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**ONLINE LEARNING IN GRADUATE HEALTH PROGRAMS: ANDRAGOGY,  
LECTURE PREFERENCE, AND THE EFFECTIVENESS OF SYNCHRONOUS AND  
ASYNCHRONOUS PARTICIPATION**

By

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A Dissertation Submitted in Partial Fulfillment of  
Requirements for the Degree of Doctor of Philosophy

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Department of Public Health and Health Sciences

Health Sciences Program  
In the Graduate School  
The University of South Dakota  
December 2021

The members of the Committee appointed to examine  
the Dissertation of Adam Ladwig  
find it satisfactory and recommend that it be accepted.

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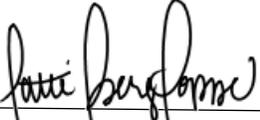
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## Abstract

Accelerated by the COVID-19 pandemic, graduate health programs have undertaken greater utilization of online learning, employing synchronous and asynchronous online lectures as a replacement for traditional face-to-face instruction. Although supported in previous literature as a method at least equally effective to traditional learning, online learning has been a source of frustration for students and instructors expecting face-to-face instruction. This dissertation project seeks to explore (1) the ways in which principles of andragogy have been implemented in graduate health programs in response to the COVID-19 pandemic, (2) the factors that contribute to preference for online method of lecture participation (synchronous or asynchronous) among graduate health students, and (3) if one method of online lecture participation (synchronous or asynchronous) is superior for students enrolled in traditional style graduate health programs and if it is in the student's best academic interest to choose, based on preference, between synchronous and asynchronous lecture. This project includes a review of literature, a survey, and a post-test only quasi-experimental design to explore the preferences and performance of physical and occupational therapy students enrolled in graduate programs at a Midwestern university.

Dissertation Advisor



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Dr. Patti Berg-Poppe

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Go Yotes.

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## **Chapter One: Introduction**

This dissertation project explores the application of online learning for professional students enrolled in traditional graduate health programs. The first study details the ways in which principles of andragogy have been utilized during online learning across graduate health programs in response to the COVID-19 crisis. The second study assesses how factors such as self-efficacy, time management, and peer learning impact preference for synchronous or asynchronous online lecture participation among graduate health students. Finally, application of online approaches both matched and mismatched to student preferences are applied to determine if compatibility of lecture preference affect examination performance. Efficacy of synchronous versus asynchronous participation is also assessed. This introductory chapter describes the current educational context which serves as motivation for development of this project and covers background information pertaining to principles of online learning.

### **Background**

Existing as a catalyst for technological advancement within higher education, COVID-19 has forever changed the educational landscape. The exponential and necessary growth in online educational methods made in response to COVID-19 safety concerns means that nearly every student has had some experience with online learning. Online education is no longer an alternative modality, but, rather, an expectation and a reality that has allowed education to continue through an extended crisis (Dhawan, 2020). While a partial return to face-to-face learning has occurred for many, educators are maintaining elements of online learning, utilizing new skills in synchronous and asynchronous delivery of content. What is unclear is the best practice guidelines for successfully transitioning traditional graduate health students from face-to-face to online learning.

### *A Brief History of Online Learning*

Originally developed to overcome challenges with proximity to educational resources, distance learning offered a solution to students and teachers who were separated in terms of space, time, or both (M. G. Moore & Kearsley, 2004). The term distance learning, originally synonymous with correspondence education, evolved to include more modern terms such as e-learning, web-based learning, and online learning (J. L. Moore, Dickson-Deane, & Galyen, 2011). Ambiguity exists in the literature regarding the precise definitions and differentiation between terms. At a minimum, there is general consensus that distance learning “occurs between two parties (a learner and an instructor), is held at different times and/or places, and uses varying forms of instructional materials” (J. L. Moore et al., 2011, p. 130). Some view the term “distance learning” as outdated (J. L. Moore et al., 2011), and the more broad term of “online learning” has gained more traction. This project will define “online learning” as learning that utilizes technology to deliver educational material to students. Material delivered online in real-time between student and instructor will be described as synchronous, while that produced by the instructor and consumed by the student at a later time will be referred to as asynchronous.

Differences in the current delivery of online learning are vast, ranging from completely asynchronous provision of written or prerecorded lectures to synchronously scheduled class times. Platforms such as Zoom® or Google Meet® allow for synchronous video interaction between teachers and students. Use of these web-based platforms have multiplied in the past year, and new technology continues to be developed to facilitate these interactions. Prior to the COVID-19 pandemic, tools for online learning were available but were often not fully utilized. The online meeting software Zoom® experienced utilization growth from 10 million daily meeting participants in December 2019 to 300 million daily meeting participants in April of

2020, a nearly 3000% increase (Kastrenakes, 2020). As the dangers of the current pandemic recede and in-person instruction resumes, experts suggest that online learning is now here to stay (Afshan & Ahmed, 2020). The new ability to engage in online instruction and learning with greater ease will mean that even in-person courses are likely to incorporate these methods at least to a degree (Afshan & Ahmed, 2020).

### **Definition of Terms**

1. **Synchronous lecture participation.** Synchronous participation is achieved when participants are “connected to the environment at the same time in a real-time interaction” (Costa, Souza, Valentim, & Castro, 2020, p.136). Real-time communication allows for student-student and student-instructor interaction. Participation in the lecture occurs remotely at an assigned lecture time. Students are encouraged to ask questions and interact as they desire.
2. **Asynchronous lecture participation.** Asynchronous participation is achieved when participants’ physical presence is not required “and they are able to communicate without the limitations imposed by time” (Costa et al., 2020, p. 136). Asynchronous participation typically includes watching the previously recorded lecture at a time determined by the student. No interaction between the participating student and instructor is available, however, the student can observe interaction between other students and the instructor occurring during the recorded session.

### **Research Stance and Statement of Research Agenda**

The conceptual framework for this dissertation study stems from the belief that learning can be optimized, and educators should employ evidence-informed strategies to maximize the effectiveness of learning for their students (Merriam & Bierema, 2014). The principles of

andragogy have shaped curricular development across the higher education landscape (Fink, 2013; Knowles, Holton, & Swanson, 2014; Merriam & Bierema, 2014). Concepts of andragogy, initially introduced by Malcolm Knowles, established the understanding that adults learn differently than children (Knowles et al., 2014). Effective learning in adults is predicated on six core learning principles (Knowles et al., 2014). In summary, adults:

1. need to know why they need to learn something.
2. should be given opportunities for self-direction.
3. tend to connect new learning to past experience.
4. need to be in a state of readiness to learn.
5. learn best when real-life application is possible.
6. respond best to internal motivation.

For many years, adult learning was neglected (Knowles et al., 2014), and often, these principles are still ignored. Acceptable methods of teaching adults resembled pedagogical approaches, placing the instructor at the center of the process. There was no differentiation between teaching adults and children. Andragogy transforms this design, focusing attention on the student. With this shift comes a degree of responsibility and self-direction on the part of the student, concepts which are reasonable expectations for adult learners. Across higher education, efforts have been made to transform teaching from a teacher-centered to a learner-centered design (Knowles et al., 2014). Some of these efforts have included use of technology and online learning to increase accessibility, flexibility, and autonomy of learning.

Within graduate health education, many programs have adopted hybrid-style instruction, blending mostly independent online learning with less frequent but intensive face-to-face sessions spaced throughout the academic year (Blackinton, 2013). This delivery style appears to

work well for students with a high degree of self-direction, likely possessing other life commitments that are less compatible with the face-to-face expectations required of most traditional graduate health programs. It is unclear if students enrolled in traditional graduate programs, having elected a face-to-face delivery method, have similar learning preferences or qualities as those enrolled in hybrid programs.

What started as a response to a global pandemic is now being employed as a long-term answer to the financial, time, and space constraints well-known to conventional face-to-face education (Afshan & Ahmed, 2020). It must be acknowledged that not all online learning is equal (Gagnon et al., 2020). Haphazard shifting of face-to-face content to online format does not foster effective learning. Learning online is different than face-to-face, with increased degree of transactional distance (Moore, 1997) and potential limitations in learning communities (Garrison, Anderson, & Archer, 2000). Considerations must be made to optimize learning, whether in the classroom or online. These considerations are best made after acknowledging the challenges and concepts unique to online learning.

### ***Transactional Distance Theory***

Transactional distance, as originally described by Moore (1997) refers to the psychological and relational space naturally present between the teacher and the students. The degree of space between the parties is dependent on three factors: structure, dialog, and autonomy (M. Moore, 1997). As autonomy increases within a course, so does the sense of transactional distance. Conversely, an increase in dialog or interaction between teacher and students leads to a reduction in transactional distance (M. Moore, 1997). Teachers are well-advised to structure online learning to reduce the degree of transactional distance felt by students.

### ***Community of Inquiry Model***

Expanded on by Garrison, Anderson, and Archer (2000), the concept of Community of Inquiry (CoI) in online learning refers to the qualities of an effective educational experience, which center on three elements: social presence, cognitive presence, and teaching presence. Essentially, learning should occur through a community of actors in collaboration, sharing, interactions, relationships, respect and trust (Kilis & Yildirim, 2018). Threats to learning occur with a poorly established CoI, such as an online learning environment failing to attend to concepts of social or cognitive presence or visual presence of a teacher. Gaining attention with the advent of online discussion boards, CoI pertains to the benefit of interaction among learners and between the learner and the teacher. With further development of educational technology, CoI is now relevant to the concept of synchronous and asynchronous methods of online learning (Kilis & Yildirim, 2018).

### ***Flexibility of Learning***

The accommodations instituted during the COVID-19 pandemic lead to a realization of the convenience and flexibility germane to online learning. In the spring of 2020, face-to-face learning expectations were suddenly reduced, as students had options, and even requirements, to participate online. As content was quickly shifted online, it is unclear the role andragogy played in decision-making for instructors, crafting adult learning experiences in a potentially unfamiliar online medium. For many health programs (Chen, Kaczmarek, & Ohyama, 2020; Dhawan, 2020; Guo, 2020), the method of participation was decided by student preference, assuming students would select the method which best supported their learning. While not always consciously realized, this decision is based on the belief that students understand how they best learn and that they make decisions in accordance with that understanding. In other programs, the method of

online instruction was dictated by the instructor's preference or understanding of available technology. With either approach, the methods employed were often chosen hurriedly with little time to determine optimal methods.

### **Statement of the Problem**

While hybrid or online graduate health programs have demonstrated success with implementation of online content (Adams, 2013; Blackinton, 2013), the effectiveness of traditional programs' transition to online format in response to COVID-19 is unclear. Simply shifting face-to-face content online because it is possible does not uphold the critical principles of andragogy. If traditional health programs intend to integrate online-learning experiences in a more permanent fashion it will be important to address the motivation, needs and preferences of these students while continually addressing the impact of such changes. Students who enrolled in a traditional face-to-face program now have the flexibility and convenience of online learning, though many had not planned for this shift and some may see it as a burden. In assessing student perception of learning effectiveness and burnout at Harvard School of Dental Medicine, Chen, Kaczmarek, and Ohyama (2020) reported 44% of students stated learning "somewhat worsened" and 26% of students reported learning "significantly worsened" following transition to online learning during COVID-19. Perception of burnout also increased following transition to online learning, utilizing synchronous and asynchronous online lectures (E. Chen et al., 2020). More research is needed to determine optimal methods of online learning in graduate health programs, respecting principles of andragogy, recognizing factors contributing to student preference, and exploring effectiveness of implemented methods.

## **Research Questions**

1. In response to the COVID-19 crisis, have graduate health programs implemented online learning strategies consistent with the principles of andragogy?
2. What factors influence students' preference for synchronous or asynchronous online lecture participation?
3. Does matching or mismatching method of participation (synchronous or asynchronous) with stated lecture preference impact performance on a multiple-choice examination?
4. Does one method of participation (synchronous or asynchronous) result in superior outcomes as measured on a multiple-choice examination?

## **Purpose of the Study**

This dissertation project sought to explore (1) the ways in which principles of andragogy have been implemented in graduate health programs in response to the COVID-19 pandemic, (2) the factors that contribute to preference for online method of participation (synchronous or asynchronous) among graduate health students, and (3) if one method of online participation (synchronous or asynchronous) is superior for students enrolled in traditional style graduate health programs and if it is in the student's best academic interest to choose, based on preference, between synchronous and asynchronous learning.

## **Summary of the Three Related Research Studies**

This dissertation project consisted of three phases as described in the following three studies.

***Research Study One: Andragogy in Graduate Health Programs During the COVID-19 Pandemic***

The first research study consisted of a critical review of the literature regarding online teaching strategies that have been implemented by graduate health programs since transitioning to online learning due to COVID-19. The principles of andragogy were explored within the context of online delivery during the COVID-19 pandemic. This review sought to reveal the current attention given to andragogy as online learning strategies grow. The findings are detailed in article one.

***Research Study Two: Assessing Factors that Influence Graduate Health Students' Preference for Synchronous or Asynchronous Online Lecture Participation***

The second phase of this dissertation study included a cross-sectional survey to examine factors that influence graduate health students' learning preference. Students' motivation for preferring certain online learning strategies were assessed using the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991). Students were asked to indicate the extent to which convenience is a factor in their preference for synchronous or asynchronous online learning. Scores from the questionnaire were analyzed in relation to self-reported online learning preference. This study provided critical information on student factors that appear to impact their online learning preference. These findings are detailed in article two. The reported online learning preference of each participant, gained from this phase of the project, shaped participant group assignment for the next phase.

### ***Research Study Three: Assessing the Impact of Online Lecture Participation Method and Student Preference on Examination Performance***

The third phase of this dissertation study was conducted using a quasi-experimental design, in which the main effect of preferences for synchronous versus asynchronous online lecture participation on multiple-choice examination scores were investigated. Groups consisted of matched and mismatched students according to stated online lecture participation preference and method of delivery (synchronous or asynchronous) for the provided learning experience. This study provided insight into the impact of matching student learning preference to online instructional method. These findings are detailed in article three.

#### **Significance**

Educators strive to provide the best education possible for their students. Education has never been more flexible but frameworks and best practice guidelines need to be established to respect the needs of adult learners and ensure that educational outcomes are not sacrificed for the sake of convenience. By understanding the accuracy with which students self-select effective online learning methods, instructors can be more confident in the degree of flexibility they afford to graduate health students. This topic is particularly timely as more programs embrace available online teaching tools.

## **Chapter Two: Paper One**

### **Andragogy in graduate health programs during the COVID-19 pandemic**

#### **Abstract**

Accelerated by the COVID-19 pandemic, graduate health programs have undertaken greater utilization of online learning, utilizing synchronous and asynchronous online lectures as a replacement for traditional face-to-face instruction. Although supported in previous literature as a method at least equally effective to traditional learning, online learning has been a source of frustration for students and instructors expecting face-to-face instruction. Effective adult education, in a traditional or online setting, necessitates accommodation for the unique needs of adult learners. Additionally, when transitioning content from face-to-face style of delivery to online delivery, the intricacies of the online medium must be addressed. This article seeks to explore the ways in which principles of andragogy have been implemented in graduate health programs in response to the COVID-19 pandemic.

## Introduction

Online learning in graduate health programs has increasingly been considered a method at least equally as effective as traditional learning (Cook et al., 2008; Lima et al., 2019; McCall, Spencer, Owen, Roberts, & Heneghan, 2018; McCutcheon, Lohan, Traynor, & Martin, 2015; Pei & Wu, 2019), offering benefits in cost, accessibility, flexibility, and autonomy (Nguyen, 2015). While a portion of studies has demonstrated effectiveness of online learning amidst the COVID-19 pandemic (Hong, Olson-Kellogg, North, Davis, & Staker, 2020; Rad, Otaki, Baqain, Zary, & Al-Halabi, 2021; Rosenthal et al., 2021; Rüllmann et al., 2020), many students are dissatisfied with the quality of the experience (Abbasi, Ayoob, Malik, & Memon, 2020; Aziz et al., 2020; Garris & Fleck, 2020; Loda, Löffler, Erschens, Zipfel, & Herrmann-Werner, 2020; Singal, Bansal, Chaudhary, Singh, & Patra, 2020; Weber & Ahn, 2021; Wu & Zeshan, 2020).

Graduate health programs have a responsibility to craft online learning experiences that meet the unique needs of adult learners while also anticipating and circumventing potential pitfalls commonly encountered with a virtual learning environment. The assumptions of andragogy, as introduced by Malcolm Knowles (1970), offer a conceptual framework for instructors designing learning experiences for adult learners. Additionally, concerted efforts to reduce transactional distance (TD) (M. Moore, 1997) and promote a Community of Inquiry (CoI) (Garrison, Anderson, & Archer, 2000) increase the likelihood for successful application of online learning. This study seeks to evaluate each andragogical assumption in the context of online learning during the COVID-19 pandemic, utilizing the available body of literature to assess ways in which each principle has been fulfilled or neglected by graduate health programs. Additionally, factors influencing quality of the learning experience such as TD and CoI are evaluated.

## **The Status of Online Learning in Graduate Health Programs**

The COVID-19 pandemic brought with it a surge of interest in student outcomes related to online learning. As professional programs moved to this delivery method en masse, student curriculums were migrated to learning platforms that quickly substituted for face-to-face educational interactions. Instructional delivery modes pivoted quickly, and the technological capacity of instructors who may have limited experience with applications that enhance student online learning was pushed to its limits. With this impromptu shift in professional programs across the United States, research questions of interest to student learning outcomes took a new turn. Increasingly, the literature from the pandemic period reported negative outcomes related to student engagement and educational quality delivered through the online experience (Abbasi et al., 2020; Aziz et al., 2020; Garris & Fleck, 2020; Loda et al., 2020; Singal et al., 2020; Weber & Ahn, 2021; Wu & Zeshan, 2020). Widespread perception of an inferior educational product has resulted in students filing lawsuits against their universities, seeking partial refunds for classes that were shifted from face-to-face to online instruction, claiming “the quality of [online] instruction is far below the classroom experience” (Binkley, 2020, p.1).

There appear to be vast differences in research quality within this body of literature, making transferability of findings difficult. Some authors report successful implementation of online learning yet offer no details of methods or experience. In a letter published in the *Indian Journal of Pediatrics*, the authors describe successful implementation of online learning in medical education, occurring via a 12-day online teaching session utilizing the free version of Zoom® (Agarwal & Kaushik, 2020). Data obtained from a survey of 77 respondents revealed 97% of students felt the sessions met their learning needs for clinical practice and 99% reported sessions were “interesting and enjoyable.” These positive outcomes are listed without any details

of session structure, student interaction, mechanism of assessment, length of sessions, disclosure of survey questions, or description of instructor background or training. Despite the lack of research transparency, the authors conclude “online teaching is feasible, cheap and must be made a part of the postgraduate training in India beyond the prevailing lockdown” (Agarwal & Kaushik, 2020, pp., p. 1). Affirming statements such as this promote further adoption and implementation of online learning, regardless of instructor aptitude or course design methodology.

There is danger in generalizing online learning as unequivocally “good.” Just as face-to-face learning resides across a wide range of effectiveness, so does online learning. Effective implementation of any instruction requires intentional and thorough planning. In gauging the amount of time required by a single instructor to adequately transition a face-to-face class to online, Gutruf, Utzinger, and Subbian (2020) estimated 80 hours of work was required. The unplanned shift to online learning in response to COVID-19 likely did not allow adequate time for course revisions, instructor training, learning system development, resource allocation, or establishment of proper IT support. It is likely that many changes occurred out of necessity, with decisions driven by practicality, expediency and health concerns rather than the educational needs of each student.

### **Online Learning is Here to Stay**

As faculty and departments have developed technological proficiency to meet the demands of online coursework during the COVID-19 pandemic, the future role of online learning in higher education is starting to become clear. Online learning is here to stay. Based on evidence accumulated before the COVID-19 pandemic (Cook et al., 2008; Lima et al., 2019; McCall, Spencer, Owen, Roberts, & Heneghan, 2018; McCutcheon, Lohan, Traynor, & Martin,

2015; Pei & Wu, 2019), there is strong justification for instituting greater levels of online learning across all health profession disciplines. This evidence, however, is largely based on programs and faculty that have made concerted and deliberate efforts to ensure that the quality of the online experience is equal, if not superior, to traditional learning.

Familiarity of traditional teaching does not guarantee success with a novel online medium. Online teaching is different. Instructors and programs, reacting to an unexpected pandemic, made commendable advancements to achieve at least minimum proficiency required for shifting content online. This allowed education to continue. Nevertheless, there is danger in contentment with the current quality of the online experience. As the work involved in transitioning a face-to-face class to an online format is generally frontloaded, instructors may be tempted to proceed with the same methods established during the COVID-19 pandemic, irrespective of effectiveness. Instructors should not shy away from online delivery. However, moving forward, care must be taken to ensure a quality online experience. If not, the literature is likely to remain cloudy concerning online learning. A course correction for online learning can occur by reflecting on the assumptions of andragogy and designing educational experiences that account for potential constraints to online learning.

### **Bringing Andragogy to Online Learning**

The andragogical model (Knowles, Holton, & Swanson, 2014) is based on six assumptions about adult learners. Simply stated, adults:

1. need to know why they need to learn something (Need to Know).
2. should be given opportunities for self-direction (Self-Directedness).
3. tend to connect new learning to prior experience (Experience).
4. need to be in a state of readiness to learn (Readiness to Learn).

5. learn best when real-life application is possible (Problem-Based).
6. respond best to internal motivation (Motivation).

Effective instructional strategies can be achieved in both the traditional setting (Merriam & Bierema, 2014) and online medium (Decelle, 2016; Muirhead, 2007) when the educator is attentive to the assumptions of adult learners. By illuminating the importance of the subject matter, providing opportunities for engagement, creating a scaffold to synthesize the new information with prior knowledge, and challenging students to utilize new information to solve practical problems, internal motivation is elevated and learning occurs (Knowles et al., 2014). While the principles of andragogy apply equally to traditional and online learning, the mechanisms by which they are achieved are different due to underlying differences between the classroom and the distance platform (Garrison et al., 2000; M. Moore, 1997). Attention must be given to a variety of factors innate to online education likely to impact student perception and academic outcomes.

Although Knowle's concept of andragogy provides a theoretical foundation for adult learning, there is less clarity in adapting his assumptions to practical teaching methods. The creation of educational experiences satisfying andragogical assumptions includes recognition of principles rather than prescription of definitive methods. Furthermore, the online medium adds another layer of difficulty for transference of andragogical principles.

### **Additional Factors Impacting Online Experience**

#### ***Transactional Distance***

Transactional distance has received additional attention (Bozkurt et al., 2020; Chen et al., 2020; Karakaya, 2020) since the onset of COVID-19, as instructors seek reasons for disengaged students or poor student outcomes. Transactional Distance Theory (TDT), as conceived by

Michael G. Moore (1997) describes the psychological space between instructor and student, impacted by three factors: dialogue, structure, and autonomy. The theory defines constructs that help educators better understand the engagement implications of their instructional design decisions and offers a mechanism for gauging the psychological gap between students and instructors.

While not exclusive to online learning, TD is most commonly encountered in virtual learning environments, lacking face-to-face communication. Instructors seeking to reduce TD must promote dialogue with students. Successful interaction stems from quality of dialogue, rather than quantity (M. Moore, 1997). Structure, in Moore's definition, refers to rigidity of the course design. A course high in structure may offer less opportunity for instructors to individualize course direction to meet the needs of students. As rigidity of structure increases, student interaction decreases, and TD increases (M. G. Moore & Kearsley, 2004). On the other end of the spectrum, course design lacking structure may lead to student dissatisfaction and confusion (Falloon, 2011). Finally, autonomy overlaps with Knowle's andragogical assumptions, recognizing that self-direction leads to positive learning experiences. The right amount of autonomy must be prescribed, however. Too little autonomy can lead to student frustration while too much autonomy increases perception of TD (M. Moore, 1997).

### ***Community of Inquiry***

Another strategy proposed to create effective online educational experience, recognizing the social and interactive nature of learning, is Community of Inquiry (CoI). Community of Inquiry refers to the collaboration among learners in social presence, cognitive presence, and teaching presence to create effective online educational experiences (Garrison et al., 2000). Although initially developed as a method for analyzing asynchronous online interaction, the

concepts of CoI seamlessly apply to synchronous online interaction (Garrison et al., 2000). Social presence includes factors of student expression and group cohesion. Garrison (2020) encourages low-stress small group interaction that occurs slowly throughout the course. He cautions against large-group forced interaction on the first day. Cognitive presence pertains to intellectually stimulating content which requires exploration and integration of key course concepts. Teaching presence refers to design, facilitation, and physical instruction (Akyol & Garrison, 2008). Garrison (2020) stresses the third factor is “teaching” presence, rather than “teacher” presence. Teaching presence in an online environment refers to the skill by which a teacher can facilitate enriching discussion. Garrison warns that too much guidance can lead to a shutting down of student discourse. When properly done, facilitation encourages students to take ownership of their learning (Garrison, 2020). Whether through synchronous or asynchronous technology, facilitating CoI promotes time for absorbing basic course principles and reserves interaction for discussion of these elements. Garrison promotes collaboration over interaction (Garrison, 2020).

Cited by over 6600 sources on Google Scholar, Garrison, Anderson, and Archer’s original publication (2000) detailing CoI makes it one of the most prominent online learning theories in higher education. Community of Inquiry accounts for the value of interaction and collaboration in online education, a concept missing from many studies since the arrival of the COVID-19 pandemic. Studies of CoI also complement TDT analyses, which have been criticized for failing to address collaboration and community (Wicks & Sallee, 2011)

Triangulation of TDT, CoI, and the assumptions of andragogy offer a comprehensive assessment of current practice as described in literature published since the arrival of the

COVID-19 pandemic. Educational techniques both satisfying and neglecting the individual assumptions of andragogy will be assessed through the lenses of TDT and CoI.

### **The Six Assumptions of Andragogy in Current Literature**

#### ***Need to Know***

Adults learn best when they understand the *why*, *what*, and *how* of the subject matter (Knowles et al., 2014). For graduate students in health programs, this includes understanding the clinical application of new knowledge. Removed from clinical context, material is more difficult to learn and abstract in understanding. A study by Rosenthal et al. (2021) illustrates educational changes in response to the COVID-19 pandemic which satisfy andragogical principles while also accounting for TDT and CoI factors. To accommodate the disruption to face-to-face learning for medical students at the Icahn School of Medicine at Mount Sinai in New York City, fourth-year medical students, under the supervision of a faculty mentor, created online learning sessions in emergency medicine (Rosenthal et al., 2021). Each session included pre-lecture assignments featuring a variety of multimedia resources, a short didactic lecture, and a case-based discussion. Interaction was assured utilizing cold-calling (involuntary participation by calling on students), solicited comments, chat function, polling software, and utilization of the “hand raise” feature of the video conference platform (Rosenthal et al., 2021). Sessions were 60-90 minutes in length and occurred twice each week for two weeks. Pre- and post-course assessment of learning objectives revealed statistically significant improvement in self-assessed learning across all objectives. Additionally, student participants favored group interaction and volunteer responses, while expressing discomfort with cold-calling. This is consistent with prior research pertaining to forced participation (Wlodkowski, 2008). Notably, more passive participation techniques, such

as the “hand raise” function were deemed less engaging and non-impactful to learning (Rosenthal et al., 2021).

The Rosenthal et al. study (2021) utilized methods which are supported in andragogical theory, implementing learning experiences rich in context, relevance, and application. The students ranked clinical scenarios (32 responses) and real-life examples (28 examples) as the most useful parts of the class. Components of the class not directly applicable to clinical application garnered less support, and included: reviewing physiology (7 responses), completing pre-reading assignments (5 responses), and completing the homework assignments (0 responses).

Building upon this andragogical perspective, the study can be assessed through TDT and CoI lenses. From a TDT perspective, dialogue between instructors and students was achieved using a variety of techniques. Scheduled synchronous sessions promoted minimal autonomy; however, course structure allowed for participant feedback and participation. Presumably, these tactics promoted a reduction in perception of transactional distance. From a CoI perspective, social presence was achieved with group interaction. Not all interaction was deemed beneficial, as negative perceptions occurred with cold-calling techniques. Cognitive presence was promoted with use of case-based discussions on clinical topics. The authors’ attention to teaching presence is noted, with instructors serving as discussion facilitators, soliciting comments from students. Overall, a CoI was established through achievement of social, cognitive, and teaching presence.

### ***Self-Directedness***

The principle of self-directed learning (SDL) as it relates to andragogy includes the central tenet that adults learn best in an autonomous environment (Conaway & Zorn Arnold, 2015). This is not to say that adults always learn best independently, but, rather, the ability to choose different learning strategies is what is most important (Knowles et al., 2014). As the

amount of desired self-direction varies between learners and by subject matter, course instructors need to structure courses to accommodate all degrees of self-direction. As explained in *The Adult Learner*:

a learner who is experienced with the subject matter and has strong learning skills will likely be frustrated in highly controlled learning situations. Conversely, a learner who is inexperienced with the subject and has poorly developed SDL skills will likely be intimidated, at least initially, in highly SDL situations. (Knowles et al., 2014, p. p. 172)

This variability explains why a reduction in teacher direction and an increase in learner expectation does not automatically translate to improved outcomes via principles of SDL. Self-direction in online learning should be fluid, allowing instructors to modify activities to assess higher-order processing and synthesis, rather than simply divulging the content and asking students to regurgitate the facts (Mahlaba, 2020). When done correctly, instructors motivate their students to take ownership of the material, self-assess their learning, and make goals for improvement.

Instructors (n = 125) within medical and dental programs throughout Pakistan were surveyed as part of a study (Aziz et al., 2020) investigating the impact of COVID-19 on medical education, following a shift to online learning. The majority of instructors (52.8%) rated the online teaching ineffective. Online instruction consisted of “short didactic lectures with no interaction” (Aziz et al., 2020, p. 183). Sessions lacked common aspects of face-to-face class such as student interaction, psychomotor skills, or simulation. Instructors complained of robotic delivery of content, lacking physical interaction and eye contact. There was uncertainty regarding student comprehension, with instructors reporting ambiguity in determination of whether learning objectives had been met. The authors offered these findings alongside

contrasting evidence in the literature, citing a prior study which found online learning useful in promoting student self-direction, depth of discussion, and quality of outcomes (Akbar, Rizal, Tiara, Islami, & Hartanto, 2020). Notably, the referenced study (Akbar et al., 2020) described online learning as a complement to face-to-face learning, allowing for remedial work or enrichment, which improved communication between students and instructors. The authors of the cited study (Akbar et al., 2020) noted the benefit of promoting student self-directedness, as students are not constrained by the limitations of individual teacher attention (Akbar et al., 2020). These studies offer contrasting methods of online learning methodology: the first method involves haphazard shifting of content online, absent any interaction or experience, the second method uses online learning to promote student self-directedness, utilizing online medium to enhance the learning experience.

From TDT and CoI perspectives, removal of peer interaction and reduction in instructor-student dialog negatively impacted learning. Comprehension of learning outcomes was difficult to assess secondary to lack of student-instructor feedback. While online learning afforded increased student flexibility or convenience, rigidity of structure, making no attempt for modification of coursework to meet student needs, resulted in widening of TD. Moreover, the lack of social, cognitive, or teaching presence prevented any sense of community of inquiry from developing, as students independently completed coursework.

### ***Experience***

Existing as a major difference between educating children and adults, adults possess a deep and diverse history of experiences (Knowles et al., 2014). This experience can be harnessed, shared, and used in collaboration to promote learning. Two recent studies offer superb examples how andragogical assumption of experience can be applied. These methods stand in

stark contrast to previously described methods which haphazardly shifted content online, removing any sense of collaboration or reflection.

An article by Rullman et al (2020) describes implementation of a virtual auscultation course for medical students in Germany. The COVID-19 pandemic necessitated a transition of face-to-face content to online format. The authors utilized pre-recorded auscultation sounds delivered during a synchronous video chat. Notably, this format was selected as “it most closely resembles the interactive character of face-to-face teaching”(Rüllmann et al., 2020, p. 1). Survey of student perception (n = 64) revealed report of student satisfaction and self-appraisal of comprehension as “good.” The structure of the two-hour online session included 6-7 student participants, exploration of clinical cases, virtual auscultation of corresponding heart sounds, synchronous discussion of sound characteristics and diagnosis, analysis of sound, and synchronous discussion of diagnosis and therapeutic intervention (Rüllmann et al., 2020). Students relied on prior experience and knowledge of diagnoses to build a conceptual understanding of auscultation and subsequently collaborate to determine proper therapeutic management. Participants “recommended that the course be established in the regular curriculum” (Rüllmann et al., 2020, p. 3).

At Hamdan Bin Mohammed College of Dental Medicine in Dubai (Rad et al., 2021), successful transition to online learning occurred following mandated instructor training in distance learning and the inclusion of additional online synchronous Case-Based Discussion (CBD) sessions. The case study sessions engaged the graduate learners “in specific clinical skills including diagnosis, decision-making, and treatment planning, by encouraging critical thinking and providing constructive multi-stream dialogue between the learners and instructors” (Rad et al., 2021, p. 4). Student collaboration and sharing of clinical perspectives served as the primary

driving forces to promote learning. A survey of student (n = 53) and faculty (n = 18) perception of the sudden transition to distance learning revealed satisfaction among both student and faculty groups. Responding to the statement “Overall, I was satisfied with the distance learning,” student mean Likert-score (4 = Agree, 5 = Strongly Agree) was 4.02 while faculty Likert-score was 4.50 (Rad et al., 2021). To combat the common complaint of shorter student attention spans during online learning, many lectures were shortened, and activities were introduced to encourage group interaction (Rad et al., 2021). Notably, instructor training in distance learning occurred prior to implementation of the online teaching method.

From an andragogical perspective, these articles emphasize a commitment to collaboration, with students analyzing clinical cases, sharing perspectives, and relating the findings to clinical application. From TDT perspective, use of small-group discussion promoted dialogue between students and instructors. The Rad et al. article also described flexible course design, with instructors shortening sessions in response to awareness of dwindling student attention span with online learning. High dialogue and flexible structure increased likelihood for a reduction in transactional distance. Regarding CoI, social presence was achieved with positive group interaction promoting “multi-stream dialogue between learners and instructors” (Rad et al., 2021, p. 4). Clinical scenarios reinforced cognitive presence while teaching presence served to facilitate discussion regarding appropriate therapeutic intervention.

### ***Readiness to Learn***

Consistent with Maslow’s Hierarchy of Needs (Maslow, 1967), foundational needs must be met for online learners before learning can be achieved. These include appropriate access to technology, internet access, and emotional and physical readiness for learning. The COVID-19 pandemic has undoubtedly worsened student access to educational resources.

A recent systematic review (Rasheed, Kamsin, & Abdullah, 2020) highlighted the challenges of the online component of blended learning. Technological illiteracy serves as the greatest threat to effective instruction for teachers. Instructors must be “technologically competent, to effectively use and manage technology for teaching, and also to create and upload learning materials to students (e.g. creating quality online videos)” (Rasheed et al., 2020, p. 2). Students, on the other hand, are most impacted by issues of self-regulation. The autonomy and flexibility afforded by online learning increases the likelihood for maladaptive behavior such as procrastination, poor time management, and underutilized peer learning (Rasheed et al., 2020). If technological illiteracy and issues with self-regulation are present, students are less likely to excel in an online medium.

Students must have technological literacy, adequate access to technology, and sufficient internet bandwidth to have a chance for success with online learning. Within Liaquat College of Medicine and Dentistry in Pakistan, where online learning was rarely utilized prior to the COVID-19 pandemic, student perceptions ( $n = 384$ ) of online format were poor, with 77% of students ( $n = 296$ ) reporting a negative overall experience (Abbasi et al., 2020). Additionally, 84% of students reported limited student-teacher interaction. Virtual classroom technology offers opportunity to improve interaction in online learning but only if access is adequate and equal among learners. With negative implications on transactional distance and community of inquiry, students lacking access to basic digital technologies are prone to limitations in student-instructor and student-student dialogue. Unless digital access and proficiency can be ensured, issues of student engagement and comprehension are bound to occur (Falloon, 2011).

### ***Problem-Based***

Adults learn best when new knowledge can be applied to real world problems (Knowles et al., 2014). For graduate health students, clinical experience, typically occurring within or after didactic content, serves as the pinnacle experience to foster learning. Across graduate health education, the COVID-19 pandemic necessitated cancellation of scheduled clinical experiences as uncertainty influenced decisions based on patient and student safety (Chiel, Winthrop, & Winn, 2020). Cancellation and minimization of clinical experience because of COVID-19 posed challenges to effective adult learning as graduate health students lacked the practical reward for prior learning. Fortunately, some graduate departments generated creative solutions to promote experiential problem-based learning.

Following cancellation of multiple students clinical experiences, the University of Minnesota Physical Therapy Department established a pro bono telehealth physical therapy clinic with dual purposes focused on the benefit of telehealth physical therapy in terms of student physical therapy education and patient outcomes (Hong et al., 2020). Patients were virtually assessed and treated by student physical therapists, under the online supervision of an expert faculty member. Guidance from faculty serving as clinical instructors was available during sessions with use of a private video conferencing text chat feature that allowed student and faculty interaction during patient evaluations. Success with this pilot program resulted in an expansion to multiple students with additional faculty members serving as clinical instructors (Hong et al., 2020).

Educational experiences offering tangible opportunities to solve problems satisfy multiple assumptions of andragogy. Adult learners thrive when immediate application of what is learned is available. For graduate health programs seeking to maximize clinical application,

online learning offers access to patient populations and clinical perspectives that are more difficult to achieve in a traditional classroom. The example by Hong et al. (2020) offers learning experience rich in andragogy and protective of the potential pitfalls of the online medium.

The online learning experience created by Hong et al. (2020) minimized transactional distance by promoting real-time dialogue between students and instructors. Learning goals were established by faculty but allowed for fluid session structure, dictated by student physical therapists under the guidance of a faculty member. With attention to CoI, social and cognitive elements were satisfied as students collaborated with each other and with faculty members to construct treatment plans which developed from prior foundational knowledge. Teaching presence consisted of “active peripheral involvement through real-time private discussion, quizzing, and reflection” (Hong et al., 2020, p. 280) utilizing the chat feature.

### ***Motivation***

Closely tied to the first andragogical assumption of “need to know”, the assumption of motivation describes the awareness of value or satisfaction that is added to the adult’s life by learning a new concept or skill (Ferreira, MacLean, & Center, 2018). If this does not occur, other life demands will take priority over the learning experience, as the adult deems the experience unworthy of time or attention. Instructors must harness and enhance the internal motivation of learners (Wlodkowski, 2008). The difficulty of this task is inversely related to the degree of interaction between instructors and students (M. Moore, 1997).

Students transitioning from traditional to online learning may struggle to maintain motivation, particularly if new distractions are present and content delivery is without social interaction. First year medical and dental students (n = 80) from All India Institute of Medical Sciences in Baddi, India completed a questionnaire detailing their perception of online learning,

as compared to face-to-face learning (Singal et al., 2020). Students in the study had participated in face-to-face anatomy classes for almost seven months before transitioning to online classes. Sixty-nine percent of students reported lack of self-motivation to engage in online learning and 68% reported being distracted by the comforts or discomforts of home (Singal et al., 2020). While the authors offered few details about the structure and resources used for online learning, the new format was described as video recorded lectures using PowerPoint with assessments occurring over Google form and Google thread following each topic. This method occurred in stark contrast to previous learning experience which was described as “cadaveric lab, face to face lectures, discussion with their classmates and interaction with mentors” (Singal et al., 2020, p. 2).

Even among medical residents, issues are surfacing regarding perception of engagement and concentration during online learning. Medical residents (n = 81) at the University of Chicago participated in a survey (Weber & Ahn, 2021) assessing perception of participation in online conferences as compared to face-to-face conferences. Eighty percent of respondents reported greater engagement with presenters during face-to-face lectures as compared to synchronous online lectures. Additionally, higher level of peer interaction was reported with face-to-face lectures (85%) than online lectures. Participants expressed difficulty concentrating (65%) during online lectures with a tendency to complete non-conference related activities such as use of internet, checking email, or daily tasks at a rate of 4.6 activities per hour during online participation, compared to 2.4 activities per hour with face-to-face participation (Weber & Ahn, 2021).

Adults are generally internally motivated to achieve their learning goals (Knowles et al., 2014); however, when faced with long lectures lacking interaction or occurring in a place with distractions, learning effectiveness worsens. Instructors must respect the more limited attention

span of learners when learning online. From a transactional distance theory, the use of synchronous sessions would presumably increase dialogue and promote reduced perception of transactional distance. If the interaction was of poor quality, however, the regularly scheduled sessions could be perceived as contributing to rigidity of structure, thereby increasing transactional distance and decreasing autonomy (Falloon, 2011). Consistent with CoI principles, online experiences rich in social interaction, reflection and discourse, and led by a trained facilitator offer increased likelihood for maintaining student motivation, thereby, increasing the effectiveness of adult learning.

## **Discussion**

A review of the current literature should also account for the likelihood of selection bias. There is innate selection bias in educational research (Dawson & Dawson, 2018). This means that the reality of the online experience may be worse than what is being discussed in peer-reviewed journals. Authors tend to seek publication for successful educational teaching strategies while hiding failures (Dawson & Dawson, 2018), or may be rejected by journals for reporting unfavorable results. Additionally, most of the online learning research develops from instructors who care enough about quality of education to conduct empirical studies on the teaching process. An accurate reflection of teaching effectiveness would encompass a true cross-section of those providing instruction.

Since the onset of COVID-19, students have been forced to take greater ownership of their learning. This has afforded a degree of flexibility in schedule and participation methods; however, greater autonomy has not always translated to improved self-direction. Lack of basic technological equipment and access to adequate internet bandwidth (Abbasi et al., 2020; Singal et al., 2020; Zayapragassarazan, 2020) have impacted the sense of engagement and

communication between instructors and students. This expansion of TD has been compounded by course designs which have failed to promote interaction among students (Aziz et al., 2020; Singal et al., 2020). A successful online learning environment creates a “community of learners,” an intentional practice that takes “dedication and skill” (Sekulich, 2020, p. 22). Interaction among students and between instructors and students needs to be more deliberate during online learning. Passive techniques such as synchronous participation allow for visual feedback, however, still do not achieve a level of interaction typical of traditional learning.

### **Conclusion**

Effective online learning in graduate health programs is achieved through adherence to the assumptions of andragogy. Before engaging in online learning, technological literacy of instructors and students, as well as access to internet and technological devices necessary for reliable use must be assured. Lesson plans and lectures deemed successful in a traditional classroom cannot simply be shifted online. As is true with face-to-face lectures, passive online lectures remain susceptible to adverse learning outcomes or poor student perception. Failure to recognize the greater propensity for TD in the online medium increases likelihood for student dissatisfaction or disengagement. Additionally, learning experiences in a traditional or online setting which fail to unite social, cognitive, and teaching presence, make learning dull, shallow, or ineffective. While not all interaction is equal, interaction is crucial to foster an online learning atmosphere that engages students in enriching learning experiences. Instructors and programs should strive to craft online learning experiences that cater to the unique learning assumptions of adults while acknowledging the intricacies of the online medium.

## **Chapter Three: Paper Two**

### **Assessing factors that influence graduate health students' preference for synchronous or asynchronous online lecture participation**

#### **Abstract**

The purpose of this study was to identify factors that impact graduate health students' preference for synchronous or asynchronous online lecture participation. Constructive factors were proposed and then measured for each participant via scales from the Motivated Strategies for Learning Questionnaire. It was hypothesized that students ranking lower in the domains of self-efficacy (confidence in mastering a task) and time management (ability to manage time), while higher in the domain of peer learning (communicating with peers to improve understanding) would favor synchronous lecture participation. Conversely, students ranking higher in self-efficacy and time management and lower in peer learning would favor asynchronous lecture participation. Assessed via survey, participants were asked to indicate preference for synchronous or asynchronous online lecture participation and indicate agreement with various item statements regarding perceptions of online learning. Multiple logistic regression was utilized to determine which factors associate with student preference for online lecture. Peer learning was found to significantly impact students' decisions, while time management and self-efficacy were not deemed influential. Other factors including student perception of convenience, ease of concentrating during lectures, and the role of online lecture within graduate health programs exhibited significant differences between synchronous and asynchronous groups. Overall, students within the synchronous group valued peer learning more, reported less difficulty concentrating during lecture, and expressed less desire for online lectures to be a part

of their graduate health program. Both synchronous and asynchronous groups expressed belief that decisions regarding online lecture participation are made with respect to how they best learn.

## **Introduction**

A trend towards higher levels of online learning in graduate health programs has been accelerated with the onset of the COVID-19 pandemic. Greater student autonomy and flexibility have been achieved with a partial or complete shift of coursework online. While a return to traditional learning has occurred for most graduate health programs, online instruction remains a viable and useful option (Afshan & Ahmed, 2020). Programs that previously mandated student physical attendance for class are exploring options for synchronous and asynchronous online participation. When given the option to participate either synchronously or asynchronously in an online lecture, a gap in the literature exists regarding factors that contribute to student preference. Presumably, student decisions derive from perceived differences between the two options. These differences may stem from factors thought to impact the quality of the learning experience, or, alternatively, factors such as convenience.

Factors contributing to student preference for online or traditional learning may be similar to factors impacting student preference for synchronous or asynchronous online participation. A review of the current literature demonstrates consistency in identifying factors contributing to student learning preference when deciding between online and traditional learning. Socioeconomic factors, convenience, flexibility, and compatibility with a full-time work schedule impact preference for online or traditional learning (Harris & Martin, 2012). Less is known about factors contributing to student learning preference when deciding between synchronous and asynchronous online lecture. With respect to the available literature, and in recognition of the differences between synchronous and asynchronous online participation, this study investigates the extent to which perception of self-efficacy, time management, and peer learning impact students' preference of synchronous or asynchronous online lecture.

## **Background and Purpose**

The impact of COVID-19 on global education has included a shift of traditional programs towards online learning that will likely persist following resolution of the pandemic (Afshan & Ahmed, 2020). While traditionally conducted asynchronously, advancements in technology, allowing synchronous interaction through platforms such as Zoom® and Google Meet®, have facilitated an evolution in online learning (Watts, 2016). In stark contrast to more rigid expectations for face-to-face participation, students in graduate health programs are now afforded options for synchronous or asynchronous online participation. It is unclear if method of learning flexibility improves or hinders outcomes for this unique population. As students selecting traditional programs consented to instruction in more structured and inflexible methods, this student population may not require the flexibility and autonomy afforded by online learning. As a result, when learning online, recommendations have been proposed to mandate synchronous participation for traditional students, to avoid potential pitfalls of decreased student engagement with asynchronous participation (Guo, 2020). Clarification of the factors influencing student decision-making would offer insight into the legitimacy of student preference. Are students selecting method of participation based on self-awareness of optimal learning styles or are decisions based on convenience? Assessing the underlying factors contributing to online lecture preference is best understood by exploring the basic differences between online and traditional learning as well as synchronous and asynchronous online lecture.

### ***Online Learning versus Traditional Learning***

Online learning, originating as distance learning (J. L. Moore, Dickson-Deane, & Galyen, 2011) was initially synonymous with anytime-anywhere e-learning (Watts, 2016). Online learning offers flexibility and convenience that is less readily available with traditional learning.

The freedom of learning afforded by online learning poses potential threats to student perception of engagement, however, when online courses fail to promote interaction typical of traditional learning environments (Aziz et al., 2020). The realization of these potential threats has resulted in an expansion of online learning to include synchronous interaction.

### ***Synchronous Online Learning versus Asynchronous Online Learning***

Online learning occurs via synchronous or asynchronous participation. Asynchronous learning allows students flexibility in content review and communication occurring through discussion boards or email (Hrastinski, 2008). The anytime-anywhere quality of online learning is preserved with asynchronous format, however, at the potential cost of student engagement and interaction (Akyol & Garrison, 2008; M. Moore, 1997). In contrast, synchronous participation implies participation in real-time, allowing instantaneous feedback between student and instructor. Requiring attendance at a certain date and time, synchronous learning may be perceived as a contradiction to “the promise of ‘anytime, anywhere’ learning that online courses have traditionally promoted” (Skylar, 2009, p. 71). Alternatively described, asynchronous participation encompasses the flexibility and convenience previously expected of online learning while synchronous participation offers structure and interaction more synonymous with traditional learning.

### ***Determination of Factors Impacting Student Preference***

Within the literature, factors impacting student preference for online or traditional learning are clear; however, there is a gap in the literature pertaining to factors impacting preference for synchronous or asynchronous lecture format. Usually comprising an older demographic, students selecting online learning typically favor the convenience and flexibility often available with online programming, allowing for completion of other life demands while

attending classes (Harris & Martin, 2012). Presence of a full-time job (Chow, 2013; Ilgaz & Gulbahar, 2017; Liu, 2011), time management (Ilgaz & Gulbahar, 2017; Liu, 2011; Smith, 2005), flexibility (Ilgaz & Gulbahar, 2017; Liu, 2011), and student comfort with technology (Liu, 2011; Smith, 2005) are common factors contributing to preference for online learning over traditional learning. Among traditional students now engaging in online learning, factors impacting student preference for synchronous or asynchronous participation are unclear but can be surmised.

*Self-Efficacy.* As introduced by psychologist Albert Bandura, self-efficacy describes individuals' beliefs in their capabilities to influence events impacting their lives (Bandura, 1986). Pintrich and colleagues (1991) describe self-efficacy as a "self-appraisal of one's ability to master a task. Self-efficacy includes judgments about one's ability to accomplish a task as well as one's confidence in one's skills to perform that task" (p.14). In online (Bradley, Browne, & Kelley, 2017; Joo, Lim, & Kim, 2013) and blended (Ying, 2020) learning, student perception of self-efficacy has been positively associated with course outcomes. The flexibility associated with online learning necessitates increased student responsibility for learning, as students require self-regulation to schedule when learning occurs and self-efficacy in personal beliefs that the material can be understood using the chosen delivery method (Wang, Shannon, & Ross, 2013). Alkış and Temizel (2018) found students ranking higher in self-efficacy, as assessed on the Motivated Strategies for Learning Questionnaire, were significantly more likely to engage in online content on a learning management system. The authors concluded, online students "do not attend face-to-face lectures and activities and therefore they usually study by themselves, which requires higher self-efficacy and discipline" (Alkış & Temizel, 2018, p. 43). As such, individuals electing online learning, or any learning requiring higher levels of self-direction (i.e. asynchronous

participation), should exhibit confidence with the material and method. Therefore, self-efficacy is anticipated to impact student preference for one method of online participation over the other.

***Time Management.*** Pintrich and colleagues (1991) asserted, “Time management involves scheduling, planning, and managing one’s study time. This includes not only setting aside blocks of time to study, but the effective use of that study time, and setting realistic goals” (p.25). Preserving the anytime-anywhere learning model previously synonymous with online learning (Ilgaz & Gulbahar, 2017; Liu, 2011; Smith, 2005), asynchronous participation allows students flexibility in scheduling when learning occurs. Synchronous online participation offers less flexibility and convenience than asynchronous participation; however, it also provides structure and timelines that may appeal to certain students. While not readily explored in the available body of literature, students’ perceptions of the effectiveness of time management should factor into decision-making when deciding between synchronous and asynchronous lecture participation. Therefore, time management is proposed as a factor influencing online learning preference.

***Peer Learning.*** Defined by Pintrich and colleagues (1991), peer learning describes the educational affinity to collaborate with peers to “clarify course material and reach insights one may not have attained on one’s own” (p. 28). Garrison et al. (2000) recognized the benefit of establishing a Community of Inquiry within online learning, noting student satisfaction, engagement, and outcomes improved with enhanced social, cognitive, and teaching presence. Peer learning is proposed as a factor in decision-making when choosing between synchronous and asynchronous online lecture participation. Past research has demonstrated students enrolled in traditional learning desire higher levels of social interaction than students enrolled in online learning (Drouin & Vartanian, 2010). Extending this concept to synchronous and asynchronous

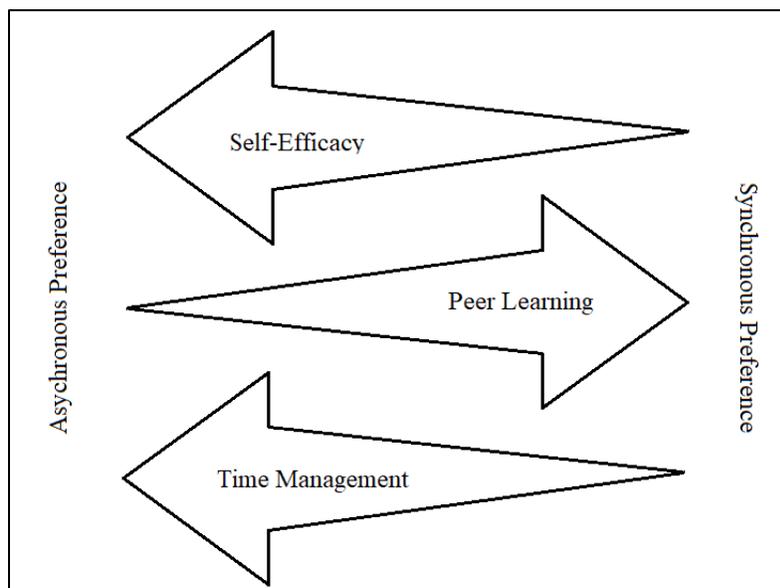
participation, student desire for peer interaction, allowing real-time student-instructor and student-student communication, is proposed to impact preference for one method of participation over the other.

### ***Assessing the Validity of the Proposed Factors***

The factors of self-efficacy, time management, and peer learning have been proposed as significant influences on student preference for online learning over traditional learning as well as factors that differentiate synchronous from asynchronous participation. Interaction of these factors has been proposed as a conceptual framework that impacts graduate health student preference for online method of participation, if decisions are made in consideration of optimal learning preferences. If student preference for one method occurs based on perceived compatibility with individual learning preferences or motivations, it is reasonable to expect an interaction of these variables on student preference. Therefore, it is hypothesized that students ranking lower in the domains of self-efficacy (confidence in mastering a task) and time management (ability to manage time), while higher in the domain of peer learning (communicating with peers to improve understanding) will favor synchronous lecture participation. Conversely, students ranking higher in self-efficacy and time management and lower in peer learning will favor asynchronous lecture participation (Figure 1). If findings are in opposition to this proposal, either the conceptual framework is inaccurate, or an extraneous variable is influencing students' stated preference for online participation. If the latter is suspected, the effectiveness by which students self-select online lecture delivery method should be called into question. If no correlation is found, further research is needed to determine other factors impacting students' decisions.

**Figure 1**

*Constructive Factors Proposed to Influence Online Learning Preference*



*Note.* High self-appraisal in the domains of self-efficacy and time management are proposed to correlate with a preference for asynchronous online lecture.

### ***Convenience***

It is hypothesized that perception of convenience plays a major role in student decision-making. This study gauges student self-reported impact of convenience on decision-making in addition to the previously proposed factors. Although perceived as a benefit for students, the factor of convenience resides in a separate category of influence. Indeed, awareness and decision-making based on the aforementioned factors (self-efficacy, time management, and peer learning) are deemed constructive to learning, while convenience is simply that, *convenient*. By recognizing factors contributing to student decision-making, instructors would better understand their students' motivations and/or learning preferences. Should multiple options of online lecture participation be allowed for the sake of constructive learning preferences or are more options simply catering to student preference for convenience? As such, the purpose of this study is to

identify factors contributing to graduate health students' online learning preferences when choosing between synchronous and asynchronous lectures.

## **Methods**

### *Design*

This research study was conducted using a cross-sectional survey design to investigate the impact of student perception of self-efficacy, time management, and peer learning on preference for synchronous or asynchronous online learning. This design was chosen to acquire quantitative data from a sample of convenience that can be readily analyzed to compare two groups: synchronous and asynchronous preference. This study (IRB-21-139) was approved by the Institutional Review Board (IRB) of the University of South Dakota, which is fully accredited by the Association for the Accreditation of Human Research Protection Programs, Inc. (AAHRPP).

### *Participants*

Participants in this study were first- and second-year physical and occupational therapy students at the University of South Dakota. The research team approached participants during scheduled classes. Participation was voluntary; however, students were incentivized to complete the study with gift cards. Inclusion criteria included 1) enrollment in the first or second year of physical or occupational therapy school at the University of South Dakota; and 2) prior experience as a student participating in synchronous and asynchronous online lectures. Exclusion criteria included 1) unwillingness to participate in the study; and 2) unavailability on the designated date of the survey.

### ***Instruments***

The survey (Appendix A) consists of three scales from The Motivated Strategies for Learning Questionnaire (MSLQ) (P. Pintrich, Smith, Garcia, & McKeachie, 1991). With almost 5000 citation in Google Scholar, The MSLQ offers educators a self-report assessment of students' motivational orientations and preference for different learning strategies. The MSLQ has proven valid and reliable for college students (Davenport, 2003; P. R. Pintrich & Smith, 1993). While the widely used (1991) version of the MSLQ consists of 81 items across 15 scales, the scales are available for individual or collective use depending on the instructor's needs (P. Pintrich et al., 1991). Included scales and corresponding reliabilities via Cronbach's alpha measures (P. Pintrich et al., 1991) are: Self-Efficacy for Learning and Performance (.93), Time and Study Environment Management (.76), and Peer Learning (.76), indicating internal consistency ranging from acceptable to good for surveys utilizing Likert-style scales (Gliem & Gliem, 2003). Likert-style item statements received minor modification to reflect student perception of motivation and learning strategies across all courses rather than a single course. For instance, item number 29, "I expect to do well in this class," was changed to, "I expect to do well in my classes."

In addition to scales from the MSLQ, five item statements generated by the authors of this study were included in the survey, as well as the question: Do you prefer to participate in online lectures synchronously or asynchronously?

### ***Procedures***

As approved by the IRB, consent was achieved with an e-cover letter placed at the beginning of the survey. The consent form included information regarding the purpose of the study, how gathered data would be used and stored, information regarding privacy and protection

of participant responses, contact information for the principal investigator, and definition of terms regarding synchronous and asynchronous online lecture. All participants completed the survey in one sitting. Only the research team had access to the database.

### ***Data Analysis***

Data were analyzed using the Statistical Package for the Social Sciences (SPSS, Version 27.0). Independent variables included self-efficacy, time management, and peer learning. The dependent variable was choice of online learning mode (synchronous or asynchronous). Multivariate binary logistic regression was used to determine the impact a combination of previously selected variables has on student selection when deciding between synchronous or asynchronous online lecture participation. Additionally, independent *t*-tests were utilized to compare between-group differences of synchronous and asynchronous mean scores across the categories of self-efficacy, time management, and peer learning. Differences in mean ranks on the additional item statements were analyzed with the Mann-Whitney U test.

### **Results**

In total, 121 first- or second-year physical or occupational therapy students were asked to participate in the survey. A total of 115 individuals agreed to participate and 114 of them completed the full survey. Mean age for participants was 22.9 years.

### ***Online Lecture Preference***

Online lecture preference was 46.5 percent ( $n = 53$ ) synchronous and 53.5 percent ( $n = 61$ ) asynchronous. Concerning factors known to impact preference for hybrid over traditional programs, only two participants reported having a full-time job. Part-time job status was reported by 39 students (34.2 percent of the total sample size). Assessed between groups, Chi-square

analysis demonstrated no significant interaction ( $p=.104$ ) between job status and lecture preference.

In comparing synchronous and asynchronous groups on the MSLQ scales, only the mean scale scores for peer learning exhibited a significant difference between groups ( $p=.018$ ).

Participants reporting a preference for synchronous online lecture participation reported higher self-report desire for peer learning. Mean scores for self-efficacy and time management were higher for the synchronous group but not statistically significant.

<b>Table 1</b>					
<i>Differences in MSLQ Scale Scores by Lecture Preference</i>					
	Total ( $n = 114$ )	Synchronous ( $n = 53$ )	Asynchronous ( $n = 61$ )	$p$	Cohen's $d$
Self-Efficacy	45.17 (5.98)	45.70 (5.32)	44.70 (6.51)	.379	.166
Time Management	45.53 (5.91)	46.53 (5.34)	44.66 (6.27)	.091	.320
Peer Learning	14.11 (3.84)	15.02 (3.65)	13.33 (3.85)	.018	.450
Note. This table depicts the results of independent t-tests between synchronous and asynchronous groups.					

The multiple logistic regression analysis (Table 2), utilizing the three predictors (self-efficacy, time management, and peer learning), was statistically significant ( $p=.027$ ). Assessed individually, however, only peer learning ( $p=.023$ ) demonstrated a significant difference between groups. Additionally, self-efficacy appears to add no predictive value to the overall model. Results from the model have been preserved, nonetheless, to assess the accuracy of the initial hypothesis. The model classified correctly 68.9 percent of participants preferring asynchronous lecture and 52.8 percent of participants preferring synchronous, for a total of 61.4 percent overall accuracy. Assessed via Nagelkerke R Square, the model accounted for 9.8 percent of the variance between lecture preference.

Predictor	$\beta$	S.E.	Wald	<i>df</i>	<i>p</i>	OR	95% C.I.
Self-Efficacy	-.001	.035	.000	1	.985	.999	.933-1.070
Time Management	.059	.037	2.614	1	.106	1.061	.987-1.140
Peer Learning	.124	.055	5.193	1	.023	1.133	1.018-1.261
Constant	-4.585	2.077	4.872	1	.027	.010	

Note.  $\beta$  - beta coefficient, S.E. - standard error, Wald - Wald Chi-Square, *df* - degrees of freedom; *p* - significance of coefficient, OR - odds ratio as  $\text{Exp}B$ , CI - Confidence Interval for OR.

Significant differences between synchronous and asynchronous groups were demonstrated on four of the five additional questions pertaining to perception of online learning and individual learning traits (Table 3). Participants were asked to rate their agreement with statements on a seven-point scale with 1 serving as “not at all true of me,” 4 as “neutral,” and 7 as “very true of me.” Asynchronous participants reported significantly higher agreement on questions pertaining to the role convenience plays in decision-making, presence of other life demands making scheduled sessions difficult to attend, trouble concentrating during lecture, and belief that online learning should be a part of their graduate program. Notably, both groups reported relative agreement to the statement “I choose my method of lecture participation based on how I believe I will best learn,” with lack of significant difference noted between groups.

<b>Table 3</b>					
<i>Questions Pertaining to Online Lecture by Method of Participation</i>					
	Median Synchronous ( <i>n</i> = 53)	Median Asynchronous ( <i>n</i> = 61)	<i>U</i>	<i>Sig</i>	<i>r</i>
I choose my method of online lecture participation based on my perception of convenience.	4 (1-6)	5 (2-7)	898.00	<.001	.394
I choose my method of online lecture participation based on how I believe I will best learn.	5 (2-7)	5 (2-7)	1362.00	.138	.139
I have other life demands that make scheduled sessions difficult to attend.	3 (1-6)	4 (1-7)	1245.50	.032	.201
I have trouble concentrating during lecture.	4 (1-6)	4 (2-7)	1147.00	.007	.255
I believe online lectures should be a part of my graduate program.	3 (1-6)	4 (1-7)	880.50	<.001	.399
Note. This table depicts Median scores (range) and the results of Mann-Whitney U tests between synchronous and asynchronous groups. Effect size is calculated via Pearson <i>r</i> .					

## Discussion

Preference for synchronous or asynchronous lecture was revealed to be nearly equally split, demonstrating the diversity of thought within a classroom, even for students largely thought of as a homogenous group (traditional students, Midwestern university, graduate program, health discipline). Although decision-making for synchronous or asynchronous online lecture participation appeared to be impacted by individual desire for peer interaction while learning, proposed variables of time management and self-efficacy were not identified as contributing factors. In constructing the model, these factors were presented as idealistic, noting

the benefit student self-appraisal of time management skills and confidence in independent mastery of the material might have on decision-making when deciding between the two formats. It appears idealism is not the most appropriate framework to accurately surmise the factors impacting student decision-making. This was not a surprise but seemed like an appropriate initial hypothesis to assess.

Lack of significant findings necessitates further identification of covariates impacting students' decisions for online lecture participation. Some of these variables were proposed during survey development, resulting in the inclusion of additional questions pertaining to convenience, perceived business, concentration during lecture, and affinity for online lectures. Notably, significant differences between asynchronous and synchronous preference groups were revealed in each of these categories. Students preferring asynchronous lectures acknowledged the role convenience plays in decision-making. Despite acknowledging convenience as a factor, group differences in response to the statement: "I choose my method of online lecture participation based on how I believe I will best learn" were insignificant. As such, students choosing asynchronous delivery of online lectures largely perceive no trade-off between convenience and effectiveness of learning. This leads to another research question: does more convenient learning lead to more effective learning? Perhaps effectiveness of learning is impacted by ability to concentrate. As reflected in participant responses, students preferring asynchronous online lectures reported statistically significant higher degree of difficulty concentrating during lecture. Indeed, serving as one of the multiple benefits of asynchronous delivery, students can pause or replay lecture, allowing for anytime-anywhere style of delivery.

There appear to be significant differences in perception of online lecture between groups of students who prefer synchronous and asynchronous online lecture. Students favoring

synchronous format reported negative perceptions towards online lectures, rating 2.77/7 on the item statement “I believe online lectures should be a part of my graduate program.” Although significantly higher, students favoring asynchronous format reported perceptions near neutral, rating 4.16/7 on the same item statement. These results should not be overgeneralized as this population selected traditional programming for their graduate health education. The students within this study generally lacked full-time jobs and exhibited mean age consistent with traditional students. Nonetheless, this information may be helpful to other traditional graduate health programs engaging in higher levels of online learning. When offering lectures online, the students showing up for synchronous lecture may be choosing the method that most closely mimics the learning atmosphere typical of face-to-face learning.

## **Conclusion**

Desire for peer interaction during learning impacted preference for synchronous or asynchronous online lecture for these students enrolled in traditional graduate health programs. On the other hand, self-appraisal of time management skills and self-efficacy did not appear to impact online lecture preference. This finding was in opposition to the idealistic hypothesis that students self-appraise these three qualities and base decisions off them. As a result, other factors appear to impact students’ decisions when deciding between synchronous and asynchronous online lecture. Possible influences identified within this study include student perception of lecture convenience, trouble concentrating during lecture, and overall opinions regarding the role of online lectures in graduate health programs. Students preferring synchronous online lecture generally did not believe online lectures should be a part of their graduate program. Notably, this study population differed from the population of students described within the literature who select online or hybrid education. Regardless of preference, students expressed they make

decisions regarding method of online lecture participation based on how they believe they will best learn.

## **Chapter Four: Paper Three**

### **Assessing the impact of method of online lecture participation and student preference on examination performance**

#### **Abstract**

The purpose of this study was to examine the impact matching or mismatching method of online lecture participation (synchronous or asynchronous) with students' stated preference has on academic outcomes. Additionally, synchronous and asynchronous online lecture effectiveness was explored. Participants included first- and second-year physical and occupational therapy students enrolled in traditional face-to-face programs. Following declaration of online lecture preference, students were randomly and evenly allocated into different groups consisting of matched and mismatched preference and synchronous and asynchronous participation in an online lecture. All students took the same multiple-choice examination. Assessment via independent t-tests revealed no significant differences between students who were matched versus mismatched to their participation preference. Asynchronous groups achieved significantly higher scores than synchronous groups. Analysis via two-way ANOVA revealed no significant interaction between method of participation and compatibility with learning preference on examination scores. Based on the results of this study, method of participation impacted examination performance, however, matching or mismatching to students' stated learning preference did not appear to impact performance.

## Introduction

The COVID-19 pandemic has thrust students enrolled in traditional graduate health programs into unexpected levels of online learning. Although previously deemed at least equally effective as traditional learning (Cook et al., 2008; Lima et al., 2019; McCall, Spencer, Owen, Roberts, & Heneghan, 2018; McCutcheon, Lohan, Traynor, & Martin, 2015; Pei & Wu, 2019), online learning since the arrival of the COVID-19 pandemic has often been a source of frustration for students and instructors (Abbasi, Ayoob, Malik, & Memon, 2020; Aziz et al., 2020; Garris & Fleck, 2020; Loda, Löffler, Erschens, Zipfel, & Herrmann-Werner, 2020; Singal, Bansal, Chaudhary, Singh, & Patra, 2020; Weber & Ahn, 2021; Wu & Zeshan, 2020). Fundamental differences between students electing online versus traditional learning environments must be acknowledged (Harris & Martin, 2012). Students choose online learning over traditional learning for a variety of reasons, most often related to non-traditional status, competing life demands, excellent time management skills, and lower socialization needs (Van Doorn & Van Doorn, 2014). It is unclear the role factors such as convenience play into decision-making. More research is required to assess the unique qualities impacting the online learning experience of graduate health students enrolled in traditional programs.

There is uncertainty regarding best practice guidelines for delivery of online lectures for graduate health students enrolled in traditional programs. Online learning offers greater flexibility in learning; however, programs offering flexible delivery methods such as synchronous or asynchronous participation are assuming students make decisions that maximize academic potential. This assumption is based on principles of *learning styles*, which include the belief that students understand how they best learn and perform best when instruction is tailored to match these stated preferences (Dunn, 1990; Kolb & Kolb, 2005). The concept of learning

styles has recently come under scrutiny (Costa, Souza, Valentim, & Castro, 2020; Kirschner, 2017). Indeed, there is uncertainty about whether students enrolled in traditional graduate health programs accurately understand how they best learn when forced to learn online.

### **Background and Purpose**

Recent challenges to the concept of *learning styles* advocate for a greater evidentiary basis for this concept and a reexamination of the impact on education. As stated, “Learning Style theories tend to define lists of the student’s learning style preferences without explaining which of the cognitive, motivational, and personality-related mechanisms support these preferences” (Costa et al., 2020, p. 137). There is evidence of a disconnect between student perception of ideal learning structure and the structure that actually affords them the best learning (Costa et al., 2020; Kirschner, 2017). Described as “the learning style myth,” Kirschner (2017) calls for an end to utilization of learning styles in education, noting the lack of supportive scientific evidence. Preference for learning, assessed using a questionnaire, does not constitute validation of a particular learning style, assuming such a thing even exists (Kirschner, 2017). Yet, proponents of learning styles in education call for the identification of individual learning preferences and “tailoring instruction accordingly” (Pashler, McDaniel, Rohrer, & Bjork, 2008, p. 105). Adherence to learning styles theories results in a flexible learning environment where students often self-determine method of participation. Tailoring instruction according to perceived learning styles occurs throughout higher education despite a lack of evidence for improving learning outcomes by tailoring educational delivery based on student preference (Kirschner, 2017; Costa et al., 2020). The relevance of learning styles in graduate health programs has emerged as even more pertinent as students are afforded greater flexibility to decide between synchronous and asynchronous participation in online lectures.

The focus of this study is to answer questions pertaining to optimal design for online lectures across graduate health programs. The impact of online lecture participation on academic outcomes is assessed at multiple levels, including matched and mismatched to student learning preference. The following two research questions are addressed: (1) Does matching or mismatching method of participation (synchronous or asynchronous) with stated lecture preference impact performance on a multiple-choice examination? (2) Does one method of participation (synchronous or asynchronous) result in superior outcomes as measured on a multiple-choice examination?

If students do not accurately understand how they best learn, attempts to tailor lecture format to meet their purported learning style would be in vain. Additionally, if flexibility in online learning occurred at the expense of academic outcomes, programs would be wise to eliminate ineffective methods and require students to participate in the online learning method which promotes better academic outcomes. In contrast, if matching student online lecture preference to method of participation results in better academic outcomes, programs would have justification to promote flexibility in participation.

## **Methods**

### ***Design***

The present study is a post-test-only quasi-experimental design assessing the impact of online lecture preference and match or mismatch of learning preference with method of participation on academic performance. The empirical design of this study, suggested by Pashler et al (2008), investigates the validity of student-stated learning preference on academic outcomes. By matching and mismatching student purported learning preference with method of lecture participation (synchronous or asynchronous) and comparing subsequent academic

performance, the validity of self-reported learning preference can be assessed in graduate health students. This study (IRB-21-139) was approved by the Institutional Review Board (IRB) of the University of South Dakota, which is fully accredited by the Association for the Accreditation of Human Research Protection Programs, Inc. (AAHRPP).

### ***Participants***

Participants in this study were first- and second-year physical and occupational therapy students at the University of South Dakota. Participation was voluntary; however, students were incentivized to complete the study by being eligible for gift cards. Inclusion criteria were 1) enrollment in the first or second year of physical or occupational therapy school at the University of South Dakota; and 2) prior experience as a student participating in synchronous or asynchronous online lecture. Exclusion criteria were 1) unwillingness to participate in the study; and 2) unavailability on the designated dates of the lecture and examination. Results from a prior study revealed the online lecture preference of the population. Asynchronous lecture participation was favored by 55.3 percent ( $n=63$ ) of the sample population, with 44.7 percent ( $n=51$ ) preferring synchronous lecture participation.

### ***Instruments***

The lecture occurred over Zoom® and was recorded into the Cloud. A hyperlink for the recording was provided to students participating in the asynchronous groups. The same multiple-choice examination, proctored by faculty, was provided to all study participants. The examination was administered in the learning management system Desire2Learn.

## *Procedures*

Prior to participation in the study, consent was achieved. The online consent consisted of a cover letter explaining the purpose of the study, how gathered information would be used and stored, information regarding privacy and protection of participant responses, contact information for the principal investigator, and definition of terms regarding synchronous and asynchronous learning. Results from a survey in a prior study were used to identify student preference for online lecture method (synchronous or asynchronous). Students were asked for prior familiarity of the lecture subject matter, to allow for differences in familiarity of the content between groups.

Students were randomly assigned to four groups within two categories: synchronous preference and asynchronous preference (Figure 2). This occurred so that participants identifying a synchronous preference were randomly and evenly assigned to synchronous or asynchronous participation in the subsequent lecture. Likewise, participants identifying an asynchronous preference were randomly and evenly assigned to synchronous or asynchronous participation in the lecture. The four groups, therefore, consisted of: (1) synchronous lecture (matched with learning preference); (2) synchronous lecture (mismatched with learning preference); (3) asynchronous lecture (matched with learning preference); and (4) asynchronous lecture (mismatched with learning preference). Students were alerted which day the lecture would occur (synchronous group), or the asynchronous lecture would be available (asynchronous group). Students were informed that an in-person examination would occur three days following the lecture or recording covering content provided in the lecture.

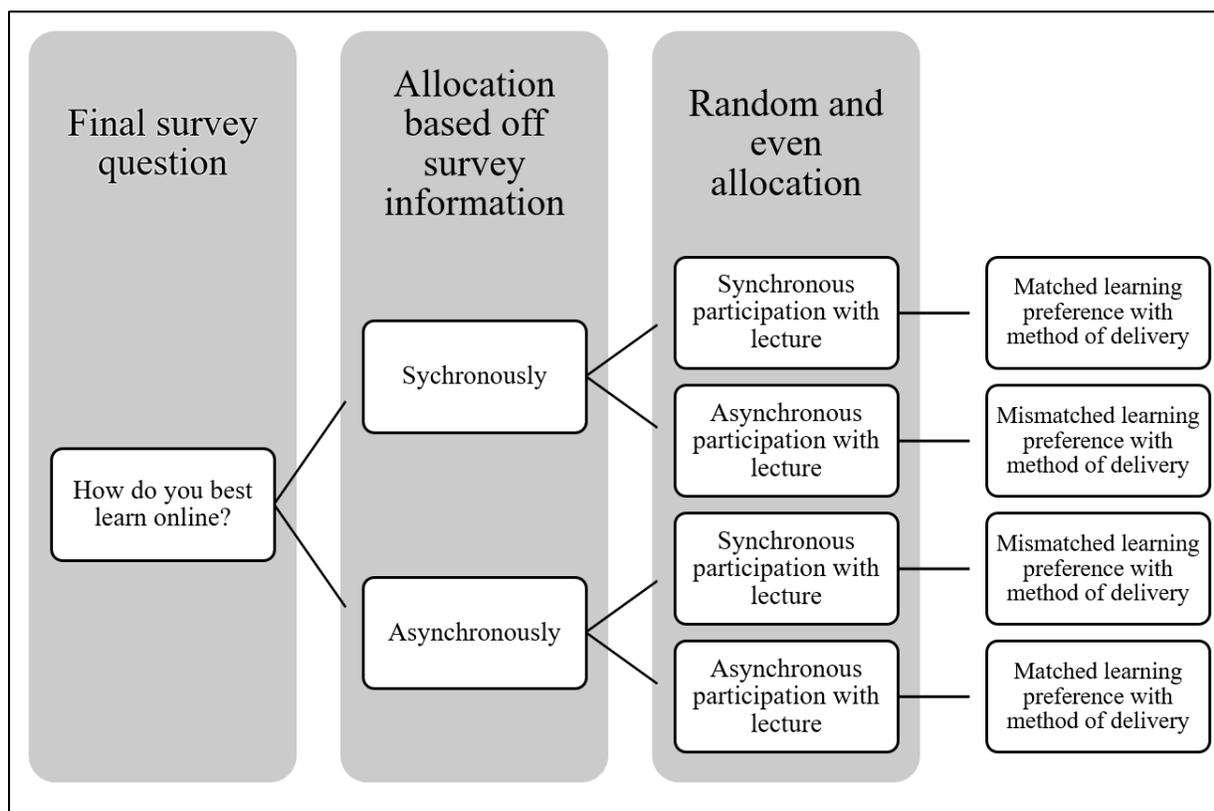
Participants in the synchronous groups participated in a 30-minute synchronous online lecture consisting of a PowerPoint and non-graded quiz questions to self-assess understanding.

Students were encouraged to turn their cameras on; however, this was not be mandated. The entire lecture was recorded and constituted the asynchronous material for the asynchronous groups. This way, all participants received the exact same information, just with differences in mechanism of delivery. Participants in the asynchronous groups received email notification of the link containing a recording of the lecture. Students could watch the recording at their convenience; however, the examination occurred on the same date for all groups.

The examination was pilot tested with a group of students not included within the prospective sample. Individual items were assessed with the Point BiSerial index, ensuring the majority of examination questions achieved scores above 0.20.

**Figure 2**

*Participant Allocation and Group Descriptions*



*Note.* Random allocation into groups occurred after determination of online lecture preference.

### ***Data Analysis***

A priori power analysis was completed with G\*Power to determine sample size needed for a power of .80 (effect size of .40 and alpha set at .05). This analysis revealed a minimum of 73 participants would be needed. Subsequent data were analyzed using the Statistical Package for Social Sciences (SPSS, Version 27.0). Independent variables included assigned participation method (synchronous or asynchronous) and compatibility to stated learning preference (match or mismatch). The dependent variable was composite score on the multiple-choice examination. Independent *t*-tests with Bonferroni adjustment were utilized to assess for significant differences between the levels of the independent variables. A two-way ANOVA was used to determine the difference in achievement based on preference type, participation type, or interaction between preference and participation. Finally, a one-way ANOVA was utilized to assess significant differences between the four groups (synch-match, synch-mismatch, asynch-match, asynch-mismatch), followed by post-hoc analysis via the Games-Howell test.

### **Results**

All 114 participants who were eligible to participate completed the full study. There were no significant differences in examination scores for participants matched ( $M=64.91$ ,  $SD=14.221$ ) or mismatched ( $M=61.14$ ,  $SD=16.557$ ) to their stated online lecture preference;  $t=1.305$ ,  $p=.195$  (Table 4). In assessing aggregate mean examination scores, asynchronous participants performed significantly better ( $M=69.11$ ,  $SD=14.369$ ) than synchronous participants ( $M=57.16$ ,  $SD=14.300$ );  $t=4.450$ ,  $p<.001$ . Among participants matched to their online lecture preference, there was a significant difference in examination scores for synchronous ( $M=55.77$ ,  $SD=12.782$ ) and asynchronous ( $M=72.58$ ,  $SD=10.398$ ) participants;  $t=5.477$ ,  $p<.001$ .

**Table 4*****Mean Examination Scores by Participation Method and Compatibility***

Independent Variables	N	Mean	SD	Diff	t	<i>p</i>	Cohen's <i>d</i>
<b>Participation Method</b>							
Synchronous	58	57.16	14.300	-11.952	-4.451	<.001	.834
Asynchronous	56	69.11	14.369				
<b>Compatibility</b>							
Matched	57	64.91	14.221	3.772	1.305	.195	.244
Mismatched	57	61.14	16.557				

*Note.* Diff = mean difference between groups. Independent t-tests were utilized to compare differences in examination scores between levels of the independent variables.

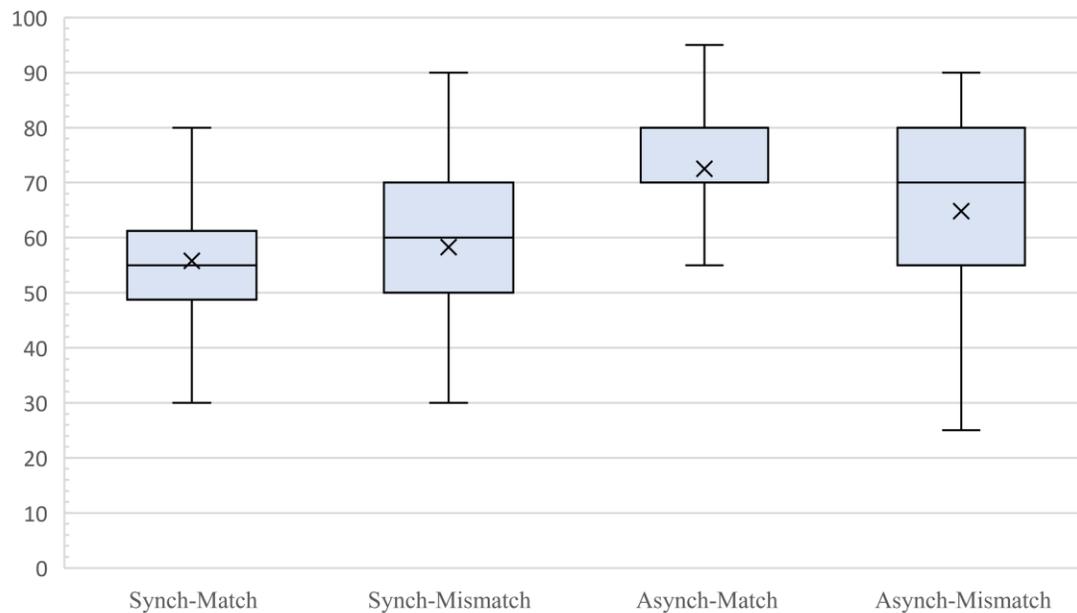
Mean examination scores across the four groups are listed in Table 5, as well as depicted in Figure 3.

<b>Table 5</b>			
<i>Mean Examination Scores Across Groups and Totaled</i>			
	Match	Mismatch	Total
Synchronous	55.77 (12.78) <i>n</i> =26	58.28 (15.53) <i>n</i> =32	57.16 (14.30) <i>n</i> =58
Asynchronous	72.58 (10.40) <i>n</i> =31	64.80 (17.41) <i>n</i> =25	69.11 (14.37) <i>n</i> =56
Total	64.91 (14.22) <i>n</i> =57	61.14 (16.56) <i>n</i> =57	63.03 (15.48) <i>N</i> =114

*Note.* Mean examination scores by method of participation and compatibility with stated lecture preference.

**Figure 3**

*Mean Examination Scores Across Groups*



*Note.* Minimum and maximum data points are depicted, along with first and third quartile. Mean scores are depicted with an *x*.

A two-way ANOVA was conducted to analyze the effect of lecture participation and compatibility on examination scores. Results from the two-way ANOVA (Table 6) revealed a lack of significant interaction between the method of participation and compatibility with stated online learning preference ( $p = .056$ ). Only method of online lecture participation appeared to impact examination score ( $p < .001$ ) significantly. Notably, the method of online lecture participation accounted for 14.8 percent of the variance in examination scores, whereas compatibility accounted for less than one percent (Partial Eta Squared = .009).

**Table 6**

*Interaction of Participation and Compatibility on Examination Scores*

	df	F	$p$	Partial Eta Squared	Observed Power
Corrected Model	3	8.299	<.001	.185	.991
Intercept	1	2218.118	<.001	.953	1.000
Participation	1	19.098	<.001	.148	.991
Compatibility	1	.974	.326	.009	.165
Participation * Compatibility	1	3.717	.056	.033	.481

*Note.* Method of participation was found to significantly impact performance on the examination ( $p < .001$ ).

A one-way ANOVA was performed to compare differences in examination scores between the four groups (Table 7). The one-way ANOVA revealed statistically significant differences in examination scores between at least two groups ( $F = 8.299, p < .001$ ).

<b>Table 7</b>					
<i>Differences in Examination Scores Across Groups</i>					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4998.289	3	1666.096	8.299	<.001
Within Groups	22082.633	110	200.751		
Total	27080.921	113			

*Note.* A one-way ANOVA identified significant differences in examination scores between at least two groups ( $F = 8.299, p < .001$ )

Post hoc testing for multiple comparisons was completed with the Games-Howell test (Table 8). This nonparametric test allows for post-hoc analysis when homogeneity of variances cannot be assured (Sauder & DeMars, 2019). Significant differences existed between groups, with asynchronous participation outperforming synchronous participation, regardless of preference. There were no significant differences between participants participating in the online lecture synchronously based on match or mismatch to the synchronous involvement. Likewise, the same was true for those who participated in the online lecture asynchronously.

<b>Table 8</b>					
<i>Post-Hoc Analysis of Between-Groups Differences</i>					
Group	Comparison	Diff	SE	<i>p</i>	95% CI
Synch-Match	Synch-Mismatch	-9.031	4.290	.167	-20.49, 2.42
	Asynch-Mismatch	-2.512	3.718	.906	-12.36, 7.33
	Asynch-Match*	-16.811	3.126	<.001*	-25.13, -8.49
Asynch-Mismatch	Synch-Match	9.031	4.290	.167	-2.42, 20.49
	Synch-Mismatch	6.519	4.434	.463	-5.28, 18.32
	Asynch-Match	-7.781	3.951	.218	-18.40, 2.84
Synch-Mismatch	Synch-Match	2.512	3.718	.906	-7.33, 12.36
	Asynch-Mismatch	-6.519	4.434	.463	-18.32, 5.28
	Asynch-Match *	-14.299	3.321	<.001*	-23.10, -5.50
Asynch-Match	Synch-Match *	16.811	3.126	<.001*	8.49, 25.13
	Asynch-Mismatch	7.781	3.951	.218	-2.84, 18.40
	Synch-Mismatch *	14.299	3.321	<.001*	5.50, 23.10

*Note.* Diff = mean difference, SE = standard error, *p* = significance level, CI = confidence interval. Group names are listed as *Assignment-Compatibility* whereas “Synch-Match” refers to a synchronous group that was matched to their synchronous preference.

\* Significant difference

## Discussion

Matching or mismatching students' purported lecture preference with lecture participation did not impact educational outcomes. This finding stands in stark contrast to efforts across higher education geared towards tailoring educational delivery to meet student learning preferences.

Method of participation played a significant role in participant success on a multiple-choice examination. As demonstrated by the effect size (.834), participating asynchronously in the provided online lecture appeared to provide a substantial advantage to students when completing the examination.

This study demonstrates the potential for a clear advantage of one method of participation over the other. Yet, while asynchronous lecture participation demonstrated superiority over synchronous lecture participation, these results should not be overgeneralized to all educational programs. The lecture provided as part of this study included minimal interaction between students and instructor. The content was low on Bloom's revised taxonomy (Anderson et al., 2001), mainly requiring rote memorization of concepts. This design was intentional, as it did not compare active learning strategy with passive learning. If extending concepts from this study to the larger educational realm, it is safer to say that asynchronous participation may be a more effective method of online lecture participation than synchronous participation for lectures high in rote memorization, lacking a need for higher order processing.

Instructors should prioritize identifying optimal educational delivery methods based on individualized content rather than student purported learning preference. Some content is more appropriate for asynchronous delivery, while other experiences may benefit from synchronous

interaction. Without guidance from instructors, students may unknowingly self-select suboptimal methods of participation.

### *Limitations*

Concerning the advantage asynchronous delivery provided to students within this study, the timing of the examination in relationship to participation should be acknowledged. While synchronous participants were required to wait three days to take the examination, asynchronous participants could have watched the lecture the day of the examination. This factor was acknowledged during the study design. However, to keep participation methods true to the actual academic environment, this design was preserved. Asynchronous lecture participation typically allows for last-minute consumption of material. Indeed, this factor may impact student decision-making when deciding between synchronous or asynchronous formats. Regardless, it is reasonable to conceive a slight advantage was incurred to asynchronous students simply by reducing the time between content delivery and examination.

Another factor possibly impacting the results of this study is the timing of the lecture. Efforts were made to schedule the synchronous lecture during a week in which distractions such as other examinations or student events were minimal. There is no guarantee each student participating in the synchronous group felt adequate bandwidth to add a lecture to their regular schedule. The asynchronous group may have benefitted from flexibility in planning when the lecture would be watched. On the other hand, this potentially confounding variable may replicate one of the natural differences innate to synchronous versus asynchronous participation.

Finally, the classification of students into dichotomous groups of synchronous or asynchronous preference may not represent the variability of individual preference innate to each student. Preference of participation may depend on the topic's unique qualities, class, instructor,

or countless other variables. Regardless, identifying a significant discrepancy in examination performance between synchronous and asynchronous participants emphasizes the significant impact method of participation can have on student outcomes.

### **Conclusion**

There appear to be underlying differences between synchronous and asynchronous online lectures, resulting in significant differences in student performance. The results of this study do not support basing the method of participation solely on student preference. Instructors should tailor delivery based on lecture content rather than student opinion when deciding to allow for synchronous or asynchronous online lecture participation.

## Chapter 5: Conclusion

The inspiration for this dissertation was the COVID-19 pandemic and subsequent revision of education globally. The sudden transition to online learning for students accustomed to face-to-face instruction revealed frustration from students and instructors alike. The depth of literature establishing online learning as a method at least equally effective to traditional learning (Cook et al., 2008; Lima et al., 2019; McCall, Spencer, Owen, Roberts, & Heneghan, 2018; McCutcheon, Lohan, Traynor, & Martin, 2015; Pei & Wu, 2019) was called into question under the new realities of a world consumed by a pandemic. Frustration among students expecting face-to-face instruction but forced to learn online necessitated an examination of the quality of the online instructional experience during the COVID-19 pandemic. Additionally, a gap in the literature pertaining to factors influencing online lecture preference for students enrolled in traditional programs inspired an exploration of factors impacting decision-making. With higher levels of autonomy comprising online learning, the accuracy in which students self-select learning strategies based on purported *learning styles* was examined. While each paper offers unique individual contributions to online learning among graduate health students, assessed collectively, these papers offer a more holistic understanding of factors impacting student perception of the online experience and student outcomes when learning online.

### Paper One

The purpose of paper one was to appraise graduate health teaching methodology during the COVID-19 pandemic. With a foundation of andragogical assumptions, literature was assessed through lenses of prominent online learning theories including Transactional Distance Theory (M. Moore, 1997) and Community of Inquiry Theory (Garrison et al., 2000). Failure to abide by assumptions of andragogy coincided with poor subjective and objective student

outcomes, whereas efforts to appease the assumptions that make adult learning unique resulted in superior outcomes.

### **Paper Two**

The purpose of paper two was to propose and assess contributing factors that impact student decisions when deciding between method of online lecture participation (synchronous or asynchronous). A better understanding of the factors impacting student decision-making may offer support or opposition to the flexibility innate to online learning. By assessing the survey results, comprised of elements of the Motivated Strategies for Learning Questionnaire (Pintrich et al., 1991), differences between students preferring synchronous versus asynchronous online lecture were assessed. Proposed factors contributing to decision-making included peer learning, time management, and self-efficacy. Analysis via multiple logistic regression revealed predictive ability based on the hypothesis, however, only desire for peer learning played a significant role. Other factors contributing to student preference were explored and significant differences were noted in student perception of convenience, ease of concentrating during lecture, and the role of online lecture within graduate health programs. This paper confirmed part of the hypothesis and introduced additional factors which likely impact students' decisions when choosing between synchronous and asynchronous online lecture.

### **Paper Three**

The purpose of paper three was to clarify the role student preference plays in academic outcomes. Do students know best? Or should course design decisions be made with respect to the qualities of the instruction or content? With an experiment design suggested by Pashler et al. (2008), paper three matched and mismatched students to their purported online lecture preference and tested each student with the same multiple-choice test. This design assessed the

validity of the matching hypothesis, a poorly supported theory resting on the premise that students learn best when instruction is tailored to their individual needs. Independent t-tests revealed a lack of significant difference in test scores between matched or mismatched students with their purported online lecture preference. Additionally, analysis via two-way ANOVA revealed no significant interaction between matching and mismatching and method of participation on examination scores. Notably, students participating via asynchronous online lecture performed significantly better than students participating via synchronous online lecture.

## **Discussion**

Assessed collectively, this dissertation places most of the responsibility for successful education on instructors, emphasizing the importance of understanding student motivation, factors which influence decisions regarding method of participation, and the differences between synchronous and asynchronous lecture. Online educational experiences should strive to appeal to the collective student population rather than the individual student.

This population of students, having elected traditional face-to-face graduate health programs, is different from students described in the literature who choose online or hybrid programs. Largely absent full-time jobs and comprising an age demographic consistent with traditional students, this student population likely makes decisions regarding online learning for different reasons. Student decision-making may not be idealistic in nature, but rather, derive from a desire for peer interaction, convenience, or an attempt to recreate the atmosphere of face-to-face learning.

Method of online lecture delivery has the capacity to significantly impact academic outcomes. Irrespective of the stated preference of students, one method of online participation may offer significant academic advantage over the other. This concept is particularly relevant

considering the lack of evidence supporting matching student preference to lecture delivery.

Instructors should focus on improving the educational experience of the entire class, rather than attempting to individualize delivery methods to cater to student preferences. Additional research is required to explore various teaching styles' impact on shifting the advantage towards synchronous or asynchronous delivery.

### **Conclusion**

Vast differences exist in the quality of the educational experience across graduate health programs, as is true with face-to-face education. Failure to abide by basic assumptions of adult education result in poor educational experiences. Additionally, decisions regarding the method of online lecture participation can have a significant impact on academic outcomes. Depending on content and teaching style, clear advantages exist for synchronous or asynchronous participation but appear to be outside student purported learning preference. Instructors should focus less on appeasing individual student preferences and more on crafting educational experiences that cater to adult learners' collective needs.

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## Appendix A

### Survey

#### Demographic

Name: (blank text box)

Age: (blank text box)

Within the last year, approximately how many hours have you spent watching **synchronous online lecture** each week? (0 hours, 0.1-2.9, 3.0-5.9, 6.0-7.9, > 8 hours)

Within the last year, approximately how many hours have you spend watching **asynchronous online lecture** each week? (0 hours, 0.1-2.9, 3.0-5.9, 6.0-7.9, > 8 hours)

Do you have a full-time job? Yes/No

Did you participate in online lectures prior to the COVID-19 pandemic? Yes/No

.....  
Assessed on the following scale:

1	2	3	4	5	6	7
not at all						very true
true of me						of me

#### Self-Efficacy for Learning and Performance

1. I believe I will receive an excellent grade.
2. I'm certain I can understand the most difficult material presented in the readings.
3. I'm confident I can understand the basic concepts taught.
4. I'm confident I can understand the most complex material presented by instructors.
5. I'm confident I can do an excellent job on assignments and tests.
6. I expect to do well.
7. I'm certain I can master the skills being taught.
8. Considering the difficulty of courses, the teachers, and my skills, I think I will do well.

#### Time and Study Environmental Management

9. I usually study in a place where I can concentrate on my course work.
10. I make good use of my study time.
11. I find it hard to stick to a study schedule. (REVERSED)
12. I have a regular place set aside for studying.
13. I make sure I keep up with the weekly readings and assignments.
14. I attend class regularly.
15. I often find that I don't spend very much time on courses because of other activities.  
(REVERSED)
16. I rarely find time to review my notes or readings before an exam. (REVERSED)

**Peer Learning**

17. When studying, I often try to explain the material to a classmate or a friend.
18. I try to work with other students to complete course assignments.
19. When studying, I often set aside time to discuss course material with a group of students from the class.

**Additional Questions**

20. I choose my method of online lecture participation based on my perception of convenience.
21. I choose my method of online lecture participation based on how I believe I will best learn.
22. I have other life demands that make scheduled sessions difficult to attend.
23. I have trouble concentrating during lecture.
24. I believe online learning should be a part of my graduate program.

**Multiple Choice**

25. Do you prefer to participate in online lectures synchronously or asynchronously?
    - a. Options: synchronously, asynchronously
-