed them. If those designers have different goals for their design than the people who use them, then some neuromyths or teaching discrepancies can inadvertently persist. When considering learning management systems, universities must remember that the designers had to consider multiple perspectives and interests, including their own.

Today's learning management systems have similar functions to help facilitate teaching and learning. Canvas, Blackboard, and Moodle, for example, all have features related to enrollment management, assignment submission, and quizzing (Blackboard, n.d.; Instructure, 2021a; *Moodle*, n.d.). However, as one browses each respective website, they may notice a harder time finding information about active learner engagement and

collaborative environments. Moodle, for example, notes that it has "collaborative activities," however some that it lists are not collaborative in nature, such as assignments, or interactive learning modules through H5P or SCORM-enabled objects (*Moodle*, n.d.). While many of these features hold learners accountable and keep their attention, they do not necessarily meet a true learner-centered philosophy as described above. Of course, these features may exist natively or through integrations, the proprietors may have simply chosen not to advertise them as strongly on their websites.

Learning Management Systems' Impact on Learner Performance

As more college students began using learning management systems as a key tool in their education, determining whether LMS's were effective educational tools became important. LMS's, such as Moodle, Blackboard, and Canvas have built-in analytics to track how often students log in or access specific materials or pages within courses (Blackboard, n.d.; Instructure, 2021b; *Moodle*, n.d.). Additionally, LMSs commonly contain a gradebook as a place to store traditional performance data. Between these two pieces of information, instructors and administrators could access rich information about academic performance of their learners. In doing so, they could determine how their LMS impacted learning outcomes and their teaching missions.

Several studies over the last years evaluated the impact an LMS has on learning outcomes. Some studies found that students who used the LMS more were more engaged with the course and earned higher grades on average, when compared with students who used the LMS less frequently (Avci & Ergun, 2019; Dulkaman & Ali, 2016; Kim, 2017; Nyabawa, 2016). In general, this finding is not surprising. If instructors use an LMS to store course content, then the more students access the material relevant to their courses,

the more they should, in theory, be able to perform well academically. Alkis and Temizel (2018) supported this theory in their study, where they found that certain personality traits predicted LMS use which predicted academic performance, particularly in online classes, where students can find all course materials within the LMS. By contrast, face-to-face courses could use the LMS to house some, none, or all of their content.

However, simply accessing the LMS is not the only way students find benefits for their learning outcomes. Kim (2017) found a positive correlation between student competency in using the LMS and learning outcomes and noted that competent instructors influenced a student's ability to become competent with the LMS. Dulkaman (2016) also found a correlation between students' usage of the LMS and their motivation while enrolled in the course. These two studies specifically showed that the learner-instructor paradigm extended beyond creating personal connections and that instructors' modeling of interaction with the LMS, directly and indirectly, influenced students' performance.

Other studies found that specific features within the LMS impact learning outcomes. For example, one study examined how an external tool allowed students to export key events from the LMS, such as due dates, into the calendar of their choice. The researchers found that students' academic performance improved due to their enhanced time management skills (Mei, 2016). Another study found that enabling dynamic and integrative features within the LMS, such as live chat and collaborative tools, enhanced academic performance more than when instructors used the LMS only for organizing content (Nyabawa, 2016).

Learner-centeredness in Learning Management Systems

Although students have shown they are generally satisfied with their learning management systems and are more likely to perform well when using their LMSs, can modern LMS support learner-centered practices? Some researchers have evaluated this question. As part of these studies, researchers noted that the LMSs which instructors work with do not appear to be learner-centered. For example, Glancy and Isenberg (2013) found that the LMS used at their institution appeared to be instructor-focused and that instructors played no role in selecting the LMS, nor could they opt-out from using it. Stevens (2012) also noted that commercially available LMSs tend to constrain instructional design with rigid features and proprietary code. While these authors published these papers nearly a decade ago, their complaints show that the heavy instructor focus of many LMSs has been a long-standing problem. Based on this research, if instructors wanted to participate in more learner-centered education practices, they likely found it difficult to do so using their institution's LMS.

A recent literature review highlighted multiple learning management systems and their learner-centeredness by how well they could promote interactive and collaborative educational practices, central tenets of learner-centered teaching philosophy. The authors of this study defined five fundamental interactions for learners: learner-instructor, learner-learner, learner-content, learner-interface, and learner-self (Katsarou & Chatzipanagiotou, 2021). Across all the studies the researchers evaluated, they found that learner-instructor had the most impact on student motivation and performance outcomes and often determined how much collaboration students could engage in, while learner-interface interaction does not impact student satisfaction. However, the learner interface

positively impacted learning outcomes when it allowed for collaborative learning experiences (Katsarou & Chatzipanagiotou, 2021).

Interaction and the freedom of learner choice were common recommendations for creating more learner-centered learning management systems. One proposal was to attempt a course-within-a-course approach. This approach offered learners dual permissions roles as both a learner – to submit assignments and receive feedback – and as an instructor – so that they could curate their preferred content and provide feedback to their peers in collaborative activities (Glancy & Isenberg, 2013). A similar study recommended a do-it-yourself approach that incorporated multiple free or low-cost features, such as chat clients and wikis, in addition to using an LMS as a content management service (Stevens, 2012). Today, some commercially available learning management systems, such as Canvas, can integrate several external features to accomplish some of these tasks (Instructure, 2021b). Recent studies have shown that instructors successfully implement learner-centered practices using today's LMSs. Two studies within the last two years showed success using an LMS to create learner-centered opportunities. An and Mindrila (2020) found that K-12 instructors created mentorship opportunities (i.e., learner-instructor interaction) and authentic learning opportunities using real-world tools and examples. A second study found similar results, where instructors created rich and meaningful feedback opportunities through learner-instructor interaction and multiple formative learning opportunities using an LMS and integrated tools that fostered deep learning and opportunities for peer collaboration (Briones et al., 2021).

Designing a Learning Management System

Consider a home. A person might be generally satisfied with her house, but if involved in the design, may have placed light switches and doors in different locations, based on how she moves throughout that house daily. The same idea also applies to learning management systems. While daily users have shown they are mostly satisfied with their respective LMS (Basioudis et al., 2007; Galanek & Gierdowski, 2019; Gierdowski, 2019; Manion, 2019; Naveh et al., 2010), satisfaction does not necessarily reflect if and how they might redesign the system if given the opportunity.

The biggest challenge for designers in their work is that they must consider all possible users and how they will use that object or space. Unfortunately, designers have a long history of failing to consult or consider all users who will interact with their design, either intentionally or unintentionally. In a recent example, a Twitter user noted a non-functional restroom design from the perspective of those expected to clean it (Sahra, 2022). Other examples include beautiful but poorly functional architectural designs, such as home kitchens with inadequate storage or floor drains located too far from the most likely source of flooding (Ratan, 2022). Learning management systems are similar to architecture; their designers must also consider all users and use cases, including the students who use them to learn.

Some of the central tenets of general design are: 1) the design must take into account everyone who will use the object or space, 2) the designed object or space must be intuitive to the users, and 3) that the designer must take into account how humans currently behave, not how they want them to behave (Norman, 2013). When translated into the necessities of a learning management system, these three concepts could become

challenging for any designer. Students and instructors are the most obvious stakeholders; however, students and instructors can potentially vary greatly in their needs, depending on the content. For example, a sculpture class will likely have different learning activities and assessment needs compared to a class about biochemistry. Furthermore, the university's administration might need insight into overall learning analytics to help support academic advising or early detection programs. Secondly, the LMS must also be intuitive to all its users. Students, faculty, staff, and administration should not have to expend mental energy learning the system but should be able to focus on the task at hand. The intuitiveness of a system partly depends on the user and whether their mental model of how the system works aligns with how the system works (Norman, 2013). Finally, the design of the LMS should consider existing human behaviors. That is, designers should not design to control or create a new behavior, but rather consider what behaviors users currently engage in and design around them. Doing so will help minimize errors and proactively reduce frustration.

The primary way in which most users interact with a learning management system is through its user interface or UI. A user interface is the look and feel of a given website, including web-based LMSs, and dictates how a user will experience that website. In addition to considering who the users are and how they will use it, some UI experts advocate for considering individualized user interfaces that adapt to personal needs, specifically individual learner needs (Oppermann, 2002). However, an adaptive user interface based on learner needs creates challenges for designers. For example, if the user interface adapts only for the learners, are the designers truly considering all users?

One can find little information about who designs commercially available learning management systems. However, some LMS providers offer some clues on their website. Instructure, for example, promotes its LMS platform, Canvas, by incorporating testimonials from various stakeholders. Language on the website caters directly to administration and instructional staff, touting the ease of communication with students and reducing administrative labor time, such as with grading (Instructure, 2021b). Blackboard, another commercially available LMS, takes a similar approach. The website addresses the purchaser directly, advertising features like learning analytics and the ability to enhance learner engagement if one chooses to purchase their solution (Blackboard, n.d.). Moodle similarly addresses instructors and administrators: in the banner at the top of their website, they state, "Join hundreds of thousands of educators and trainers on Moodle, the world's most customisable [sic] and trusted learning management system" (*Moodle*, n.d.).

Higher education institutions may have similar questions about the design of learning management systems and of learning and have sought to rectify it, albeit somewhat after-the-fact. Many colleges and universities today hire specialized staff called instructional designers, who help to fill this gap. Instructional designers are professionals with specialized training and experience in learning theory, technology, and instructional media (Reiser, 2001b). Within higher education, instructional designers ". . . exist to bridge the gap between faculty instruction and student online learning" (Intentional Futures, 2016, p. 2). With their experience in learning theory, teaching, and education technology, instructional designers are well-positioned to advise on how best to

use the technology, including learning management systems, to reflect the learner-centered teaching philosophy.

Instructional designers fall under a large variety of job titles and descriptions but have four primary roles in higher education: designing educational materials and digital courses, project management, training, and support (Intentional Futures, 2016; Nworie, 2022). One study that reviewed job descriptions found that instructional designers could fall under one of roughly nine job titles and had a lengthy list of required skills, including both technical abilities and interpersonal skills (Nworie, 2022). However, not all higher education institutions hire an instructional designer, and those that do, can find themselves challenged with oppositional faculty. Some of the key barriers to success that many instructional designers faced were misconceptions about their roles, misconceptions about how good online teaching occurs, and a lack of leadership infrastructure to integrate instructional designers' expertise into teaching and learning practices (Intentional Futures, 2016). Furthermore, these highly specialized staff were often not included when the administration selected a learning management system or other EdTech tools (Intentional Futures, 2016). With these studies in mind, it seems even more unlikely that a learner-centered philosophy was honored or that designers included students when designing an LMS. Additionally, even though the researchers noted in the preceding section that instructors were capable of designing learner-centered education within an LMS, what was not clear was whether the learner-centered educational practices were the primary intended function.

The Impact of COVID-19

Disruptions, such as natural disasters and other extreme conditions can majorly impact all aspects of life, including education. In the previous paragraphs, I described idealized education that included instructional methods designed from a learner-centered pedagogical philosophy. However, these methods are difficult to implement during ideal conditions and might even be impossible to attempt during times of disruption. The COVID-19 pandemic closed colleges and universities in early March 2020 (Baker, 2020). By the end of March, nearly 1,500 higher education institutions had evacuated students from their campuses and instructed them to begin learning online (Johnson-Hess, 2020). One benefit that higher education in the United States had was, that by 2020, most colleges and universities had a learning management system in place for several years (Dahlstrom et al., 2014). While many higher education campuses have likely reopened, the pandemic has changed the standards of teaching and learning.

Since the onset of the COVID-19 pandemic, some researchers evaluated learning management systems and overall teaching efficacy, especially during the initial emergency shift to remote teaching. Several studies revealed key themes about students' perceptions of using their respective LMS during the pandemic and the challenges of switching to remote learning in the United States and worldwide. In general, these studies found that students were generally satisfied with their LMS during the pandemic (Alturki & Aldraiweesh, 2021; Alzahrani & Seth, 2021; Esi Quansah & Essiam, 2021; Murphy et al., 2020). They also found that the LMS was useful when shifting to teaching remotely in 2020 (Cavus, 2021; Gamage et al., 2020; Murphy et al., 2020).

Some studies found that one of the biggest challenges in using an LMS to shift instruction to remote during the pandemic was related to general infrastructure in the community. Specifically, access to reliable internet proved to be a problem for many students and instructors over the world, with many students relying upon public Wi-Fi from local businesses and internet cafes (Almaiah et al., 2020; Arshad et al., 2020; Esi Quansah & Essiam, 2021; Gonzalez-Ramirez et al., 2021). One study found that in developing countries, low-tech literacy combined with inequitable internet access presented unique challenges in needing to teach students how to use technology using technology (Almaiah et al., 2020). Gonzalez-Ramirez, et al (2021) noted similar difficulties in the United States and found that lower-level learners were more likely to experience technical issues than were upper-level students.

When considering the design of the LMS, two studies noted that the LMS design was not flexible enough to meet all populations' needs. Almaiah et al. (2020) noted that the LMS design assumed a baseline level of technical literacy that many of their students and instructors did not have. Similarly, Esi Quansah and Essiam (2021) noted that the LMS design also worked best when accessed via a laptop or desktop; however, many students surveyed did not have access to a personal computer and relied upon smartphones.

Some studies also evaluated several factors influencing student perceptions of their LMS during COVID. These factors were directly related to or were modified from the Technology Acceptance Model and included factors, such as perceived ease of use, self-efficacy, and learning engagement, among others (Alturki & Aldraiweesh, 2021; Alzahrani & Seth, 2021; Cavus, 2021; Dindar et al., 2021). One study that evaluated

(Dindar et al., 2021) found that individuals with more LMS experience were more likely to use the LMS or intend to use it. They also found that this group received greater support than their colleagues with less LMS experience; however, their level of experience did not influence their perception of the LMS's performance nor their perceived self-efficacy with the LMS. While this study focused on instructors in a K-12 environment, its results could translate into the student experience. For example, students earlier in their programs may have less experience with the institution's LMS and, therefore may find the system more challenging to use. Studies that evaluated student satisfaction with their LMS during COVID found that some instructor factors were strong influencers. Two studies (Alzahrani & Seth, 2021; Cavus, 2021) found that information quality influenced student perceptions of their LMS. This finding was important as instructors primarily controlled the type of information available to learners and when it was available. The two studies also agreed that social factors influenced student perceptions of their LMS. Alzahrani and Seth (2021) found that information quality had one of the strongest impacts on university students in the United Kingdom and how satisfied they were with their LMS. Conversely, Cavus (2021) found that, while social factors did influence student perspectives, they were the lowest influence over Nigerian university students.

Another factor related directly to instructor behaviors was communication. Timely and high-quality instructor feedback strongly influenced student perceptions of using their LMS for college students in Saudi Arabia (Alturki & Aldraiweesh, 2021). Students in the United States felt similarly. Murphy et al. (2020) found that students valued more frequent communication that was closer in time to their assignments. These

students also expressed greater satisfaction with their learning experiences when their instructors acknowledged their humanity and created flexibility around deadlines to accommodate changing schedules and demands with the pandemic.

Finally, one study in the United States found that factors related to learning engagement were important to students enrolled at a college or university. The study found that students desired more active engagement with synchronous learning activities using technology, such as audience response systems (Murphy et al., 2020). This finding is particularly interesting, because students expressed a desire to change the instructional methods to suit their learning needs better. The students in the study listed third-party technologies to achieve this, though, and the study did not mention built-in LMS features. Gamage et al. (2020) agreed that instructional practices should change, stating, "encouraging quality in online education is not primarily a question of IT support, but of academic strategy and educational design" (p. 6). Their study specifically focused on delivering laboratory courses remotely using an LMS, and while it could be done, they strongly advocated for additional faculty development to meet their educational standards.

Overall, students and instructors were satisfied with their LMS for the emergency switch to remote teaching during the COVID-19 pandemic. However, studies focused primarily on factors influencing student satisfaction rather than LMS design. Factors that focused on design tended to reflect instructors' behaviors, such as timeliness of communication, rather than on the design of the LMS itself. The challenges these studies revealed about LMSs generally found that issues were more related to situational factors affecting access to the LMS, such as reliable internet service.

Summary

The learning management system, or the LMS, represents one tool in a long history of educational technology. Today most higher education institutions in the United States use an LMS to meet the demands of educating their students. LMSs are sophisticated tools that meet content management and administrative needs at many colleges and universities. Several studies outlined within this chapter, have examined both faculty and student perceptions regarding LMSs over the last several decades. These studies have found that students are generally satisfied with how they use their LMSs.

Today, a learner-centered teaching theory dominates current educational practices and includes students as primary stakeholders in their education. In this role, learners take on responsibility for their learning and become learning partners, rather than passive absorbers of knowledge. As primary stakeholders, I argued that learners should have a voice in the decisions related to which tools they use to enhance their learning and how those tools should be designed to consider their unique learning needs. While many LMS's today are capable of supporting learner-centered instructional practices and can help improve learning outcomes, the parties most involved in the learning process, instructors and students, often do not have much voice in the selection and implementation of the LMS. At the time of the study, there was little research to support student inclusion in the design of their learning management systems or other educational technology.

Finally, the COVID-19 pandemic shifted many higher education institutions into a remote delivery mode for education. This remote delivery featured learning management systems as the central tool for education. Two years after the initial COVID

wave, some research has shown that colleges and universities across the world experienced similar challenges in using their LMSs effectively. These challenges were primarily logistical, involving issues surrounding existing infrastructure and equity of access. However, some studies found that students reported being generally satisfied with the performance of their LMS during the emergency transition to remote learning.

In Chapter Three, I outline the study's design, which incorporates student voice and opinion regarding the design of the learning management systems they use. The study's design encompasses many aspects outlined in Chapter Two and seeks to explore them further from the student perspective. I will also discuss the study’s participants and the process for their selection and inclusion within the study.

Chapter Three: Research Method and Design

Introduction

In this chapter, I discuss the design for the study. Specifically, I discuss how the survey and interview support the purpose and goals of the study. I also briefly discuss the limitations of the study design before discussing the results in Chapter Four.

Purpose

I sought to understand student opinions and attitudes regarding their learning management system (LMS). Broadly, the research project focused on how students might design their own LMS to best suit their learning needs. Study participants answered questions about their LMS features, navigation methods, and expectations both pre-COVID and during COVID in either a survey or an interview.

The purpose of the study was to determine how undergraduate students in the United States felt about their respective learning management systems' designs. I also wanted to understand whether the students felt their LMS design supported their learning. Specifically, participants shared their perceptions regarding using an LMS as a tool for learning and its ability to facilitate learning activities consistent with learner-centered teaching philosophy. Previous studies have evaluated overall student satisfaction with their LMS and have determined that students are generally satisfied with their LMS, although they might like improvement in some specific areas (Abdel-Maksoud, 2018; Basioudis et al., 2007; Borboa et al., 2017; Gierdowski, 2019). However, asking learners about satisfaction is not the same as involving them in the design decisions.

As part of a learner-centered teaching philosophy, learners take responsibility for the acts of learning and are primary stakeholders in the process (Wright, 2011). By taking

responsibility for their learning, the instructor's role shifts to a guide rather than a professor. As a result, learning activities shift from traditional lecture to incorporate active learner engagement that allow students to make connections between concepts and learn the critical thinking process of drawing conclusions (Moate & Cox, 2015; Weimer, 2012). The shift in roles also changes the relationship between students, and instructors and administration. This role shift also assumes that learners are capable and knowledgeable partners in learning. As primary stakeholders, I believe that learners deserve voice and choice in the tools that they use for learning. In general, good design principles necessitate consideration of *all* end users when designing tools, such as an LMS (Norman, 2013). While previous studies have examined student satisfaction with their LMS, little research exists that evaluates student satisfaction and choice in its design. The study will add to a body of research that considers students in higher education as co-designers in the tools they use for their learning.

Research Questions and Null Hypotheses

The study's hypotheses and research questions centered on undergraduate students' preferences regarding LMS design. The hypotheses used quantitative data collected in the survey. I answered the research questions using qualitative data collected from interviews and a survey. The null hypotheses and research questions are:

- Null Hypothesis 1: There is no difference in the perceived value of LMS features.
- Null Hypothesis 2: There is no difference in the perceived value of LMS features based on learning level.
- Null Hypothesis 3: There is no difference in the perceived value of LMS features based on degree program.

- Null Hypothesis 4: There is no difference in the perceived value of proposed alternative LMS navigation methods based on learning level.
- Null Hypothesis 5: There is no difference in the perceived value of proposed alternative LMS navigation methods based on learning level.
- Null Hypothesis 6: There is no difference in the perceived value of proposed alternative LMS navigation methods based on degree program.
- Research Question 1: How would students design a learning management system, compared to what is provided by the administration? Specifically,
    a. Research Question 1A: Which LMS features and functions do students find the most valuable to their learning?
    b. Research Question 1B: How would students reorganize Canvas to make it easier or more meaningful to navigate?
    c. Research Question 1C: How do students feel about the use of external tools in addition to their LMS, if they use them?
- Research Question 2: How do the desired LMS features, functions, and organization differ between students in degree pathways and at different levels?
- Research Question 3: How has the COVID-19 pandemic altered expectations and overall satisfaction for undergraduate students using learning management systems?

Study Design

I conducted the study in two parts: a survey and an interview. The goal of the survey was to capture participants' general attitudes and opinions regarding their learning management system, whereas the purpose of the interview was to expand on those

attitudes and opinions to find underlying causes. In short, the survey asked participants, "*what* do you feel," and the interview asked them, "*why* do you feel that way?" I believe this method allowed for the greatest level of flexibility in both aligning with and expanding upon previous research about student satisfaction with their LMS, conducted from surveys. I used responses from the follow-up interview to help identify overarching trends and themes related to desired LMS design.

When I chose this study design, I had a few goals for its use. The first goal was to allow participants to explain their responses beyond what they could communicate through fixed responses on a survey. Initially, I designed the study so that participants would complete both the survey and the interview. The second goal was to lower barriers to participation as much as possible. I structured the survey to be as brief as possible and accessible via an online link. I structured the follow-up interview to be similarly brief. Participants met with me using a popular web-conferencing tool, Zoom, to participate live as their schedules allowed. Using Zoom helped reduce barriers related to transportation and commute time.

Students who participated in the study could choose to complete the survey, the interview, or both. At the end of the survey, students could choose to answer a question that allowed them to expand upon their answers in the optional interview. However, I initially designed the study so that the survey occurred first. If participants only completed the interview, they did not receive a link to the survey. This portion of the study design was unintentional. I further explain how this operation order occurred in the limitations section. The Lindenwood University Institutional Review Board (IRB) reviewed and approved the study.

Instrumentation

Survey

I created the survey in four key sections: demographic information, key features and functions, organization and navigation, and impacts of COVID. Each section of the survey, except the demographic portion, included both closed-ended questions, such as Likert-scale questions or ranking questions, and one open-ended question where participants could optionally leave additional comments related to that section as a whole. At the end of the survey, participants could choose to answer a question that allowed them to opt into the interview. Interested participants could leave an email address so that I could contact them and schedule time for an interview. The survey tool estimated that the survey would take approximately 20 minutes for participants to complete. I did not require that participants answer all questions; they could choose to decline to answer any question for any reason by simply skipping the question.

The first section of the survey focused on demographic information. I included two questions asking students to identify their degree program and learning level. I used these questions to help identify differences in responses between different fields of study and differences between early and late learners. The first question was multiple choice and asked students to identify a degree category that most closely aligned with their chosen major. They could choose from the following options: Arts & Humanities, Business & Entrepreneurship, Education & Human Services, Science, Technology & Health, or N/A or I have not yet declared my major. The second question asked participants to identify their learner level with a multiple-choice question. They could choose one of two options: this is my first semester, or this is not my first semester. I

grouped students enrolled in their first semester as early learners and students in their second semester or later as later learners. I asked this question as I thought that early learners might have less experience with their institution's learning management system and could make different design choices based on their lack of familiarity.

I intentionally chose to omit additional demographic questions related to race, ethnicity, gender, and age. Since I included hypotheses about design decisions based on experiences in learning, these pieces of information seemed irrelevant. Most research about learning in adult learners agrees on key principles of learning that apply across multiple populations (Brown et al., 2014; Carey, 2015).

The next section on the survey focused on key features and functions within a learning management system. I structured these questions using standard functions that most popular LMS have. I deliberately included within the questions key features and functions that previous studies (Abdel-Maksoud, 2018; Adzharuddin & Ling, 2013; Basioudis et al., 2007; Gierdowski, 2019) found were most desired or problematic. For example, Gierdowski (2019) found that many students desired a chat function to communicate with their instructors concurrently during class, so I was certain to include a chat function in the survey question. One question specifically asked participants to rank the perceived importance of 13 common features within an LMS as it related to their learning. Participants ranked these features on a scale of one through three, where one was *not at all important*, two was *somewhat important*, and three was *very important*.

Following the section on LMS features and functions, I included questions about the LMS's organization and navigation. As part of this section, I incorporated some proposed alternative navigation methods, which I based on the navigation methods of

well-known apps, such as Facebook, Twitter, and Instagram, or by inverting common navigation within existing LMSs with which I had familiarity. In one question, I asked participants to rank the perceived usefulness of proposed navigation alternatives on a scale of one through three: one was *not at all useful*, two was *somewhat useful*, and three was *very useful*.

The final section of the survey contained just two questions that asked participants to compare their satisfaction with their LMS and its ability to meet their learning needs from a time before COVID. Participants agreed with one of four statements: 1) I dislike my LMS more now than I did pre-COVID; 2) I feel the same about my LMS now as I did pre-COVID; 3) I like my LMS more now than I did pre-COVID; and 4) N/A or I was not enrolled pre-COVID. The second question allowed participants to leave additional comments if they desired to do so.

Interview

The second part of the study consisted of a live 30-minute interview via Zoom. I structured the interview with nine loose prompts to ensure all participants answered questions about four sections from the survey. I also scripted out optional follow-up prompts and examples to help clarify if needed or to offer hesitant interviewees assistance. While I did script the interview, I left enough flexibility to allow participants to discuss as much or as little as they wanted for each question and to allow the conversation to flow naturally. I include a list of the interview prompts, as I had initially written them, in Appendix A.

At the beginning of the interview, if participants had not also completed the survey, I asked the two demographic questions before entering into any discussion. I also

informed participants that they could decline to answer any question for any reason or could leave the study at any time.

Participants and Study Sites

To participate in the study, survey and interview respondents had to be at least 18 years of age and be enrolled in a college or university at the undergraduate level at the time of the study. Participants could be enrolled either part-time or full-time. I excluded graduate and professional students from the study to best align with previous research that focused heavily on undergraduate students. Additionally, graduate programs can vary greatly in their needs when compared to undergraduate courses. For example, graduate classes may be more likely to have few students enrolled, and therefore would not use the same instructional strategies as undergraduate courses with hundreds of students. For these two reasons, I opted to focus on undergraduate students only.

I recruited participants for the study in three main ways. The first two recruitment methods took advantage of a student population of a local university, which I refer to as Institution A. This institution was a private, not-for-profit, four-year university located within a suburb outside a major city in the Midwestern United States. The university conferred four-year bachelor's degrees, master's degrees, and doctoral degrees from several schools. At the time of the study, roughly 65% of the student population was classified as undergraduates (Institution A, n.d., accessed February 18, 2021).

The first method I used to recruit participants from this institution was to leverage the site Participant Pool to recruit participants for the study. The Participant Pool was a formally organized body sponsored by a full-time faculty member that allowed instructors to grant extra credit to their students in exchange for completing various

studies (Institution A, n.d., accessed February 18, 2021). Due to the Participant Pool's faculty sponsor and its organization within the university, most students in the participant pool were enrolled in courses related to psychology anthropology, criminology and criminal justice, or sociology (Institution A, n.d., accessed February 18, 2021). To access members of the Participant Pool, I presented the oversight organization with IRB approval and completed additional training related to using their online scheduling system and awarding extra credit points. To help minimize the potential for a conflict of interest, students remained anonymous, and a worker from the Pool awarded their points, after I marked each participant as complete.

To invite participants, I used the Participant Pool's online scheduling system, Sona Systems, listing the survey and interview separately. Students interested in participating could log on and register through their user accounts for the survey or the interview. Students accessed the survey through a survey link, which *Qualtrics* automatically generated. If they wished to participate in the interview, students could choose to sign up for a given time slot through Sona Systems' online scheduling system. I could then follow up with an individualized Zoom link.

In addition to using Institution A's Participant Pool, I also requested assistance from the dean at one of the schools. The dean's office agreed to send an email to the actively enrolled undergraduate students with a link to the survey. The survey link prohibited duplicate submissions from IP addresses to help prevent overlap between this group of students and the group who had already participated as part of the Participant Pool. If students were interested in completing the interview, they could leave their email

address at the end of the survey or contact me directly using the email address I listed at the end of the survey.

All participants who completed the survey came from Institution A. All survey participants were undergraduate students who were actively enrolled at the institution at the time of the study. Nearly half the survey participants noted that they were enrolled in their first semester at that institution. These learners could have been in their first semester in a university setting overall, or they could have transferred from another institution. None of the survey participants opted to complete the interview portion of the study.

I also recruited participants through social media. Three participants agreed to an interview with this recruitment method. The participants I recruited through social media did not complete the survey. These participants came from three different institutions. One came from Institution A. A second participant was from a private, not-for-profit school located within a major city in the Midwestern United States, Institution B. The third participant was enrolled in a public, four-year university, whose satellite campus was located in another suburb outside a major city in the Midwestern United States, Institution C.

Data Collection

Since I created the survey in *Qualtrics*, I generated an anonymous link to include within the Participant Pool's system and within an email that Institution A's dean's office sent. Although both distribution methods used the same link, I used *Qualtrics*' options to disallow multiple submissions from the same IP address to reduce duplicate entries. I added the survey link and interview scheduling options to Sona Systems in the Fall 2021

semester. Participants could opt-in from September through the end of November 2021. The survey collected 35 responses during this time. No participants from the Participant Pool elected to participate in the interview.

Institution A's dean's office emailed the study information with a link to the survey in January 2021. While keeping the survey link the same, I modified the end of the survey to include an option for participants to add their email addresses if they were interested in participating in the interview. The survey closed at the end of March 2022. The survey collected an additional 14 responses. No participants from this method opted to complete the interview.

I added the social media recruitment post in February 2022 and stopped accepting data at the end of March 2022. I shared the post publicly in a well-known local group and encouraged others to share. I re-shared the post twice after its original posting. Three participants responded to the social media post and scheduled an interview in March 2022. None of these participants responded to the survey. All participants consented to my recording their interview in an audio format and as a written transcript using the Zoom platform's artificial intelligence (AI).

Data Analysis

The survey, and interview stopped accepting new data at the end of March 2022. Therefore, I saved all data on a password-protected hard drive. The survey collected a total of 49 responses, and three total participants completed the interview. In the conclusion, I downloaded all the survey responses from *Qualtrics* as a '.CSV' file and then used Microsoft Excel 2016 with the *Data Analysis Toolpack – VBA* enabled to analyze the data. As part of the download process, I intentionally excluded the final

question where interested participants could leave their email addresses to help maintain anonymity. I first analyzed the survey for completeness. Because participants could opt out of any question, I allowed for some questions to contain blank information. I considered surveys complete if the participant answered at least 15 questions or completed 75% of the survey. Four participants did not complete enough of the survey to meet this criterion, therefore I excluded their responses from the subsequent analysis. In each of these cases, participants either stopped answering questions after the demographic section or chose to decline the survey following the initial consent question.

I first analyzed each question in *Qualtrics* for descriptive statistics, including mean, median, mode, and standard deviation. If participants skipped any question, I only analyzed the responses the survey collected. For questions that asked participants to rank the perceived usefulness or perceived importance of features or proposed alternatives to navigation, I also calculated the mean rank and the total percentage of respondents who answered positively.

To analyze the differences between degree categories, I assigned each degree category a number and split responses according to their respective groups. For each question regarding external tools, features, and alternative navigation methods, I conducted an Analysis of Variance (ANOVA) using the data tab in Microsoft Excel. I followed a similar method to analyze the difference in responses between learner level. I split them between the two groups and then conducted an ANOVA in Excel. In both cases, if the p value was less than 0.05, then I determined there was a statistically significant difference between the groups. I included specific ANOVA results and information for each null hypothesis as relevant in Chapter Four.

Next, I analyzed the narrative responses for trends and themes. I revisited each recorded interview and read through the transcript the AI generated. I corrected any errors within the transcript and saved a copy to work from. I then read through all narrative comments from the survey and the interview transcripts multiple times to evaluate them for trends and themes. I grouped them according to overarching concepts and according to the research questions, when applicable. Due to the small number of interview responses, I was unable to determine major differences between degree types or learner levels. Interviewees only represented two-degree categories and one learner level among the three of them.

Summary

I sought to add to a body of research that considers learners as primary stakeholders in their learning, including in the design of learning tools, such as the LMS. I recruited participants from three key areas and invited them to participate in an online survey, an online interview, or both. Forty-eight undergraduate students completed either a survey or an interview to give their perspectives on the design of their learning management system. The key areas from which participants offered their perspective included features and function, external tools, navigation, and expectations they had at the time of the study compared to what they had pre-COVID. After collecting the data, I used Microsoft Excel to analyze the data and further evaluated narrative responses for trends and themes. The analysis results are explored in greater detail in Chapter Four.

Chapter Four: Analysis

Introduction

The study contained six hypotheses and three research questions regarding student attitudes and opinions regarding the design of their learning management systems, or LMSs. I collected data from two main sources: a survey, which focused heavily on quantitative data, and an interview, which focused on qualitative data. In the following paragraphs, I will explore the results of these data and whether they support the outlined hypotheses. I will also outline themes and trends discovered from the results of the interviews and narrative comments.

Overview and Participants

Student participants voluntarily completed either a web-based survey through *Qualtrics* or a 30-minute interview conducted via the web conferencing tool, Zoom. *Qualtrics* did not collect any identifying information from the survey, except if students left their respective email addresses if they wished to participate in the interview. After the surveys closed, I downloaded the results from *Qualtrics* and removed any identifying information before analyzing the data. I analyzed the data using descriptive statistics and comparative statistical tests outlined below. To preserve anonymity, I assigned each participant a number from one to 40, based on the order in which they responded. I named those who responded to the survey as Survey Participant, abbreviated as SP, followed by their number. For example, SP14 represents Survey Participant 14.

As noted in Chapter Three, I recruited undergraduate students to participate in a web-based interview. There were no participants who completed both the survey and the interview. Interviews occurred via the web-based conferencing platform, Zoom. I

recorded the audio and video for each interview and used the built-in artificial intelligence to complete a draft transcription. Then, I listened to each recording and corrected any errors within the transcripts within 24 hours of the interview. Afterward, I analyzed the interviews using free-text comments from the surveys for emerging trends and themes. To protect their identities, I assigned each interviewee a number based on the order in which they completed interviews. Similar to the survey participants, I named them 'Interview Participant,' abbreviated as IP, followed by their number. For example, IP2 represented Interview Participant 2.

As part of the study, I used two grouping methods to compare groups of students: learning level and degree program. The first grouping method was learning level. Participants answered two demographic questions before completing the survey and the interview. The first question asked students which degree program or category best represented their chosen degree pathway and presented them with the following options: arts and humanities; business and entrepreneurship; education and human services; science, technology, and health. If respondents had not yet chosen a degree pathway, they could select *not applicable* as an answer choice. The second question asked students to identify whether it was their first semester at their institution. Students responded with either a *yes* or a *no*. Table 1 lists the degree category makeup of the survey respondents who chose to answer the demographic questions.

Table 1

Degree Programs for Survey Respondents

Degree Category	Count	%
Arts and Humanities	9	22.5
Business and Entrepreneurship	3	7.5
Education and Human Services	5	12.5
Science, Technology, and Health	20	50.0
Not Applicable	3	7.5
Total	40	100.0

Forty-five participants answered the question related to their semester of enrollment. I used semester of enrollment as a proxy for learner level. I considered those who are enrolled in their first semester as early learners, compared to their more experienced peers who were enrolled in their second semester or later. Twenty-one participants (46.7%) reported that they were enrolled in their first semester at their respective institutions, and 24 participants (53.3%) noted that they were enrolled in their second semester or later. Those students enrolled in degree programs that aligned with arts and humanities had the highest percentage (88.9%) of learners enrolled in their second semester or later. The group of students who had not yet declared their degree pathway had the highest percentage of students enrolled in their first semester (100.0%). Other degree pathways showed a split between early learners and later learners. Table 2 shows the makeup of those participants and whether they were early learners or more experienced learners at their respective institutions, grouped by their self-reported degree category.

Table 2

Survey Participant Learning Level by Degree Program

	Total Count	Count First Semester	Percentage First Sem	Count Second Semester or Beyond	Percentage Second Semester or Beyond
Arts & Humanities	9	1	11.1%	8	88.9%
Business & Entrepreneurship	3	1	33.3%	2	66.7%
Education & Human Services	10	3	30.0%	7	70.0%
Science, Tech, & Health	20	13	65.0%	7	35.0%
N/A	3	3	100.0%	0	0.0%
Total	45	21	46.7%	24	53.3%

I will use these data about participant groupings by learning level and degree program when analyzing data from the second, third, fifth, and sixth null hypotheses.

Research Questions and Hypotheses

The purpose of the study was to evaluate student perceptions regarding the design of their provided learning management systems. The study contained six hypotheses and three primary research questions. The first research question also contained three sub-questions nested within it. The hypotheses and research questions are:

- Null Hypothesis 1: There is no difference in the perceived value of LMS features.
- Null Hypotheses 2: There is no difference in the perceived value of LMS features based on learning level.
- Null Hypothesis 3: There is no difference in the perceived value of LMS features based on degree program.
- Null Hypothesis 4: There is no difference in the perceived value of proposed alternative LMS navigation methods.

- Null Hypothesis 5: There is no difference in the perceived value of proposed alternative LMS navigation methods based on learning level.
- Null Hypothesis 6: There is no difference in the perceived value of proposed alternative LMS navigation methods based on degree program.
- Research Question 1: How would students design a learning management system compared to what is provided by their administration?
    - Research Question 1A: Which LMS features and functions do students find the most valuable to their learning.
    - Research Question 1B: How would students reorganize their LMS to make it easier or more meaningful to navigate.
    - Research Question 1C: How do students feel about the use of external tools in addition to their LMS, if they use them?
- Research Question 2: How do the desired LMS features, functions, and organization differ between students in degree programs and students at different learning levels?
- Research Question 3: How has the COVID-19 pandemic altered expectations and overall satisfaction for undergraduate students using learning management systems?

Null Hypothesis 1: There is no difference in the perceived value of LMS features

Null Hypothesis 1 stated that there is no difference in the perceived value of LMS features. To evaluate this hypothesis, I analyzed the responses from Question 11 on the survey. This question asked participants to rank the importance of multiple features and functions within their LMS on a scale of one to three, where one was not at all useful,

two was somewhat useful, and three was very useful. Participants ranked the following features and functions:

- Discussion boards (asynchronous)
- Asynchronous communication with your instructors, such as email
- Asynchronous communication with your classmates/peers, such as email
- Synchronous or real-time communication with your instructors, such as a chat function
- Synchronous or real-time communication with your peers/classmates, such as a chat function
- Synchronous or real-time document or project collaboration tools
- Asynchronous document or project collaboration tools
- Assignment submission tool
- Quiz/exam tool
- Classroom polling, similar to Poll Everywhere or clicker questions
- Instructor feedback tools
- Course gradebook
- Push notifications

Participants ranked asynchronous communication the lowest, with the average score of 2.15. They ranked the course gradebook the highest with a mean score of 2.85. The features and functions with the highest mean average included the course gradebook (2.85), an assignment submission tool (2.83), a quiz or exam tool (2.77), and instructor feedback tools (2.73). All participants reported that a course gradebook, assignment submission, and quizzes and exams were either somewhat or very important to them. By

contrast, participants ranked the following features as the least important to them: discussion boards (mean 2.15), asynchronous peer communication tools (2.10), and synchronous peer communication tools (2.10). However, when comparing the total percentage of participants indicating features were useful with the mean rank, there was little difference between features.

To determine if there was a statistical significance between the features, I conducted an Analysis of Variance test (ANOVA). Table 3 shows the results of the ANOVA, which reveals a statistically significant difference between groups, or features.

Table 3

ANOVA Results for LMS Features

Source of Variation	SS	df	MS	F	*P* value	F crit
Between Groups	32.01736	12	2.668113	7.598537	< 0.001	1.771319
Within Groups	177.6744	506	0.351135			
Total	209.6917	518				

Note: Each feature represents a group, so between groups results are those found between each feature.

The *p* value of less than 0.05 showed a statistically significant difference when comparing the overall desirability of LMS features between groups. In this case, the groups represent the different features that the participants ranked. From these results, I rejected Null Hypothesis 1, as there is a statistically significant difference between the features.

Null Hypothesis 2: There is no difference in the perceived value of LMS features based on learning level.

As determined in Hypothesis 1, I found significant differences in participants' perceived value of specific LMS features. I conducted an Analysis of Variance (ANOVA) test on the features as part of Question 11, which resulted in a p value < 0.001. As part of Hypothesis 2, I aimed to determine if there was a difference in perceived value of LMS features based upon learning level. I analyzed responses from Question 11 in the survey by grouping the responses for each LMS feature into two groups: one where participants noted they were enrolled in their first semester, and a second where they identified themselves as being enrolled in their second semester or later. I called these groups early learners and later learners, respectively. After grouping them, I conducted a post-hoc Analysis of Variance (ANOVA) test on each of the features, as part of Question 11, which resulted in a p value of 0.089. Table 4 shows the between-groups ANOVA post-hoc results for each of the LMS features listed in the survey. "Groups" signifies whether participants indicated they were or were not enrolled in their first semester. Therefore, a significant difference between groups is a significant difference based on the learner level.

Table 4

ANOVA results between learner levels for LMS features

Feature	SS	df	MS	F	*P* value	F crit
Discussion boards	0.9	1	0.9	2.408451	0.128971	4.098172
Asynchronous instructor communication	2.025	1	2.025	4.824451	0.034231	4.098172
Asynchronous peer communication	0.9	1	0.9	2.047904	0.160589	4.098172
Synchronous instructor communication	0.9	1	0.9	1.455319	0.235133	4.098172
Synchronous peer communication	0.625	1	0.625	1.17866	0.284468	4.098172
Synchronous document/project collaboration tools	0.225	1	0.225	0.630996	0.431923	4.098172
Asynchronous document/project collaboration tools	0	1	0	0	1	4.098172
Assignment submission tool	0.025	1	0.025	0.165217	0.686678	4.098172
Quiz/exam tool	1.225	1	1.225	8.095652	0.007111	4.098172
Classroom polling tool	0.025	1	.025	0.061889	0.804874	4.098172
Instructor feedback tools	0.625	1	0.625	2.540107	0.119272	4.098172
Course gradebook	0.1	1	0.1	0.76	0.388803	4.098172
Push notifications	0.225	1	0.225	0.681275	0.4143	4.098172

When I evaluated the post-hoc data *p* values, I found a statistically significant difference between learner levels for two features: asynchronous instructor

communication tools and the quiz/exam tool. The asynchronous instructor communication tools analysis resulted in a *p* value of 0.034. The quiz and exam tool feature resulted in a *p* value of 0.007. The remaining features – discussion boards, synchronous instructor communication, synchronous peer communication, synchronous document collaboration tools, an assignment submission tool, classroom polling, instructor feedback tools, the course gradebook, and push notifications – did not result in *p* values that were significant. After I found significance for asynchronous instructor communication tools and the quiz and exam tool, I evaluated the mean rank for each of these features by group. The mean rank of asynchronous instructor communication tools was 2.75 for early learners, compared to a mean rank of 2.3 for later learners. Similarly, for the quiz and exam tool, early learners ranked this feature at an average of 2.95, compared to a mean rank of 2.6 for later learners. In both instances, students who were enrolled in their first semester assigned a higher ranking to each of these features on average. Lower-level learners were more likely to rank those features as more important, when compared to their peers who were in their second semester or later. From these results, I rejected Null Hypothesis 2 as the evidence supported that there were differences in perceived value of two specific LMS features between early and later learners.

Null Hypothesis 3: There is no difference in the perceived value of LMS features based on degree program.

From Hypothesis 1, I found a statistically significant difference in the perceived desirability of LMS features. To determine if there was a difference in the perceived value of LMS features based on degree program, I analyzed the responses from Question 11 of the survey and grouped them according to the participants' stated degree program.

If participants chose to skip the question about their degree program, I excluded their responses from the analysis. For each feature, I grouped the individual rankings for each degree program group: arts and humanities, business and entrepreneurship, education and human services, science technology and health, or not applicable or undeclared.

After grouping the responses, I conducted a post-hoc Analysis of Variance (ANOVA) from the original ANOVA in Hypothesis 1, to determine whether there were differences among how participants ranked the perceived usefulness of LMS features when comparing the different degree program groupings, and found a *p* value of 0.415, which was not less than .05. I completed the ANOVA post-hoc test for each feature that students ranked as part of the survey. Table 5 shows the between-groups post-hoc ANOVA results for each of the features that respondents ranked in the survey. "Groups" signifies "degree categories," thus a difference between groups is synonymous with a difference between degree categories.

Table 5

ANOVA results between degree programs for LMS features

Feature	SS	df	MS	F	*P* value	F crit
Discussion boards	2.944444	4	0.736111	2.119516	0.099115	2.641465
Asynchronous instructor communication	1.736111	4	0.434028	0.935469	0.454799	2.641465
Asynchronous peer communication	1.666667	4	0.416667	0.915272	0.465927	2.641465
Synchronous instructor communication	5.111111	4	1.277778	2.318548	0.076292	2.641465
Synchronous peer communication	2.802778	4	0.700694	1.364567	0.266087	2.641465

Feature	SS	df	MS	F	*P* value	F crit
Synchronous document/project collaboration tools	1.091667	4	0.272917	0.753121	0.562744	2.641465
Asynchronous document/project collaboration tools	2.061111	4	0.515278	1.168136	0.341581	2.641465
Assignment submission tool	0.469444	4	0.117361	0.774215	0.54942	2.641465
Quiz/exam tool	1.002778	4	0.250694	1.469186	0.232485	2.641465
Classroom polling tool	1.936111	4	0.484028	1.260593	0.303911	2.641465
Instructor feedback tools	1.086111	4	0.271528	1.069141	0.386429	2.641465
Course gradebook	0.194444	4	0.048611	0.346829	0.844415	2.641465
Push notifications	0.936111	4	0.234028	0.69187	0.602569	2.641465

The analysis revealed no significantly tested differences among the groups for any of the features mentioned in the survey. The results of the post-hoc analysis showed that no feature had a *p* value less than 0.05, therefore I did not conclude that students in one degree program had a higher or lower preference for any feature compared to students in any other degree program. However, there was one feature that had a noticeably smaller *p* value compared with the others: synchronous instructor communication ($p = 0.076$). While this result was not statistically significant, it was interesting to note that many students might desire a way to communicate with their instructors concurrently during class via the LMS, for example, via a web-based chat. Such a feature is interesting, especially since many courses early in the COVID-19 pandemic converted to remote delivery. Many courses that converted to a remote instructional delivery may have kept some simultaneous components, such as synchronous web-based meetings through a

web-conferencing tool like Skype, Zoom, or Microsoft Teams. Specifically, students who had specified any degree program were likely to rank this feature as desirable (minimum: 2.2, maximum: 2.78), compared to students who had not yet declared a major (1.33). If I were to repeat the study, I would incorporate additional questions related to this feature to determine how and why specifically students find it useful. However, student desirability for this feature was not found to be statistically significant. As I did not find statistical significance for any features between degree groupings, I did not reject Null Hypothesis 3.

Null Hypothesis 4: There is no difference in the perceived value of proposed alternative LMS navigation methods.

To evaluate whether there was a difference in the perceived value of proposed alternative navigation methods, I analyzed participants' specific stated preferences using their responses to survey question 20. Question 20 asked students to rank proposed alternative methods that a learning management system could be organized to improve navigation. Participants ranked each method on a scale of one to three, where one represented that the alternative method would not be useful at all and should never be used, two representing the method as somewhat useful, and three being very useful and the LMS should strongly consider using the method. Participants ranked the following proposed alternative methods of navigation:

- Central gradebook: Keeping all gradebook items (assignments, quizzes, etc.) in one large gradebook and filtering according to course, deadline, assignment type, or other parameters as desired.

- Navigation by function: For example, if you wished to navigate to discussion boards, you would first choose discussion boards, and then choose your course.
- Cross-course search: A dashboard search bar that searches across all Canvas objects and all courses.
- Centralized feedback: Including a navigation option to view all narrative feedback and instructor comments across all courses and submission types.
- Cross-linking: Increased cross-linking between objects in the LMS. For example, the option to navigate to related assignments or gradebook posts while within another feature (email, discussion posts, etc.)
- Custom bookmarks: A custom list of bookmarks that are visible from every page

I conducted an Analysis of Variance test (ANOVA) to determine the difference between the proposed organization and navigation alternatives. I organized the results based upon the proposed function; therefore, the between-groups results represent those between each proposed alternative. Table 6 shows the ANOVA results between these groups.

Table 6

ANOVA Results for Alternative LMS Navigation

Source of Variation	SS	df	MS	F	*P* value	F crit
Between Groups	8.092593	5	1.618518519	3.068205	0.010748	2.257066
Within Groups	110.7778	210	0.527513228			
Total	118.8704	215				

The *p* value less than 0.05 between groups showed a statistically significant difference regarding student preference among the proposed navigation alternatives. Next, I analyzed the survey responses to determine which specific alternative navigation methods were most preferred. To do so, I reviewed the mean rank from all responses for each proposed method. The mean ranks for each of the alternatives showed that participants most preferred an inclusive search option (mean: 2.64), where they could search for a term or a set of terms and the LMS would return a list of results across all courses. The second most highly ranked proposed alternative was a common gradebook (mean: 2.53), which would show all academic performance data, filtered by course if desired. Similar to participants' preferences related to features and functions, these results show that students tend to prefer instructor-centered tools. Tools that feature a comprehensive search across courses or a centralized gradebook, strongly feature instructor-centered learning strategies, such as assignments and traditional grades, or the ability to find content the instructor provides. Study participants ranked learner-centered navigation methods, such as customized bookmarks and navigation according to function, as least desired on average. With the presence of a statistically significant difference, I reject the null hypothesis that there are no differences in participants' perceived value of alternative navigation and organizational methods.

Null Hypothesis 5: There is no difference in the perceived value of proposed alternative LMS navigation methods based on learning level.

After I found a statistically significant difference in proposed alternative navigation methods overall in Hypothesis 4, I proceeded to evaluate if there was a difference in the desired alternative navigation methods between different learning level

groups. To evaluate this null hypothesis, I first sorted the responses to each proposed navigation method according to learner level. The two groups were early learners, which included participants who stated they were enrolled in their first semester, and later learners, which included those who stated they were enrolled in their second semester or later. I excluded participants' responses from the analysis if they skipped Question 20 or if they did not provide information about their learning level at the beginning of the survey. To determine if there was a difference in preference between the groups, I conducted an initial Analysis of Variance (ANOVA) test comparing the two groups which had a p value of < 0.01, which allowed me to conclude there was a difference between groups. Then I conducted the post-hoc for each proposed alternative navigation method. Table 7 shows the ANOVA Post-hoc analysis between-groups results when comparing learner levels. "Groups" signifies "semester," thus a difference between groups indicates a difference between early learners and later learners.

Table 7

ANOVA Results Between Learner Level for Alternative Navigation

Feature	SS	Df	MS	F	*P* value	F crit
Navigation by function	4.668817	1	4.668817	8.67269	0.005791	4.130018
Cross-course search	1.661593	1	1.661593	3.857846	0.057731	4.130018
Centralized feedback	1.498452	1	1.498452	2.753681	0.106228	4.130018
Central gradebook	0.433523	1	0.433523	0.717658	0.402837	4.130018
Custom bookmarks	0.072325	1	0.072325	0.139986	0.710619	4.130018
Cross-linking	0.0344	1	0.0344	0.090987	0.764764	4.130018

Only one feature had a statistically significant difference between the groups with a *p* value of less than 0.05 ($p = 0.006$). This feature was navigation by function. In this navigation method, users might first navigate to a function, such as discussion boards or assignment submission, and then filter by the course of their choice. Next, I analyzed the difference in means between the early learners group and the later learners group to determine the mean ranks that each group assigned to this feature. I found that early learners ranked this feature at 2.37, compared to an average of 1.65 for later learners. That is, if given the opportunity, early learners would be more likely to redesign their learning management system so that they could navigate it according to function. Later learners would be less likely to choose this design change. Early learners might prefer this method while they continue to adjust to university teaching expectations, compared to later learners who have more experience with the learning management system and the teaching style at their university.

The results of the post-hoc analysis showed that all remaining proposed alternatives – cross-course search, centralized feedback location, central gradebook location, custom bookmarks, and enhanced cross-linking – did not yield a *p* value of less than 0.05. However, a cross-course search navigation option was nearly statistically significant, with a *p* value of 0.058. In this proposed navigation method, learners could navigate their LMS from a common search function that would return results across all functions and courses. I analyzed the mean ranks that each of the learner level groups assigned to this method. I found that early learners ranked this option slightly higher (mean: 2.84) compared to later learners (mean: 2.41). Early learners would be more likely to request a design change that incorporated an inclusive cross-course search than later

learners. Similar to the navigation by function option, this preference could be related to early learners' reduced experience with university expectations and overall experience with the learning management system compared to their more veteran peers. However, even though there was a difference between the groups, it was not statistically significant.

Based on the results of the ANOVA and the post-hoc analysis, I rejected the null hypothesis. The post-hoc analysis revealed a statistically significant difference for only one proposed alternative navigation method: the navigation by function method. When analyzing the mean rankings, I found that early learners would prefer different alternative navigation methods, compared to later learners.

Null Hypothesis 6: There is no difference in the perceived value of proposed alternative LMS navigation methods based on degree program.

To determine if there was a difference in the perceived value of alternative LMS navigation methods based upon degree program, I followed a similar process as I did for Null Hypothesis 5. I grouped all responses to Question 20 according to the self-selected degree pathway for each survey respondent. If any participant declined to answer either Question 20 or did not identify their degree pathway, the response was excluded from the analysis. I then conducted an Analysis of Variance (ANOVA) to determine whether there were differences among groups when ranking the perceived usefulness of alternative navigation methods, which resulted in a p value of 0.009, thereby rejecting the Null Hypothesis. I then conducted a post-hoc analysis that compared outcomes between degree groupings for each of the proposed alternative methods of navigation. Table 8 shows the between-groups ANOVA post-hoc results for each of the proposed alternative navigation methods from the survey. "Groups" signifies "degree categories" and

therefore a statistically significant difference between groups represents a difference in responses between respondents enrolled in different degree pathways.

Table 8

ANOVA Post-Hoc Results Between Degree Groups for Alternative Navigation Methods

Feature	SS	df	MS	F	*P* value	F crit
Central gradebook	1.124603	4	0.281151	0.439129	0.779325	2.678667
Navigation by function	4.974603	4	1.243651	2.142126	0.099157	2.678667
Cross-course search	1.260317	4	0.315079	0.649206	0.631716	2.678667
Centralized feedback	2.27619	4	0.569048	0.995298	0.42483	2.678667
Cross-linking	3.710317	4	0.927579	3.132836	0.028315	2.678667
Custom bookmarks	0.724603	4	0.181151	0.332008	0.854293	2.678667

I found a statistically significant difference (p value < 0.05) in one feature, cross-linking. When I investigated responses further, I found that students enrolled in the business and entrepreneurship degree category and students who had not yet declared a major were more likely to rank cross-linking as important than students in other degree categories. On average, they ranked the cross-linking feature at 3.0 and 3.0, respectively. The ANOVA did not reveal a difference between degree categories for any other proposed navigation method. However, because there was a statistically significant difference between groups for cross-linking, therefore I rejected the null hypothesis.

Research Question 1: How would students design a learning management system compared to what is provided by their administration?

To evaluate this research question, I analyzed narrative responses from the interview and some free-text comments left within the survey. The analysis revealed that students would make design choices to their LMS. These design changes; however, had more to do with how instructors and universities used the system, and less to do with the design of the LMS itself.

Theme 1: Instructor design mattered

One primary theme emerged when analyzing data from Research Question 1: the way instructors designed and used the learning management system was critically important to participants. The design of the LMS itself mattered less to participants than the design instructors created when using it. This finding makes sense as students often do not have control over the design of the LMS nor the content within it. A student's primary role is to react to information left by instructors. One key change the participants discussed was not related to the design of the LMS itself, but rather to how instructors used it overall. SP7 specifically noted, "I don't think there are many issues with [the LMS] itself. I think it's more of the instructors who use it." Another interview participant, IP3, agreed, stating that "Well [the LMS] is for our professors, really. It's just for organizing their content."

An instructor-focused view of learning and the learning management system was also present within the survey. Participants showed a statistically significant preference for instructor centered LMS features and alternative navigation methods. On average, participants ranked existing LMS features that focused more on the instructor more

highly than those that were more learner-centered. For example, if participants had a more learner-centered philosophy about teaching and learning, they might have ranked tools that allowed them to better collaborate with their peers. Peer collaboration is one of the teaching methods that would indicate a more learner-centered teaching philosophy. Instead, students preferred tools that facilitated more traditional instructor focused education, like gradebooks, assignments, quizzes, and exams. Likewise, participants also preferred alternative navigation methods that favored the instructor. For example, students preferred a central search feature that could return results from any course. If students perceive that the issue is with the instructor design of the course, then favoring a comprehensive search makes sense, especially if every course is designed differently from the others.

Theme 2: Students desired more consistency in design from course to course

Both survey participants and interview participants noted that they desired greater consistency in the course setup between courses they would take. All participants in the study were undergraduate students. While I did not specifically ask whether they were enrolled full-time or part-time, all students in the interview revealed in conversation as part of the interview that they were enrolled in multiple courses simultaneously. One participant, IP1, discussed the challenges in finding feedback on assignments and noted,

> Some instructors do their feedback as footnotes within your assignment, like they'll just put numbers, and you have to click into it to see what they said, but then you have to go back out and back into each individual number. Other instructors just leave comments in the gradebook overall. It's just frustrating.

In this situation, the participant was describing a situation where the footnotes became nested within the assignment, necessitating a click to a new window or a popup to view the comment. By comparison, some learning management systems can show the comments side-by-side with the original submission or otherwise within the same window. The same participant also expressed a desire to have greater consistency in the navigation menus between the web version and the mobile app, noting that she often completes her coursework on her iPad. SP33 agreed and noted in the free comments field of the text box that, "I wish professors had just one place to put things … it's too different between courses." IP2 also noted, that

> the biggest improvement I would make is having consistent usage across courses. Some instructors actually use it, but most either don't use it or don't seem to know what all the features are actually for, so they put things anywhere.

IP3 expressed similar frustration and noted, "I take five or six courses at the same time and every time something is due, I have to re-learn my professor's individual preference for uploading things." From these responses, I can conclude that most participants believe that the design of their LMS is sufficient, but that participants would prefer greater consistency between how instructors use the tools.

Research Question 1A: Which LMS features and functions do students find most valuable to their learning?

When evaluating how participants felt about specific features and functions, I examined free-text comments from the survey and interview responses. From these responses two primary themes emerged. First, students expect features to work smoothly.

Secondly, students appreciated the ability to consolidate their most important tasks in one place.

Theme 1: Students valued features that worked smoothly and intuitively

In general, students had high expectations for their LMS and the features and functions it provided to function smoothly. Simply having features available, either directly built into the LMS or integrated through a third party, was not sufficient. Many students were likely comparing the technology of their LMS to other types of digital technology they interact daily, such as smartphones, mobile apps, and other websites. Standards for technological performance are high and tolerance for errors or non-intuitive design is low. Participants specifically noted some features they disliked, because they provided a clunky experience. For example, SP3 noted that a specific built-in web conferencing tool in their LMS was "horrible," noting that it didn't seem to work when they needed it to. Another student, SP4, noted that their LMS's built-in calendar feature was challenging to use in months with 31 days, noting, "I have to change the format of it to see my assignments that are due." From this information, I conclude that desired features have more to do with their ability to function well in the moment, and less to do with the function that they provide. This conclusion aligns with Theme 1, where instructor design matters. While instructors do not have control over the functionality of the LMS or technical capabilities of the LMS, students seem willing to use any feature since their role is to react to what is provided to them. In this way, all features support their learning, and less valuable features are those that are difficult to use.

Theme 2: Students appreciated consolidated features for one-stop shopping

Students appeared to appreciate LMS features that allow them to create a consolidated to-do list of their most important tasks related to their learning. In essence, student users indicated they would benefit from one-stop shopping. Having one place within the LMS serve as a comprehensive collection for all key activities would benefit learners. Key activities as part of this roundup would likely include due dates for assignments, a list of tasks, including any formative learning opportunities, and key dates, such as synchronous sessions or high-stakes exams. The primary feature noted for accomplishing this goal was the dashboard. From the interviews, all three participants reported that the dashboard and the calendar were helpful features for them. IP1 stated, "I really appreciate the dashboard. … It makes it easy to have an at-a-glance type thing that makes it really easy to avoid missing things." She further explained that she had used two different LMS's as part of her degree program at her institution and, although she preferred one over the other, noted that the dashboard and calendar were her favorite features. She noted that the calendar helped keep her on track with deadlines and said of the dashboard, "I really like the one-stop-shopping; I like that everything is all in one place for me there."

IP2 shared similar feelings and said, "I really like the calendar because it serves as sort of a checklist, although I wish I could change the view sometimes, almost like the syllabus page but have everything for all my courses in one spot." IP2 elaborated that she found the calendar specifically appealing because she could find all of her tasks across her courses in one place, and it made it easier to focus on the assignments. IP2 also noted

she would change nothing about the dashboard and would prefer to keep it "exactly the way that it is" because it made it easy for her to find all of her courses' expectations.

IP3 agreed with the previous two participants: "I like having everything all in one spot [on the dashboard] so I don't have to try too hard to chase everything down." In all three of the interviews, the biggest draw to the calendar and the dashboard is having a central location to find the academic to-do list. In each case, the interview participants appreciated having an easy way to engage with their materials and meet expectations.

Research Question 1B

How would students reorganize Canvas to make it easier or more meaningful to navigate?

When I analyzed the comments from the survey and the interviews, two additional themes emerged. One theme was the ability to customize the LMS. The second theme was that students believe navigation could be improved with consistent design within courses.

Theme 1: Students wanted to customize their LMS experience

Students would appreciate the ability to customize their LMS navigation to make it more personally relevant to them. The ability to choose which links and features were most valuable to them was key to a learner-centered teaching philosophy. One study recommended giving learners permissions as both an instructor and a learner within a course to allow more flexibility and customizability within the course (Glancy & Isenberg, 2013). Customizability within the LMS would be unique to each student, although the content and activities for the course as a whole would not change. One survey participant, SP14, suggested allowing learners to customize their navigation

menus to be more useful. They stated, “Students being able to customize what they see within courses [sic]. Sometimes professors disable important tabs or enable all the tabs creating a cluttered tab bar.” Although they did not elaborate, in this case, SP14 might have liked the ability to re-enable certain navigation features that the instructor had disabled. IP2 had similar feelings, stating, “I don’t really have a problem with the navigation, but it would be nice to choose the navigation method that was best [for me].”

The results from the qualitative aligned well with quantitative data from the survey. Specifically, when participants ranked their preferred methods for LMS navigation, they expressed a strong preference for an inclusive cross-course search, which I discussed under the heading, Null Hypothesis 4 (Table 8). An inclusive cross-course search is similar in concept to a comprehensive search tool, such as Google or Bing. While the searcher would have no control over which resources existed and which did not, the list that would appear is customized to the user, depending upon their needs. Users customize the results based upon the search terms they use.

Theme 2: Navigation could be improved with greater consistency in design within each course

Similar to Theme 2, students indicated that they might appreciate greater consistency in course design. Specifically, they indicated a desire for greater consistency within each of their respective courses. For example, even though a file could be placed in more than one location, students preferred it when instructors chose one location and consistently used it for the duration of the course. IP2 noted that,

> The biggest improvement I would make is consistent usage [within all my courses]. Some instructors *actually* use [the LMS] and some don’t, or some use it

> totally differently. … Assignments or slides are often hidden in other places besides the assignments folder which often make things confusing.

IP3 also expressed frustration with inconsistency in information location:

> Sometimes I have to go to more than one place to find instructions on what I'm supposed to do, which is frustrating. Like sometimes they'll send an announcement about an assignment and then no instructions or a link to the assignment itself.

IP1 had a similar sentiment noting that instructions for assignments were sometimes gated or unavailable to students or that instructions were not located within the assignment, but could be found in a downloadable file in an alternate location. Two survey participants agreed. Survey Participant 23 noted, "Assignments are often hidden in other places besides the assignments folder which often makes things confusing." SP7 specifically blamed instructors,

> I don't think there are many issues with [the LMS] itself. I think it's more of the instructors who use it. They either don't have the knowledge of how to use [the LMS] or they don't upload useful things for the students. For example, I feel like many of my professors have posted assignments with little to no instruction and information about how to complete it correctly.

Research Question 1C: How do students feel about the use of external tools in addition to their LMS, if they use them?

During the interview, I asked participants about their feelings related to external tools. For the study, I defined external tools as those tools that were not built-into the LMS and could potentially require a separate username and passcode. Only one theme

emerged: that students didn't seem to mind using them. Participants also provided some quantitative information from the survey, which I discuss later under the heading, *Other Data*.

Theme 1: Students didn't mind using external tools

Based on interview responses, participants indicated that they had neutral feelings about using external tools, if they were asked to use them. In general, participant responses showed that students thought it was acceptable for their courses to require them to use one or more external tools. Students seemed to accept them as part of their learning. IP2, for example, felt that the use of external tools was fully acceptable for learning overall. IP2 was also unconcerned about the potential number of external tools students could be asked to use and sign into on a regular basis, specifically stating, "I have four streaming apps just to watch TV. That's just how things are. You just have to have lots of apps." IP2 further explained that he felt there was no need to have the features of external tools directly built into the LMS: "I feel like the other companies do it better than if [the LMS] had to make them from scratch." Another interview participant noted that she liked the external tools, stating that using them gives her a chance to be more engaged, "I feel like my professors who use [external tools] get me to think differently and more deeply when they do, and I have an easier time paying attention."

Survey participants also had no objections to using external tools. From the survey, most participants indicated that they did use external tools as part of their courses; only three respondents indicated they had never been asked to use them. A vast majority of survey participants (85%) indicated they didn't mind using or were happy to use external tools for their learning. Furthermore, the highest percentage of responses

(47.5%) seemed ambivalent about whether these external tools should be built into the LMS directly, rather than being fully external. When asked, this group of students answered “maybe.”

Between the interview participants and the survey participants, using external tools seemed to be an acceptable practice. Participants in general seem to feel neutrally about their use, or in some cases positively about them. They also did not appear to feel strongly that they should be fully incorporated into the LMS.

Research Question 2: How do the desired LMS Features, Functions, and Organization Differ between Students in Degree Programs at Different Schools, and Students at Different Learning Levels?

Throughout the interview, I discussed overall feelings and attitudes about the LMS and its specific features with the interview participants. The three interview participants came from two different degree pathways: IP1 best aligned with the degree pathway, business and entrepreneurship, and IP2 and IP3 best aligned with the education degree category. No clear themes emerged for this research question when comparing the different degree programs. Additionally, all the interview participants reported that they were enrolled in their second semester or later. I was therefore unable to determine any unique preferences based upon learner level or degree program.

Research Question 3: How has the COVID-19 Pandemic Altered Expectations and Overall Satisfaction for Undergraduate Students Using Learning Management Systems?

Throughout the interview, participants discussed their feelings about their learning management system during COVID. Some survey participants also left

comments about their feelings regarding their LMS during COVID. Overall, two main themes emerged. The first was that students' use of and expectations for their LMS remained about the same as they had been before COVID. Second, students felt that faculty might have benefitted from additional training.

Theme 1: Students had similar feelings about their LMS at the time of the study as they did pre-COVID

Interview participants generally agreed that there was little change in how they used their LMS during COVID compared to pre-COVID. They additionally seemed to have neutral feelings about their use of their respective LMSs during COVID. IP2 noted that while COVID did not change much about how she used her LMS, she did appreciate how it "leveled the playing field." She additionally noted a positive side effect that COVID made some courses more accessible through the LMS. She stated, "I liked how it made everyone use [the LMS] because it made it easier for me to submit all my coursework in one system." IP3 noted that overall, his use of his LMS did not change much, although he did notice an increase in the number of integrations used: "We started using more tools, like Zoom and Padlet, although I'm not sure how much some of those tools were really needed." While the interviews revealed some changes in how students used their LMS, responses revealed COVID did not adjust students' expectations regarding their LMS on the whole. This finding aligns well with survey responses where most participants who were enrolled at their institution during COVID reported feeling the same or better about their LMS as they did pre-COVID. Only one participant noted that they disliked their LMS more compared to their pre-COVID experience. When evaluating the full survey results, this same participant had described that their LMS's

built-in web-conferencing tool as “horrible.” It may be more likely that this individual had a negative experience based upon the specific features their instructors were using, rather than having had a negative experience with the LMS itself. If this hypothesis is true, then the reasoning aligns with the theme that instructor design matters more than LMS design.

Theme 2: Students thought instructors needed training

In alignment with another theme, where instructor design matters more than LMS design, study participants perceived that instructors could benefit from additional training regarding LMS use to design the courses well. Specifically, students perceived that instructors had a poor understanding of how the LMS worked, particularly from a student view. Participants who had a challenging experience in finding their materials, blamed lack of training as one of the primary causes. Interview Participant 1 (IP1), for example noted that the biggest challenge in using the LMS during the pandemic was related to how the instructors used it. She noted, ‘…the biggest weakness now is that instructors who had not necessarily taught online classes before now were offering online classes, and the experience is different just because they’re not used to how that works.’ When asked to elaborate, she noted that it felt as though “…instructors were totally unfamiliar with [the LMS] and completely untrained. It was easy to tell who had never used it before because it was so much harder to find what I needed.” From this response, I can infer that the student may have had a different experience if the instructors displayed more confidence. SP7 left a comment that also implied that instructors would benefit from training: “[Instructors] either don’t have the knowledge of how to use [the LMS] or they don’t upload useful things for the students.” While they did not explicitly state so, the

issue of instructors not knowing how to use the LMS could be resolved with some additional training or at least stronger centralized support from the university. Even if universities did offer training and support for instructors during COVID, students did not appear to perceive that teaching faculty were prepared to use their LMS.

Other data from the survey supported this theme. In general, participants indicated that they were generally satisfied with the LMS itself. Question 6 in the survey asked respondents to what degree they agreed or disagreed with statements about their LMS's ability to support their learning. That is, does their LMS have the correct features to complete the required tasks for their courses. All participants (100%) that they were somewhat or fully satisfied with their LMS's ability to support their learning, which supports the theme that students perceive that instructors' knowledge of the system to be the cause of flaws within the LMS.

Additional Results

In addition to the information discovered related to the null hypotheses and research questions, the study also revealed additional information important to the study's overall goals. Several other questions on the survey asked participants to respond to statements regarding their feelings about LMS features, external tools, and opinions about their LMS during COVID. While these questions did not directly correspond to one of the hypotheses, the results are important as they lend further insight into supporting qualitative data found within the interviews.

Satisfaction with Existing LMS Features and Functions

Overall, participants indicated that they felt positively about the features and functions within their learning management system. Participants ranked their feelings

about the overall features and about two specific features on a scale of one to three, where one is low, and three is high. In some cases, participants could select that the question did not apply to them, in which case I omitted that information from the overall calculations. Table 9 below lists survey participants' responses from specific questions that asked them to provide their opinions on a ranked scale about overall features and abilities within their respective LMS.

Table 9

Descriptive Statistics for LMS Features Overall

Question	Minimun	Maximum	Mean	Standard Deviation
Overall opinions about the LMS features	1.00	3.00	2.30	0.56
How do you feel overall about the features and functions currently provided to you in your LMS?	2.00	3.00	2.45	0.50
How do you feel about your ability to work collaboratively with your peers?	1.00	3.00	2.35	0.63
How do you feel about your current ability to receive instructor feedback on your coursework?	1.00	3.00	2.52	0.63

Two questions within the survey specifically asked respondents about their feelings related to two specific key features that align with a learner-centered pedagogical approach: the ability to work collaboratively with peers, and the ability to receive rich narrative feedback from instructors. Most survey participants (75.0%) reported that they were either somewhat or fully satisfied with their ability to collaborate with their peers within their LMS, while 17.5% reported that they were not at all satisfied with their LMS's ability in this area. While most participants reported general satisfaction, this question did report the highest percentage of respondents who indicated that they were

not satisfied, when compared to other survey questions. When evaluating the LMS's ability to deliver instructor feedback to students, a large majority (92.5%) reported being either somewhat or fully satisfied in their ability to receive feedback on their work.

Satisfaction with Existing Navigation Methods

Four questions in the survey, questions 16-19, asked participants to rank their level of satisfaction with the organization of their LMS overall, the organization and navigation from the LMS's dashboard, navigation from within courses, and the navigation method for their LMS overall. For each of these, participants ranked their satisfaction on a scale of one to three, where one was not satisfied, two was somewhat satisfied, and three was completely satisfied. In general, survey participants indicated that they were satisfied with the way their LMS was currently organized. When asked how they feel about their LMS's overall organization, 100% responded that they were either somewhat (58.3%) or totally satisfied (41.4%). Survey participants felt similarly when asked about the content organization within specific courses within their LMS: 66.7% reported they were somewhat satisfied and 33.3% reported they were totally satisfied. However, 5.6% of participants reported that they were not at all satisfied with how their LMS's navigation, or their ability to find what they needed. Most participants reported that they were either somewhat or fully satisfied with the navigation overall. Table 10 lists survey participants' responses to questions 16, 17, 18, and 19, which asked students to rate their overall satisfaction with the general navigation abilities of their LMS.

Table 10

Survey Results for Participant's Overall Satisfaction with LMS Navigation

Question	Minimum	Maximum	Mean	Standard Deviation
16. How do you feel about the way the LMS is organized?	2.00	3.00	2.42	0.49
17. How do you feel about the dashboard (i.e., the home page you see when you first log in)?	1.00	3.00	2.56	0.55
18. How do you feel about how each course is organized within the LMS?	2.00	3.00	2.33	0.47
19. How do you feel about the LMS's overall navigation?	1.00	3.00	2.50	0.60

Satisfaction with External Tools

Overall, participants seem to be generally satisfied with using external tools. Only 7.5% of survey participants reported that they disliked using external tools with their LMS and 85.0% noted that they either did not mind it if there were some improvements or were happy to use them. A small percentage (7.50%) were unable to answer the question as their instructors had never asked them to use external tools to support their learning within their LMS. Table 11 lists participant responses on the survey to two questions asking for their opinions about external tools overall. In some cases, participants could indicate that the question did not apply. In those instances, I excluded those data from the descriptive statistics calculations.

Table 11

Descriptive Statistics for External Features Opinions

Question	Minimum	Maximum	Mean	Standard Deviation
Overall opinions about the use of external tools	1.00	3.00	2.35	0.63
Would it be better if those features (external tools) were built into to your LMS?	1.00	3.00	2.16	0.69

A second question asked participants whether they thought external tools should be natively built-in options to their LMS, rather than called in from external sites for integrations. Most participants agreed that their LMS either could benefit from or should have additional built-in features. Only 15.0% responded that they felt their LMS needed no additional features that were represented by external tools. These results generally align with and help validate the results from the interview. Interview participants in general accepted the use of external tools as part of their learning and had a neutral opinion of them.

LMS Satisfaction during COVID

Participants answered one question on the survey that asked them to compare their overall level of satisfaction with their LMS now, compared to their overall satisfaction before the COVID-19 pandemic. Participants indicated whether they felt the same, better, or worse about their LMS now than they did when comparing it to how they felt about their LMS before COVID. Nearly half of those who responded to the question (52.78%) indicated they were unable to answer the question as they were not enrolled at their institution before COVID. All participants who responded this way also indicated in the demographic questions that they were currently enrolled in their first semester. 44.44% of the responses indicated that students felt the same or better about their LMS as they did before COVID. Table 12 below shows what percentage of survey participants agreed with which statement.

Table 12

Survey Responses for LMS Attitude During COVID

Response	%
I dislike my LMS more than I did pre-COVID.	2.78
I feel the same about my LMS now as I did pre-COVID.	22.22
I like my LMS more now than I did pre-COVID.	22.22
N/A or I was not enrolled at my institution pre-COVID.	52.78

Note: Results from the survey showing what percentage of survey participants agreed with which statement about their feelings toward their LMS during COVID.

These results align with the comments from the interview participants. While survey participants had an opportunity to leave comments to explain their response, no participants chose to do so. However, for the students who felt better about their LMS, their responses might follow similar logic to IP2, who appreciated that COVID 'leveled the playing field' when it came to accessing and using the LMS more consistently for coursework. These results help validate the responses from the interview as they were closely aligned.

Summary

This chapter discussed the results for the study, according to the null hypotheses and research questions. The results for the null hypotheses are as follows:

- Null Hypothesis 1 – Rejected; there was a statistically significant difference in the perceived value of LMS features.
- Null Hypotheses 2 – Rejected; there was a statistically significant difference in the perceived value of LMS features according to learning level.
- Null Hypothesis 3 – Failed to reject; there was no statistically significant difference in the perceived value of LMS features according to degree program.

- Null Hypothesis 4 – Rejected; there was a statistically significant difference in the perceived value of proposed alternative LMS navigation methods.
- Null Hypothesis 5 – Rejected; there was a statistically significant difference in the perceived value of proposed alternative LMS navigation methods according to learner level.
- Null Hypothesis 6 – Rejected; there was a statistically significant difference in the perceived value of proposed alternative LMS navigation methods according to degree program.

Data related to the research questions revealed several themes. First, instructor design mattered to the study participants. The participants felt that how the instructors used their LMS was critically important to how students interacted with the system. To that end, I found a related theme in that students perceive that their instructors likely need training on how to design and use their LMS effectively.

Next, participants expressed a desire for greater design consistency from course to course. As undergraduate students often take multiple classes at a time, increased consistency in the LMS design for those courses could free up some mental energy to focus on the learning tasks. A similar theme emerged in that participants felt that greater consistency in design between courses would create an easier and more desirable navigation experience. Participants also valued features that worked smoothly and intuitively. That is, features that allowed learners to focus on their learning the best were those that worked as intended and that required minimal instruction to learn how to use.

Participants expressed a desire to have their LMS features consolidated for more one-stop shopping. Some participants noted they would like to incorporate LMS features into

their existing digital ecosystems, whereas others appreciated rounding up similar features into one tool. Finally, participants noted that COVID had little impact on their feelings and attitudes toward their LMS.

Overall, students would make few changes to the features, functions, organization, and navigation methods to their respective learning management systems. In general, participants agreed that the most important features were those related to traditional learning approaches, such as assignment submission and quizzing or examinations, which is misaligned with learner-centered instructional practices. The study could not determine whether the cause was related to a lack of learner-centered practices within student courses or because students may not yet feel comfortable with learner-centered approaches. If students were dissatisfied with their LMS and its design, they often felt that it was because instructors did not design the courses well or could use additional training and knowledge about how to effectively employ the LMS. To that end, instructor design was critical for the study participants. Participants expressed that they felt they would benefit from more consistent instructor design both across and within courses. Finally, students' feelings about their LMS did not change because of COVID. Some students noted that they appreciated that COVID enabled more of their courses to use the LMS more fully.

In Chapter Five, I will explore these results further, including why participants may have felt this way. I will also discuss some key limitations of the study and how they may have impacted the study's results. Chapter Five will also explore how these results could be applied in future studies and in practice in higher education.

Chapter Five: Discussion

Introduction

The purpose of the study was to examine student opinions and preferences related to the design of their learning management systems (LMSs). With higher education trending more toward learner-centered teaching philosophies, students are considered primary stakeholders in the learning process; however, little research currently exists about how students would design an LMS to meet their learning needs. The results will add to a limited body of evidence in educational research regarding student voice in the active design of the tools used for their learning.

In the study, a total of 48 participants offered their opinions regarding their learning management systems (LMSs) and how they did or did not meet their learning needs. Specifically, the participants answered questions about how they might re-design their LMS to better meet those needs if they were given an opportunity. They also provided information about whether they met their expectations during the COVID-19 pandemic. In order to answer those questions, 45 participants completed an online survey that asked them to provide opinions about features, functions, and proposed alternatives to organizing those features. Three participants completed a semi-scripted interview and provided qualitative information about what changes they would make to their LMS and why. The survey and the interview provided both quantitative and qualitative data that I then analyzed to determine whether there were differences between different types of learners and to find trends and themes. In general, the data from the survey and the interview complemented and supported one another, which helped validate the responses from both. Overall, the study revealed that students generally would not make changes to

the design of their respective LMSs alone, but that most of their recommendations were related to how instructors and administrators use the existing tools within the LMS.

I also explored the differences in degree pathways and in learning level. Slight differences were found between students of different degree programs regarding the different types of proposed alternative navigation methods. I also found a statistically significant difference between early learners and later learners regarding the features and functions they valued the most and which proposed alternative navigation methods they preferred.

In the following paragraphs, I will further examine the results described in Chapter Four and discuss possible reasons for those results. I will first review the hypotheses and the supporting quantitative data. Then, I will move into the research questions and qualitative data.

Hypotheses

Often when we think of the design of an online system, such as a website or LMS, we often first think of the features or functions it can perform to meet our needs. Following a learner-centered teaching philosophy, features that support that philosophy are those that allow students to construct and author their own learning experiences. The study attempted to measure where there were any differences in the perceived value of LMS features. As a secondary measure, the study also attempted to measure the perceived value of different ways to organize an LMS such that doing so would impact how students navigate the system. In total, the study had six hypotheses to measure these two key design features and how different groups of students responded to them.

Null Hypothesis 1: There is No Difference in the Perceived Value of LMS Features

When asked to rank features from a list regarding their usefulness, participants tended to agree that all the features were important to their learning. However, there was a statistically significant difference found in the preferred features, ranked from survey responses. The *p* value for the ANOVA for this hypothesis was noticeably different compared to other ANOVA calculations. To ensure the result was not made in error, I calculated the result on two separate occasions in Excel. This difference could have been caused from a low number of survey responses. It could also have been caused by the design of the question, which contained a high number of available features to rank.

After finding the statistical significance, I evaluated the mean ranks and percentages for each of the individual features. The features with the highest mean ranks and lowest variances were the LMS gradebook, assignments, and exams, followed by instructor feedback. Features with the lowest mean rank included synchronous and asynchronous peer communication. This finding may reveal that students continue to value or prefer an instructor-focused teaching method, which is a theory that some proponents of learner-centered teaching philosophies agree is common (Moate & Cox, 2015). This finding could also signal that instructor-centered teaching practices continue to dominate teaching for the students who participated in the study.

Although there were differences between which feature was more desirable than others, the survey in general revealed high rankings for all features. No feature had a mean rank below 2, or “somewhat useful.” This finding supports results from another question within the survey, where 95% of participants noted they were either somewhat or fully satisfied with their LMS as a whole. This result seems to make sense: if students

generally find the features of their LMS useful, then they are likely to be satisfied with the tool overall. Taken together, the study aligns with previous research explored in Chapter Two, that students are generally satisfied with their learning management system as it is.

Null Hypothesis 2: There is No Difference in the Perceived Value of LMS Features Based on Learning Level

From the survey, I found a statistically significant difference in two features according to learner level: asynchronous instructor communication and exams. When I analyzed according to learning level, early learners showed a statistically significant preference for asynchronous instructor communication tools, like LMS-based email, and the exam tool, when compared to later learners. Early learners' relative inexperience with their LMS and with learning at the college level could be partially at fault for this finding. Early learners may have less confidence in learning at the university level and rely on clear communication from their instructors and more familiar traditional measures of academic success than their more experienced peers. Given the timeframe of the study, it may also be possible that these students were more likely to be taking classes remotely. If they were taking classes remotely, then communication with their instructors would rely heavily on digital methods, such as email, which would explain why these participants noted this feature as so important. Later learners, by contrast, were more likely to have had a traditional face-to-face educational experience at their institution before COVID.

In remote classes, asynchronous communication with instructors, such as through LMS messaging or class announcements, may be more important if students do not have an opportunity to communicate with their instructors synchronously. In thinking of a

more traditional class setup (i.e., pre-COVID), students may have had more opportunities for spontaneous question-asking directly before or after class, as the classroom transitioned between classes. If taking classes fully remotely; however, students could have fewer opportunities to ask spontaneous questions, even if they have synchronous meeting times. Unfortunately, as part of the study, participants had no opportunity to indicate whether their classes were fully remote, fully face-to-face, or a mix of the two. I am therefore unable to explore this reasoning in more detail.

A second reasoning that early learners may prefer these features is their relative inexperience with learner-centered pedagogies in higher education. One previous study found that students had a hard time adjusting to learner-centered teaching, and often preferred more instructor-based teaching methods at first as they struggled to adjust (Wohlfarth et al., 2008). So, if instructors are using more learner-centered pedagogies in these classes, earlier learners may have still been adjusting to these teaching methods and may have desired more direct instruction from their instructors, and therefore have favored features that allowed them to communicate with instructors. Additionally, being less experienced with learner-centered teaching methods, they may have preferred more familiar methods of academic success, such as traditional exams and quizzes more heavily than later learners. This explanation does not account for previous experience with learner-centered pedagogies, such as during high school or from previous institutions.

Null Hypothesis 3: There is No Difference in the Perceived Value of LMS Features Based on Degree Program

At the beginning of the survey, participants indicated a degree program based upon five overarching categories: 1) arts and humanities, 2) business and entrepreneurship, 3) education and human services, 4) science, technology, and health, or 5) not applicable or undeclared. When I compared the perceived value of LMS features among these groups using an analysis of variance test (ANOVA), I did not find any statistical significance. No one field of study preferred any LMS feature over any other. It may have been reasonable to assume that different fields of study may have demanded different features from their LMS based on the differences in their content. For example, STEM fields with laboratory requirements could reasonably have different needs compared to a fine arts class on garment construction. However, this finding aligns well with currently accepted learning theory that states that humans construct their learning based on their experiences, combined with practice of recalling information and applying it in new ways (Brown et al., 2014; Carey, 2015). In fact, having different learning needs associated with different fields of study more closely aligns with learning styles theory, where certain individuals learn best by one method or another. Learning styles theory has since been disproved and has not shown to improve students' academic performance whether instructors follow this theory or not (An & Carr, 2017). Taking these theories into account, learners should not need different features or functions depending upon their degree program, despite perhaps personally preferring one over another. Provided that instructors are using them in a way that focuses on learning and the learners, the LMS features should be equally appropriate between these groups.

An alternative explanation for this finding stems from the study sample. The chosen degree programs for the study were skewed. Students enrolled in science, technology, and health fields were more strongly represented than other fields. Twenty students responded from this degree program, compared to nine from the arts and humanities, five from education and human services, and three each from business and undeclared. Taking this fact into consideration, a difference could exist, but the results were overrepresented in the science fields compared to other degree pathways leading to an artificial result. To truly know, I recommend repeating the study with a more balanced sample.

Null Hypothesis 4: There is No Difference in the Perceived Value of Proposed Alternative LMS Navigation Methods.

As part of the survey, participants responded to a question that asked them to evaluate how important they perceived proposed alternative navigation methods. Proposed alternatives included different methods of organizing the LMS in such a way that would change how learners navigate the system. Examples include grouping objects according to their function, rather than placing them into individual courses, or having a universal search feature that would search across all courses, rather than a dedicated search field only in the uploaded files location. In general, I was unable to determine a clear alternative that participants favored more than another. While some methods were ranked higher on average, some methods with a lower overall average score had a higher percentage of participants who described them as somewhat or very useful.

One possible explanation for this finding could be that navigating the LMS or any website could be more of a matter of personal preference, compared to a need related to

learning. Considering this perspective, each individual's unique preference may have been different enough from others that the results were difficult to distinguish and followed no clear trend. As discussed in Chapter Two, previous studies have shown that students are generally satisfied with their LMS. Their satisfaction could plausibly include the navigation of the system. Additionally, comments from the interviews showed that the content within the LMS mattered more.

Null Hypothesis 5: There is No Difference in the Perceived Value of Proposed Alternative LMS Navigation Methods Based on Learning Level.

To determine whether there was a difference based upon learner level, I compared the early learner group to the later learner group using an analysis of variance test. Early learners did display a statistically significant difference in the proposed alternative navigation methods they would prefer. Specifically, early learners ranked a navigation-by-function option as more useful compared to the more experienced learner group. One reason for this preference may be due to their relative inexperience compared to their peers. Less experienced learners may still be learning how to navigate learning at the university level and might find it more helpful to navigate according to function to find what they need.

An alternative explanation might be related to the COVID-19 pandemic. Earlier learners might not have had an opportunity to experience learning in higher education prior to the pandemic. They may be more likely to have experience many or all of their classes online and remotely. As a result, their instructors might have been more likely to use similar features to one another to engage learners. For example, in a remotely taught course, discussion boards may be important to facilitating student engagement, especially

if that class was taught asynchronously. As a result, these learners might find it more efficient to simply navigate to the function *discussion boards* and participate in all of their activities at once, rather than jumping from course to course and starting the navigation process over each time.

Null Hypothesis 6: There is No Difference in the Perceived Value of Proposed Alternative LMS Navigation Methods Based on Degree Program.

To determine if there was a difference in participant-perceived value of proposed alternative navigation methods between degree programs, I separated responses according to groups of degree programs and performed an analysis of variance test. The results of the test showed that there was a statistically significant difference in the perceived value of alternative navigation methods when comparing degree programs. Specifically, participants enrolled in a business degree program and those who were undeclared were more likely than their peers in other programs to rate increased cross-linking functionality as useful. In fact, both of these groups of students unanimously rated increased cross-linking as very important, with an average rating of 3.0 of 3.0.

This finding was surprising and somewhat misaligned with the findings from the third null hypothesis. If choosing system organization and navigation methods has more to do with personal preference than learning, as I hypothesized earlier, then degree programs should not show a difference in their preferences. This difference could be due, in part, to an unbalanced sample. For this question, only three students for each the business and entrepreneurship category and the undeclared category responded to this question. By contrast, 20 participants responded from the science, technology, and health programs, and seven responded from the arts and humanities. The likelihood that all six

participants responded the same could have been coincidence. Regardless, this finding warrants further study, specifically with students enrolled in business degree programs and those who are undeclared.

Research Questions

The study had three primary research questions and three subordinate research questions that sought to examine student opinions regarding the design of their learning management system. I collected data primarily from interviews with three participants. I also included comments from the survey, although there were few. I recorded all responses, read them multiple times, and then grouped them according to trends and themes. Some comments applied to more than one theme. In total, three participants completed the interviews. Finally, I included applicable comments from two survey participants.

Research Question 1: How Would Students Design a learning Management System Compared to What is Provided by Their Administration?

Two themes emerged when analyzing comments related to this research question. One was that instructor design plays a large role in how students perceive the design of their LMS. One participant specifically noted that they felt like issues with the LMS did not stem from the LMS itself, but rather from how instructors use it. Other comments supported this theme, and in general had an instructor-centered view of instruction and LMS use. One participant even stated that they did not believe the LMS was for students, but rather intended as a place for instructors to post their materials.

This theme supports previous literature that shows that many students have difficulty adjusting to learner-centered pedagogies and default to instructor-based

teaching methods. Additionally, previous studies found that the quality of the content, or instructor-created design, matters a great deal to student satisfaction (Lao & Gonzales, 2005; Ozkan & Koseler, 2009). More recent studies continue to support this claim. In one study, Cavus (2021) encouraged instructors to post higher quality content as the study found that content quality was one of the most important aspects for student LMS use. Therefore, the quality of the content and how instructors place it within the LMS would matter to students. Ultimately, students' role within the LMS is reactive: instructors design their courses and provide the content, and students have to react to it and interact with it based upon that design. Even the most intuitive tool would be frustrating to use if it was not leveraged appropriately.

A second theme that emerged was that students desired more consistency in instructor design from course to course. Several comments between the survey and the interviews noted that different instructors had different preferences on where and how to house course materials. For full-time students, who tend to be enrolled in multiple courses simultaneously, learning to navigate each course individually could be time-consuming and inefficient. Differences between courses could arise from differences in instructor preference or differences in their respective understanding of the LMS. Many LMS are complicated systems with multiple places to place documents, assignments, or other materials. This design could be intentional, planning for flexibility to account for multiple different needs for multiple different institutions. However, if faculty do not have a good mental model of how the LMS is organized, they could inadvertently place materials in a place that is difficult to find from the student perspective. Additional faculty training or the implementation of standard guidelines for LMS use could help

resolve this issue and create more consistency for students and enable them to better focus on the content, rather than learning the individual locations in each course.

Research Question 1A: Which LMS Features and Functions Do Students Find Most Valuable in their Learning?

When discussing specific features and functions with study participants, most seemed to agree that all the features they used played a role in their learning within the learning management system. However, participants had strong opinions about which features they preferred based on how smoothly they worked. One survey participant described a built-in web-conferencing tool as 'horrible' and that they preferred another more popular web-conferencing tool. Since that participant opted not to complete an interview, I was unable request further explanation. However, the experience is relatable. When software tools are not intuitive, they can incur feelings of frustration and sometimes anger. Norman (2013) also discusses this phenomenon, and encourages designers to create tools based upon how people behave, rather than how designers want them to behave.

This experience is relatable. Many people likely have anecdotes about being forced to use systems they claim to hate or becoming frustrated when a software or website doesn't work the way that they think it should. Based on this result, universities might consider periodically surveying their students or testing tools from the student perspective to ensure that the tools they have chosen work well for *all* their primary stakeholders.

A second theme that emerged was that participants appreciated consolidated systems. This theme is closely related to students desiring more consistency in the LMS

design from course to course. Comments specifically focused on having one tool dedicated to providing a comprehensive list of tasks to complete across all their courses. Some participants mentioned a dashboard, while others mentioned using a common calendar with a task list. For full-time undergraduate students, having a consolidated list of all required tasks could make learning more efficient, as they are likely to take multiple courses during a semester. Based on responses from the interview participants, existing tools seem to be working well. If possible, instructors should ensure that they are using features associated with student learning tasks within the LMS in such a way that ensures they appear on student dashboards and calendars.

Research Question 1B: How Would Students Reorganize their Learning Management System to Make it Easier or More Meaningful to Navigate?

Interview participants and some survey participants agreed that they would like more of an opportunity to customize their LMS to better suit their needs. One survey participant noted that they would like the ability to turn certain features on and off, based on whether they used them in that class or whether they felt they were useful. An interview participant agreed noting that she would like the ability to move within the system the way she preferred. Although this finding does not validate the findings from the hypotheses, a customizable navigation experience was not an alternative I provided on the survey. The participant responses also align with other research that focuses on student customizability. One previous study found that students desire greater customizability in their LMS experiences, particularly within their dashboards (Roberts et al., 2017). Providing customizability within the dashboard may provide students with customizable navigation experience they desired from the study.

Secondly, students desired greater consistency within courses regarding navigation. Interview and survey participants noted that within one given course, some materials and assignments could differ in where they were housed within that course. For example, one course with three assignments, could possibly house those assignments in three different locations, rather than making their primary information available in one spot (i.e., an *assignments* page). This finding is similar to participants desiring greater design consistency between courses and their desire for a consolidated list of tasks. Although not quite the same, students' fundamental care from the study seemed to be that they wished to dedicate their mental energy to the course material, rather than struggling to navigate each course and remember different navigation methods for each course for which they are enrolled. Providing additional faculty training and templated course structures for faculty could help alleviate this concern.

Research Question 1C: How Do Students Feel About the Use of External Tools in Addition to their LMS, if they use them?

Students from the study largely did not mind using external tools as part of their learning experience. These types of tools could be integrated within their LMS or not, are often owned by a different third-party company, and could use single-sign-on (SSO) or require a different username and passcode. The consensus from these study participants was that using external tools was a neutral experience and, in some cases, expected. One interview participant likened using external tools to downloading multiple apps to stream TV shows and movies and described the experience as a normal part of life.

To that end, universities and instructors should consider using other EdTech tools and apps provided that they enhance learning and do not compromise student data. One

previous study found that students generally accepted giving away their learning data in exchange for using tools for learning (Ifenthaler & Schumacher, 2016). However, with the number of tools available, universities should use caution in how their students' data may be used and encourage faculty to select from a vetted list that they periodically reevaluate.

Research Question 2: How Do the Desired LMS Features, Functions, and Organization Differ between Students in Different Degree Programs and at Different Learning Levels?

Due to the small number of interview participants, I was unable to determine whether any trends or themes corresponded to different degree programs or different learner levels. Of those who did participate in the interview, only two different degree programs were represented, and all participants were enrolled in their second semester or later. In the future, I would like to repeat the interview portion of the study with a larger sample size to compare.

Research Question 3: How has the COVID-19 Pandemic Altered Expectations and Overall Satisfaction for Undergraduate Students Using Learning Management Systems?

Participants in the study overall felt similarly about their LMS both pre-COVID and during. I was unable to determine their feelings post-COVID as the pandemic was still ongoing at the time of the study. Some participants noted that COVID revealed one advantage, namely in that it forced all courses to use the LMS when they might not have been using it prior. One clear weakness that emerged from the study was participants noted that it was clear to them which instructors were unfamiliar with the LMS, and they

felt they needed more training. Similar to student feelings from instructor design for the LMS, the study showed that students would benefit if faculty had additional training on their LMS or if they were provided with general guidelines to follow.

Implications

The study has important implications for how colleges and universities in the United States use their learning management systems to support learning. The study adds to a growing body of research related to student satisfaction and student-driven design of the LMS. The study could add to a foundation of research and promote additional study regarding student design of their LMS and other learning tools. Additionally, the participant opinions and discussions lead to valuable data for institutions of higher education now. Below I outline some recommendations for administrators in higher education to consider as they evaluate their existing LMS or begin to select a new one.

Recommendations

Based on the results of this survey, I have extrapolated a few recommendations for administrators in higher education and LMS designers. First, designers should ensure that a student view exists from the faculty and administration perspective. While many LMSs likely already provide a student view, some student views might not expose all areas of the system. Based on the study, many students perceived that their instructors did not understand how the LMS worked and that they specifically did not have a good understanding of how the system worked from a student perspective. Allowing faculty complete insight into the student experience could assist instructors in designing their courses in a more learner-centered way, and help them provide their students with assistance when they need to.

Secondly, students perceive that faculty need a better understanding of the LMS overall. Study participants expressed some frustration around where and how content was placed within the system that negatively impacted their learning experiences. To improve their learners' experiences and allow them to better focus on learning, universities should consider providing more comprehensive and structured training approach for their teaching faculty. Given that faculty tend to teach and conduct research during the day, universities should choose any synchronous training times carefully. Additionally, many part-time faculty may have other obligations making it challenging to come to campus for a synchronous training. Instead, I recommend that universities focus on creating high-quality engaging enduring resources for instructional faculty to use initially and to return to on an as-needed basis. While LMS vendors might provide their own training, university-created training would benefit faculty and learners as it could incorporate university-specific details and philosophy, and include additional resources where they could find help.

With increased faculty training, colleges and universities should also consider creating guidelines or flexible templates for faculty to use. A templated approach could help improve the learner experience by providing a more consistent course approach between courses. This template should be carefully constructed with input from learners, instructors, administrators and from instructional designers who focus specifically on learning in higher education environments. Involving multiple stakeholders in the design of a course template or a small selection of course templates would help ensure that all aspects of learning for the system as a whole are represented. Additionally, creation of a template may provide busy faculty some relief as they plan their courses, allowing them

to focus more fully on constructing learning experiences, particularly if the templates could be automatically provided when courses are provisioned each semester. With these templates, universities should also consider curating a list of acceptable external tools. IT and instructional design professionals should evaluate these tools for any security concerns and learning support, respectively. Providing instructors with a list of vetted tools ensures that students have a consistent experience with a tool the university is familiar with and can support, and removes the onus from faculty to ensure that student data is not inappropriately used by the tool's vendor.

Providing faculty with additional training and with templates would come with additional costs to universities. Universities should not think of these tasks as completed only one time. Rather, a deep investment will need to be made with specialized staff who can assist faculty as needed, re-evaluate training materials, and create templates. This recommendation comes with a heavy administrative support need that cannot be ignored. These types of tasks might fall within teaching centers or dedicated instructional design units. Another challenge in this approach would be with faculty buy-in, especially at institutions where instructors are accustomed to high levels of academic autonomy. Determining how to implement this approach is beyond the scope of the study; however, it is one that should be approached with respect and sensitivity over the course of one or more years.

In addition to faculty development, students may also benefit from some training and development. One key thing piece of information the study revealed is that students may continue to hold instructor-centered learning belief. Universities might consider adding an introduction to learner-centered teaching and learning methods, perhaps as part

of their orientation. While students can be overloaded with information when they begin a degree program at a college or university, providing them some context for learner-centered teaching practices could help provide a foundation for expectations, and help shift their mindset toward these practices.

Finally, universities should select learning management systems that provide functionality that students find helpful. From the study, I learned that students value a consolidated dashboard of upcoming tasks and deadlines. While further study may be needed, universities could also consider possibly surfacing learning data to their students on this dashboard that could help better prepare them to be successful in their chosen degree program overall, rather than burying course grades in individual gradebooks or in other systems.

One interesting comment from an interview participant in the study was that he would have appreciated the learning management system integrating more with his chosen digital ecosystem. For example, being able to import the tasks and deadlines into an Apple, Google, or other popular calendaring tool. Many more students today use mobile devices, such as smartphones and tablets, and smart devices, such as a Nest or Alexa device. If students could import their LMS information into these digital ecosystems, they could leverage digital assistant tools. Incorporating LMS data into a personal digital ecosystem is beyond the scope of the study and may be an area for future study.

Reflections on the Study

In general, I believe the study surfaced important information about how higher education can better incorporate students as primary stakeholders in their learning with

respect to the design of their LMS. However, one large limitation of the study was the sample. Specifically, many more participants came from the science, technology, and healthcare degree category than any other degree category. While constructivist learning theory would posit that all degree programs have the same cognitive mechanisms for learning, this does not necessarily mean that they would use or favor the same tools. Multiple tools can accomplish the tasks of free recall and application practice, but one may be better suited toward one kind of specific activity than other. If I was to repeat the study, I would attempt to recruit more participants from other degree programs to have a more balanced study sample.

Another challenge with the sample size was the small size for the interviews. Despite attempting to recruit participants three different ways, students were reluctant to participate in interviews. At the end of the survey, participants could choose to opt into the interview, but none of the 45 participants chose to do so. Several potential participants responded to the social media recruitment via a private message. In some of these messages, these individuals would offer an isolated comment regarding something about their LMS that they either liked or disliked but would not respond to requests for explanation nor to participate in an interview. Because these comments were not part of the planned study design, I did not include them as part of the data set. However, due to the small sample size and the importance of the study, I would repeat the study with more interview participants if possible.

As an alternative, I might change the methodology of how I collected qualitative data. Since students were unwilling to participate in more traditional interviews, I could use a learner-centered approach and meet participants using their preferred tools. For

example, I could leverage existing social video-making apps, such as TikTok or Instagram, and ask potential participants to stitch the video with specific prompts. This method has drawbacks, however, students seemed more eager to provide quick isolated feedback, rather than dedicating 30 or more minutes at a time.

Another limitation with the study sample was the lack of demographic data. As part of the study, I asked participants to identify whether they were in their first semester, or if they were enrolled in their second semester or later, and to choose the closest category that represented their chosen field of study. However, upon further reflection, I feel it may have been more important to include additional information related to their personal background. A learner-centered teaching philosophy considers the student as a whole person with experiences outside the classroom that impact how they learn. If I repeated the study, I would incorporate more questions about student life experience, such as their gender identity, cultural background, and other factors.

The collection of demographic data was also imperfect. I attempted to use semester of enrollment as a proxy for learner level, rather than age. I felt that since students can choose to start an undergraduate degree at any age, that collecting their age would not have been a good measure of how previous learning experience impacted their experiences within their respective learning management systems. However, the metric for early learners compared to later learners did not take into account whether students were transfers or whether this was their first undergraduate degree.

Finally, some of the results of the study were surprising. Before collecting data, I had anticipated that students would have preferred more learner-centered tools and navigation approaches, such as a centralized instructor feedback location, or tools that

facilitated collaboration with their peers. One previous study (Gierdowski, 2019) had found that students desired more collaborative tools. I was surprised to find that no clear preferences for specific features or functions emerged from the survey information.

Areas for Future Study

One clear area for future study is with an expanded sample, especially with an intentionally diverse participant sample. Since the study examined learner preferences in the context of a learner-centered teaching philosophy, a future study should incorporate additional information about student identity. Panthee (2016) included students as citizen designers and found that many students perceived their LMS to have a mainstream White Western focus, and assumed the same of its users. Incorporating perceptions about students from a diverse range of cultural backgrounds will be important in applying findings to university populations across the United States.

Secondly, the study should be expanded to include alternative types of qualitative information. If the question is how students would like to design a learning management system, students should then have an opportunity to do so. To expand the study, I would recommend partnering with a UI/UX expert and together consulting with multiple students to create mockups using visual design software. We could then compare the designed mockups and analyze them for common trends and themes.

Conclusions

The study adds to a growing body of evidence that includes students as a key stakeholder in the tools used for their learning. The results of the study supported previous research that showed students are generally satisfied with the learning management systems that their universities provide for them. However, one of the

clearest conclusions is that instructor design of existing LMS features matters a great deal to students. Many students perceive that faculty need additional training for using the LMS to benefit learning and that a more consistent experience both within and between courses is important to their learning.

From the results of the study, I recommend that higher education institutions evaluate their existing instructor development and LMS maintenance to include a more structured approach to design, both across courses and disciplines and within courses. I propose a loosely structured template could accomplish this goal with an increase in specialized support staff. Additionally, the use of external tools can greatly enhance a learner's experience in the higher education space, and colleges should encourage their instructors to use them. However, the onus of ensuring data security and providing a streamlined experience is on administration. Colleges and universities should regularly vet external tools for information security and ensure there is a robust selection of supported tools for instructors to choose from.

Finally, researchers should continue to research by determining student opinions and perspectives on the designs of the tools they use to learn. Further research can establish recommendations for how best to incorporate learners into the design process, while still meeting the needs of multiple stakeholders. Additional research could also assist in applying these results more broadly nationally and globally.

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Appendix A: Interview Prompts

1. What features or functions do you appreciate the most within your LMS?
2. What do you dislike the most in your LMS? Why/tell me more?
    a. Optional follow-up: If you could, would you remove any features?
3. How would you feel about tools the LMS uses that are integrated, but might not be built-in? Do you think those tools would be better if they were part of the LMS itself? Why/why not?
    a. Optional follow-up: For example, Zoom is a tool not owned by your LMS, but it might integrate into it to make it easier to access from within the LMS. You might need a separate sign-in to use it.
    b. Optional follow-up: How do/would you feel if your coursework needed you to use additional tools outside of or beyond your LMS to be successful in class? What if they needed you to make another username and password?
4. If you were given an opportunity to redesign the dashboard (what you see when you first log in), exactly the way you like it so that it was the most useful for you, what would it look like?
5. If you were given an opportunity to reorganize how you navigate your LMS exactly the way you like, what would it look like?
    a. Optional follow-up: What are your thoughts about chunking navigation to feature or category, rather than by course, for example? Would this be useful in place of, or in addition to course-based navigation? Useful at all?
6. What other improvements would you make to your LMS?

    a. Optional follow-up: Why? What purpose would they serve?

7. How has your experience with your LMS changed since the COVID-19 pandemic? Is that change good, bad, neither? How?
8. Has the pandemic revealed any obvious strengths or weaknesses about your LMS for you?
9. Is there anything else you would like to tell me about your LMS?

Vitae

Erin P. Manott Morris

Colleges and Universities

2007-2011: Bachelor of Arts in Communication Sciences and Disorders, minor in French Language Studies from Saint Louis University; 2016-2016: Master of Arts in Education, emphasis in Higher Education from Lindenwood University; 2018-present: pursuing Doctorate of Education in Instructional Leadership with an emphasis in Higher Education (expected graduation date in December 2022) from Lindenwood University

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2021-present: Senior Education Specialist/Instructional Designer, and Manager, Instructional Design Studio, Washington University in St. Louis School of Medicine

2019-2020: Education Specialist/Instructional Designer, Washington University in St. Louis School of Medicine

2019-present: Keystone Weekly Staff Training Classes, Lead Instructor, Washington University in St. Louis School of Medicine

2018-2019: Guest lecturer for Designing and Delivering Continuing Pharmacy Education session and Student Privacy, Safety and Accommodations session at St. Louis College of Pharmacy at University of Health Sciences and Pharmacy

2016-2019: Coordinator for Academic Affairs and Postgraduate Education and Continuing Education Administrator, St. Louis College of Pharmacy at University of Health Sciences and Pharmacy

2014-2016: Administrative Assistant and Course Manager, St. Louis College of Pharmacy at University of Health Sciences and Pharmacy

Committees and Professional Service

2019-present: Member, Keystone LMS Project Team at Washington University in St. Louis School of Medicine

2021-present: Non-voting Member, MD Curriculum Build Committee at Washington University in St. Louis School of Medicine

2018-2019: Non-voting Member, Co-Curriculum Development Committee, St. Louis College of Pharmacy at University of Health Sciences and Pharmacy

2016-2019: Member, Continuing Professional Development Committee, St. Louis College of Pharmacy at University of Health Sciences and Pharmacy

2017-2019: Accreditation Field Reviewer, Accreditation Council for Pharmacy Education (ACPE)

2017-2019: Chair, Staff Council, University of Health Sciences and Pharmacy

Publications, Presentations, and Contributions

Morris, E.P.M., Dufault, C., Thompson, E. W., Crustals, J., & Sullivan, M. (2020, September 30) *Training staff to use Elentra: the Exposure to train model* [Conference session]. Elentra Engage 2021 Conference. https://conference.elentra.org/

Morris, E.P.M., Dufault, C. [2020, September 29—October 1] C*reating a course calendar model for an integrated pre-clerkship curriculum* [Conference session] Elentra Engage 2021 Conference. https://conference.elentra.org/

Dufault, C., Thompson, E. W., **Morris, E.P.M.**, Crustals, J., & Fariborz, M. (2020, September 30) *How it started/How it's going: An Overview of our year 1 Elentra*

launch [Conference session]. Elentra Engage 2021 Conference. https://conference.elentra.org/

Nasser Jr., R.M., & **Morris, E.P. M.** (2019). Whose side are you on? In M. Benjamin & J. Jessup-Anger (Eds), *Maybe I should…: Case Studies on Ethics for Student Affairs Professionals*. Lanham, MD: Lexington Books.

Awards

2020 Spellman Graduate Award in Education, Lindenwood University