Transitioning to Digital Classrooms at an Academic Medical Center: An Investigation of the Readiness Level of Faculty and the Experiences and Perceptions of Technology Experts

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DEDICATION

This project is dedicated to my family. Over the last three years, my wife, Lisa, and my son, Braden, displayed an enormous amount of patience, even when I displayed very little. I sincerely thank you both. This would not have been possible without your endless support.

I also dedicate this to my father, Ottis, Sr., and my mother, Mae. Although they have both passed away, I still find strength in my memories of them. I know they are looking down from Heaven and are proud of the man I have become. My drive and ambition is a testament to the way they raised me.

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LIST OF ABBREVIATONS

ALP	Active Learning Program
ANCOVA	Analysis of Covariance
APTA	American Physical Therapy Association
BYOD	Bring Your Own Device
CPOE	Computerized Order Entry System
CSCL	Computer-Supported Collaborative Learning
CT	Computed tomography
DHA	Doctor of Health Administration
DIS	Division of Information Systems
EHR	Electronic Health Record
ELC	Education Leadership Conference
eMAR	electronic Medication Administration Record
FDA	Food and Drug Administration
HA	Health Administration
HIIM	Health Informatics and Information Management
HIM	Health Information Management
HS	Health Sciences
HT	Histotechnology
ICT	Information and Communications Technology
IRB	Institutional Review Board
IT	Information Technology
IUPUI	Indiana University – Purdue University Indianapolis
LMS	Learning Management System
MCOATT	Michigan Consortium for Outstanding Achievements in Teaching with Technology
MLS	Medical Laboratory Science
MRI	Magnetic Resonance Imaging
NMT	Nuclear Medicine Technology
OT	Occupational Therapy
PACS	Picture Archiving and Communications System

PT	Physical Therapy
REDCap	Research Electronic Data Capture
RS	Radiologic Sciences
SAS	Statistical Analysis System
SES	Sport and Exercise
SHRP	School of Health Related Professions
SOD	School of Dentistry
SOGS	School of Graduate Studies
SOM	School of Medicine
SON	School of Nursing
SOP	School of Pharmacy
SOPH	School of Population Health
SPSS	Statistical Package for the Social Sciences
TEL	Technology-Enhanced Learning
UC CoN	University of Cincinnati College of Nursing
UMMC	University of Mississippi Medical Center

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ABSTRACT

Today's college students are adult learners who have been raised using technology in their everyday lives, and many of these students utilized some form of computer technology in the classroom during their elementary and high school educations. As a result, students are beginning their college careers expecting that same type of technology use in their secondary education classrooms. By many accounts, universities and colleges are not fully meeting these expectations. However, the digital classroom is a way to reverse this trend. Quantitative data collected from administrators and face-to-face teaching faculty in the School of Health Related Professions (SHRP) on the University of Mississippi Medical Center (UMMC) campus in Jackson, MS identified potential challenges regarding implementation of digital classrooms. Additionally, qualitative data were collected from educational technology experts on the UMMC campus via maximum variation sampling. These experts identified three key themes regarding digital classrooms at SHRP. These themes included the rationale for implementing technology in classrooms, challenges related to the adoption of digital classrooms, and key topics important to the implementation of a digital learning environment. The findings of the study were used to create a resource guide for SHRP faculty interested in transitioning to a digital classroom. Results of the study were also presented to UMMC academic administration.

INTRODUCTION

CHAPTER 1
INTRODUCTION

Advancements in technology have occurred rapidly over the past several years and have ushered in a variety of changes in the professional world. Technological changes in business and health care have resulted in the need for professionals that possess, at a minimum, basic computer skills and knowledge (American Health Information Management Association, 2018; Carter & Veale, 2019; Hilty & DeJong, 2018; Quail, 2015). Opportunities exist to develop these skills in the educational setting; however, in many traditional classrooms, students simply read textbooks, listen to didactic lectures, and take tests (Merrill, 2013). Conversely, integrating technology into classrooms can offer students, faculty, and educational institutions an updated approach to education. Digital classrooms are an opportunity to bridge the gap between education and available technologies. A digital classroom is a paperless, face-to-face classroom environment that utilizes digital educational materials to promote student engagement and collaboration, provide student feedback, and assess student knowledge via students' personal computing devices (De Bonis & De Bonis, 2011; Hofstein et al., 2013; Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010; Wardley & Mang, 2016;). The face-to-face setting differentiates a digital classroom from an online course administered via a learning management system (LMS), such as Canvas.

Background and Significance

In 1968, Malcolm Knowles sought to differentiate between andragogy, the concept of adult learning, and pedagogy, the concept of helping children learn (Merriam, 2001). As a result, andragogy became a key term in separating adult learning from child learning. Knowles stated that adult learners share five key traits:

1. Adult learners are independent and can direct their own learning.
2. Adult learners have life experiences that can contribute to the process of learning.
3. Social roles can affect the learning needs of adults.
4. Adult learners want to be able to apply knowledge to problems immediately.

5. Internal factors are more important than external factors in the learning process.

Knowles later revised his position on andragogy versus pedagogy. Knowles explained that andragogy and pedagogy were a continuum that applied to both adults and children. Andragogy, according to Knowles, was a student-directed form of learning while pedagogy was a teacher-directed form (Blackley & Sheffield, 2015; Merriam, 2001). Multiple learning theories for adult learners were developed based on Knowles' beliefs. These include behaviorism (Clark 2018a), cognitivism (Cullata, 2018), constructivism (Clark, 2018c), and connectivism (Gerard & Goldie, 2016).

Today's college students are all adult learners. These students share a classroom; however, they come from various backgrounds and have different beliefs and needs. Although today's students are very diverse, they share many expectations regarding education. Adult learners desire an educational setting that allows for student autonomy and personal input in the educational process. These students also value close relationships with their faculty (Chen, 2014; MacDonald, 2018). However, student expectations regarding the learning environment are not the only factors that should be considered.

Educational programs should prepare students for their professional roles. Because health care professions are continually adopting new technologies, the use of computers in the clinical environment is becoming more commonplace. As a result, health care professionals may be required to access and utilize website information, study electronic educational materials, and use various digital technologies. Group chats and social media networking are common. Furthermore, many health care professionals utilize mobile devices for patient monitoring and reporting (Hilty & DeJong, 2018). Additionally, nurses and other medical professionals must utilize various computer skills for documentation in patients' electronic health records (EHR). In today's health care setting, proper and accurate documentation is of utmost importance (Quail, 2015). The field of diagnostic imaging also provides an example of increased reliance on technology. The days of radiographic film and chemical processing have passed. Today, radiologic technologists acquire digital diagnostic images that are sent to the picture archiving and communications system (PACS) where they are modified via computer algorithms,

viewed on a computer screen, and manipulated with a keyboard and mouse (Carter & Veale, 2019). Each of the previous tasks require basic computer knowledge and skills; therefore, it is important that educational programs incorporate computer skills into their curriculum.

Benefits of Digital Classrooms

Some believe that digital classrooms are more suitable for today's college students because they provide an adult-centered, andragogic approach to learning as opposed to the relatively child-centered pedagogical approach of traditional classroom settings (De Bonis & De Bonis, 2011; Kong & Song, 2013). Sogunro (2015) found that adult learners prefer a learning environment that includes high quality instruction, interactive classrooms, timely feedback, and a self-directed pace. According to Rashid and Asghar (2016), technology, student engagement, and self-directed learning are interconnected. Specifically, increasing the use of technology in the classroom leads to increased student engagement that can develop into self-directed learning (Rashid & Asghar, 2016). Simply stated, digital classrooms may satisfy Knowles' vision of adult learning by promoting an educational setting in which learning is more self-directed than teacher-directed (Merriam, 2001).

Digital classrooms offer faculty flexibility regarding the types of educational materials employed in the classroom. As a result, various learning tools may be used to satisfy each level of learning for different learning styles. Visual learners may benefit from videos and digital handouts. Auditory learners may appreciate group discussions and narrated demonstrations. Kinesthetic learners would likely enjoy computer games and simulations (Project Life, n.d.). Print learners can write digital notes in order to promote learning. Tactile learners, who like to avoid written directions, would benefit from digital simulations. Finally, interactive learners may be stimulated by online wikis and group discussions (Calvert, 2019).

Digital classrooms also provide faculty the opportunity to increase student engagement via the use of digital technologies and educational materials (Hofstein et al., 2013; Hughes, Bradford, & Likens, 2018). The use of technology-enhanced instruction also promotes communication, collaboration, and critical thinking among students. For instance, communication may be improved using blogs and interactive tutorials (Hughes

et al., 2018). Student collaboration may be encouraged by creating student groups whose computers are networked together so that each student may contribute to assignments simultaneously (Deveci, Dalton, Hassan, Amer, & Cubero, 2018). Critical thinking may be improved due to a student's ability to locate information quickly through an electronic library or various internet sites (Hughes et al., 2018). As a result, students often experience improved outcomes (Habler, Major, & Hennessy, 2016; Ozerbas, M. A., & Erdogan, B. H., 2016). A digital classroom also allows for computer-supported collaborative learning (CSCL) and interactive educational games. The use of such activities has shown the ability to improve students' assessment scores (Schleisman et al., 2018; Yang, Ghislandi, & Dellantonio, 2018). According to Deveci et al. (2018), digital classrooms allow faculty to adapt teaching styles based on students' desired learning styles, different needs, and classroom feedback. Faculty are also able to adjust teaching materials on shorter notice when compared to traditional classroom settings.

Studies have shown that the educational institution also experiences benefits because digital classrooms have the potential to be more cost-effective than traditional paper-based classrooms (Arney, Jones, & Wolf, 2012; Livas, Katsanakis, & Vayia, 2019). Furthermore, multiple studies have demonstrated that students express satisfaction with the use of computers in the classroom and feel digital classrooms promote a more interactive learning experience. Students also feel the digital classroom is a practical way to learn and increases their engagement (Chou, Chang, & Lin, 2017; Hofstein et al., 2013; Rossing, Miller, Cecil, & Stamper, 2012; Wardley & Mang, 2016).

Challenges of Digital Classrooms

There are challenges when transitioning to digital classrooms. For instance, use of computers in the classroom may create distractions for students and result in cyber-slacking (Flanigan & Kiewra, 2018). Tas (2017) states that educators must constantly learn and adapt to new technologies in order to incorporate them into the classroom setting. However, getting faculty buy-in can be a challenge due to the time and effort necessary to convert paper-based teaching materials into a digital format (Hesser & Schwartz, 2013; Stec, Bauer, Hopgood, & Beery, 2018). Finally, physical facility factors, such as the availability of a reliable Wi-Fi connection, an adequate number of

power outlets, and proper lighting schemes, must be considered (Deveci et al., 2018; Tas, 2017).

Various research studies have demonstrated that students express concerns regarding certain aspects of digital classrooms. For instance, a study conducted by Santos, Bocheco, and Habak (2018) revealed some students view electronic devices in the classroom as a distraction. The distractions caused some students to pay less attention during lectures and others were unable to finish assignments due to their device. Other students feel that traditional educational tools, such as paper, pencil, and textbooks, cannot be replaced completely and are sometimes necessary in the learning environment (Kontkanen et al., 2017).

An Example at the School of Health Related Professions

The Radiologic Sciences faculty at the School of Health Related Professions (SHRP) on the University of Mississippi Medical Center (UMMC) campus are transitioning to a computer-enhanced teaching environment. Radiologic Sciences faculty require its students to bring their own personal computing device to classes to take notes and complete assignments. Personal communications with Radiologic Sciences faculty in SHRP appear to support the literature regarding benefits and challenges of a digital classroom.

Radiologic Sciences faculty stated that digital assessments and tests administered via Canvas, Respondus Lockdown Browser, and ExamSoft are more efficient, compared to paper tests. Furthermore, digital assessments allow for immediate feedback to students. Using computers in the classroom promotes a conversion to electronic textbooks and creates the avenue for utilizing new teaching technologies. Radiologic Sciences faculty also claimed a reduction in the time necessary to prepare for classes. This efficiency is primarily due to the decreased need to print materials and manually grade tests. Another benefit mentioned by Radiologic Sciences faculty was the decreased use of paper, printing supplies, and Scantron forms. This is a direct result of less need to print educational materials such as PowerPoint presentations, worksheets, and tests (Radiologic Sciences faculty, personal communication, January 24, 2019).

Radiologic Sciences faculty at SHRP conducted a survey in November 2018 to determine its students' views regarding the digital classroom environment. Radiologic

Sciences faculty surveyed 24 of the program's students after their first semester in a digital classroom. Approximately 63% of the students surveyed either agreed or strongly agreed that they felt comfortable in the digital classroom setting (Figure 1). Additionally, 88% were comfortable with their ability to operate their devices and their ability to operate necessary software. Furthermore, 88% of students felt the digital classroom environment leads to more opportunities to collaborate with peers, 83% cited improved personal organization skills, and 58% stated the digital classroom might improve computer skills needed for future careers (Street et al., 2018).

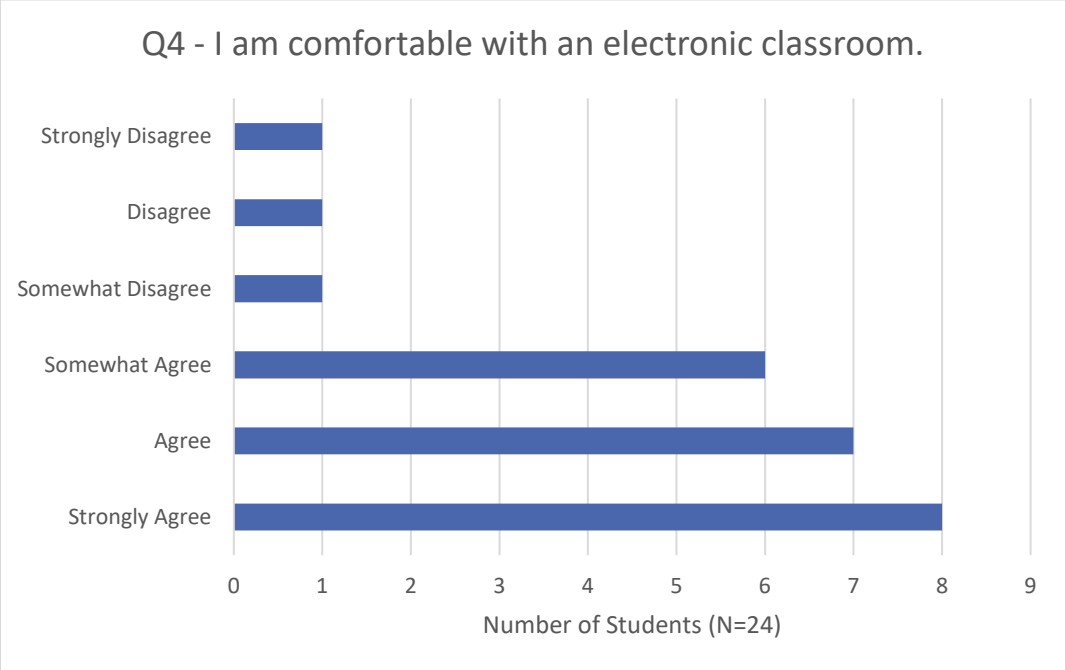


Figure 1. Digital Classroom Comfort Level of RS Students. This chart illustrates the digital classroom comfort level of Radiologic Sciences students at the School of Health Related Professions (Street et al., 2018).

Radiologic Sciences faculty mentioned several challenges that closely mirror the findings from the literature. First, faculty had to identify ways for students to download presentations and worksheets, take notes on them, and upload them for assessment. The second challenge is the time necessary to convert educational materials and assessments to a digital format. It was discovered that not all examinations and knowledge assessments are reproduced easily in a digital format. The third challenge involves the physical layout of classrooms. The use of personal computing devices requires multiple

power outlets, which are not available in every classroom (Radiologic Sciences faculty, personal communication, January 24, 2019).

Radiologic Sciences faculty in SHRP discovered that its students' concerns regarding digital classrooms mirrored many of the concerns identified in the literature. The results of the student survey conducted by the Radiologic Sciences faculty in SHRP (Street et al., 2018) supported this. The survey results were mixed regarding the effect digital classrooms have on study skills and student engagement. Approximately 54% of Radiologic Sciences students agreed or strongly agreed that the use of an electronic device improves study skills, while only 50% of the Radiologic Sciences students surveyed felt more engaged in class (Figure 2).

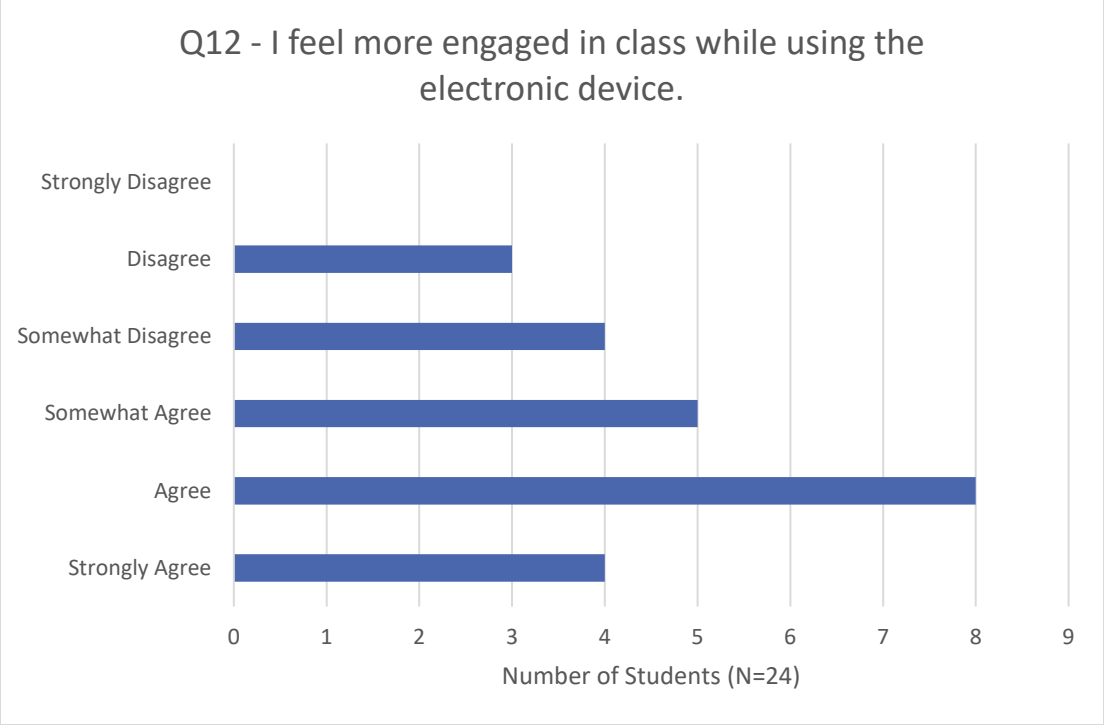


Figure 2. Digital Classroom's Effect on Engagement of RS Students. This chart illustrates the digital classroom's effect on student engagement according to Radiologic Sciences students at the School of Health Related Professions (Street et al., 2018).

The majority of negative responses corresponded to electronic testing. While most Radiologic Sciences students are comfortable with digital worksheets and PowerPoint presentations, many stated they prefer paper examinations to electronic examinations.

The following quotes were taken directly from the Radiologic Science program's Device Study (Street et al., 2018).

- "I enjoy doing worksheets and being able to write my notes on my device; however, I hate having tests online."
- "I don't think tests should be taken electronically, but taking notes and looking at notes are completely okay."
- "The only thing I don't like about the devices is taking tests on them."
- "Honestly, I prefer having things on paper over an electronic device. Tests are better on paper because I can write and mark over them. Studying on the computer also doesn't work as well for me as it does on paper."

Statement of the Problem

Advancements in technology have created opportunities for faculty in face-to-face classroom environments to transition to digital classrooms. In a digital classroom, as defined in this study, students bring their own portable computer or tablet to each class creating a one-to-one technology-enhanced learning environment (1:1 TEL) that is also paperless. Students use their computers to view digital presentations, read textbooks, complete educational activities, and complete course assessments and examinations. Although most of today's students are familiar with computer technologies, transitioning to digital classrooms is not a simple process. Additionally, there is limited information detailing the steps necessary to transition to a digital classroom in a setting such as SHRP, which is home to multiple allied health programs. Furthermore, the readiness of faculty, along with reported experiences from educational technology experts, must be considered when converting to a less traditional educational setting.

Purpose of the Study

The purpose of this study is to address SHRP faculty and administrators' readiness to adopt digital classrooms, their desire to modify current instructional designs, and to identify educational technology experts' perceptions and experiences regarding digital classrooms. This study utilized a two-phase, sequential mixed methods research design. During the quantitative phase of the study, a questionnaire was used to collect questionnaire data from teaching faculty and administrators in SHRP. During the second phase of the study, qualitative data were collected via educational technology expert

interviews. In the context of this research project, educational technology experts are considered the educational technology experts of each school on the UMMC campus. This group consists of faculty, staff, administrators, and instructional designers employed by UMMC to provide support for students and faculty who are incorporating or utilizing technologies in the classroom. Each of these individuals is familiar with the most commonly used classroom formats in his or her particular school. Furthermore, each educational technology expert has knowledge that would benefit the transition to a digital classroom format. As such, educational technology experts will be familiar with actions that may or may not work during the transition from a traditional classroom setting.

The UMMC campus is composed of the School of Medicine (SOM), the School of Nursing (SON); the School of Pharmacy (SOP), the School of Population Health (SOPH), the School of Dentistry (SOD), the School of Graduate Studies (SOGS), and the School of Health Related Professions (SHRP) (University of Mississippi Medical Center, n.d.a). The School of Health Related Professions houses multiple programs including Health Sciences (HS), Health Administration (HA), Health Informatics and Information Management (HIIM), Histotechnology (HT), Magnetic Resonance Imaging (MRI), Medical Laboratory Sciences (MLS), Nuclear Medicine Technology (NMT), Occupational Therapy (OT), Physical Therapy (PT), and Radiologic Sciences (RS) (University of Mississippi Medical Center, n.d.b). The variety of schools on the UMMC campus is comparable to the variety of educational programs located within SHRP; therefore, qualitative results from educational technology expert interviews should be generalizable to SHRP. Additionally, the schools on the UMMC campus have faced unique challenges utilizing technologies in the classroom. Qualitative data acquired via educational technology expert interviews played an important role in explaining viable methods that faculty and administration in SHRP may utilize to transition to digital classrooms.

Questions to Be Answered

This research study utilized a mixed method design to answer the following questions.

1. How do faculty and administrators in SHRP rate their readiness to transition from a traditional classroom setting to a digital classroom setting?
2. What are UMMC educational technology experts' experiences and perceptions of transitioning from a traditional classroom setting to a digital classroom setting?
3. Based on integrated quantitative and qualitative data analysis, "what strategies might be beneficial if SHRP elects to transition to digital classrooms?"

Definition of Key Terms

The following are general definitions of terms utilized in this project. The researcher provided all definitions not supported by citations.

Andragogy: the theory of adult learning (Pappas, 2015).

Canvas: the learning management system (LMS) utilized on the UMMC campus.

ClickShare: a wireless presentation system developed by Barco (Barco, 2019).

Digital Classroom: a face-to-face learning environment that has transitioned to a one-to-one technology-enhanced learning (1:1 TEL) environment. In this setting, each student is responsible for acquiring a computing device, such as a laptop or tablet, which meets specific requirements set forth by each program's faculty.

ExamSoft: ExamSoft Worldwide's electronic assessment software for educational programs (ExamSoft Worldwide, 2019).

Flipped Classroom: an educational setting in which the student learns the given material prior to attending class; class time is utilized to reflect on learning and further develop concepts (Eaton, 2017).

Nearpod: Nearpod's digital application/software that offers educators the ability to create electronic, interactive lessons using current computer technologies (Nearpod, n.d.).

Notability: Ginger Lab's proprietary note-taking application/software used with Apple devices (Ginger Labs, 2018).

One-to-One Technology-Enhanced Learning Environment (1:1 TEL): a method of integrating information and communications technology (ICT) into the classroom

environment. In a 1:1 TEL setting, each student has his or her own computing device (Blackley & Walker, 2015).

OneNote: Microsoft's proprietary digital notebook application /software (Microsoft, 2019).

Pedagogical: "a child-focused teaching approach" (Pappas, 2015).

Picture Archiving and Communications System (PACS): groups of computers, archives, and servers networked together in order to manage digital radiographic images (Carter and Veale, 2019).

Research Electronic Data Capture (REDCap): Research Electronic Data Capture is a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources (Harris et al., 2009).

Respondus Lockdown Browser: Respondus' lockdown browser developed for use with proctored electronic examinations (Respondus, 2019).

Traditional Classroom: a face-to-face classroom environment in which the teacher is the focal point of learning; the teacher lectures, the students take notes; educational materials and knowledge assessments are most often in paper form.

Possible Applications of Findings

The target audience for this study includes faculty and administrative personnel in the allied health programs that embody SHRP. Multiple studies have demonstrated the advantages and challenges of the use of computers in a digital classroom; however, few describe their use in a teaching facility as diverse and interprofessional as SHRP. Results from the quantitative and qualitative phases of this study were used to establish an interest in digital classroom at SHRP and to create a digital classroom implementation resource guide. Digital classrooms in SHRP have the potential to improve students' academic performance and better prepare them for newer technologies utilized in today's health care field. Faculty could potentially reduce the time spent preparing for classes and grading tests. Likewise, SHRP may be able to limit operational costs due to less printing and a reduced need for associated supplies. Based on a personal conversation

with SHRP's Supervisor of Business Operations, this could save the school approximately $35,000 to $50,000 annually (R. Willis, personal communication, June 4, 2018).

Summary

Evolution of technology has resulted in changes in students' attitudes regarding education. Likewise, employer expectations have changed. Today's students are accustomed to having portable digital devices as part of their everyday lives, and digital classrooms incorporate those devices into the learning environment. Digital classrooms offer multiple benefits. Studies demonstrate that students are more engaged (Hofstein et al., 2013; Hughes et al., 2018), utilize increased critical thinking skills (Hughes et al., 2018), and produce better outcomes in digital classrooms (Habler et al., 2016; Ozerbas & Erdogan, 2016). When learning occurs in a digital environment, educators are better able to adapt their educational materials and make changes on shorter notice (Deveci et al., 2018). Educational facilities benefit by reducing costs associated with learning materials (Arney et al., 2012; Livas et al., 2019). However, there are also challenges regarding digital classrooms. Studies have noted an increased opportunity for student distractions and cyber-slacking (Flanigan & Kiewra, 2018), challenges associated with faculty buy-in (Hesser & Schwartz, 2018; Stec et al., 2018), and physical facility factors that must be addressed (Deveci et al., 2018; Tas, 2017). Therefore, faculty readiness and educational technology expert experiences should be studied before a transition to digital classrooms occurs.

REVIEW OF THE LITERATURE

CHAPTER II

LITERATURE REVIEW

Over the past decade, technology has advanced rapidly. With these advancements come changing requirements in business and health care. Health care employers need employees with, at the very least, basic computer skills (American Health Information Management Association, 2018; Carter & Veale, 2019; Hilty & DeJong, 2018; Quail, 2015; Robinson, Estes, & Knapfel, 2014). Educational programs, such as those housed in SHRP on the UMMC campus, provide the opportunity for students to develop clinical skills as well as the technical skills needed for professional success (UMMC, n.d.a). Incorporating new computer and educational technologies into the classroom may provide tools to enhance learning and prepare students for professional careers.

The Current Educational Setting

Today's students are diverse in many ways, including background, personal experiences, beliefs, and needs. However, these adult learners want an educational setting that provides autonomy, student-faculty relationships, and input in the education process (Chen, 2014; MacDonald, 2018). Furthermore, there are multiple learning theories that may be utilized in curriculum design. These theories are multifaceted and no single theory is best for all students; therefore, classroom design and instruction should be fluid and adaptable to meet the diverse needs of each student.

Theories of Learning

Learning may be defined as an acquisition of knowledge via teaching, instruction, study, or personal experiences (Clark, 2018a). Furthermore, learning is influenced by changes in an individual's environment, and it continues to be a primary focus of psychological research. As a result, multiple theories have been developed to better define the concept of learning (Houwer, Barnes-Holmes, & Moors, 2013).

Bloom's taxonomy. According to Krathwohl (2002), Benjamin Bloom divided the cognitive domain into six ordered categories: knowledge, comprehension, application, analysis, synthesis, and evaluation. Knowledge is the simplest and most concrete cognitive domain, while evaluation is the most complex and abstract domain. Bloom believed an individual had to master a category before moving to a more complex one. Bloom divided each category, except for application, into subcategories. Knowledge was

divided into the subcategories of specifics, ways and means of dealing with specifics, and universals and abstractions in a field. This category focused primarily on terminology, facts, conventions, trends and sequences, classifications and categories, criteria, methodology, principles and generalizations, and theories and structures. Comprehension was divided into translation, interpretation, and extrapolation. Analysis encompassed analyses of elements, relationships, and organizational principles. Synthesis pertained to production of a unique communication, plan, or proposed set of operations and determining abstract relationships. Evaluation was subdivided into evaluation and judgements based on internal evidence and external criteria (Krathwohl, 2002).

Kidwell, Fisher, Braun, and Swanson (2013) described Anderson's revision of Bloom's taxonomy. The six revised categories include remember, understand, apply, analyze, evaluate, and create. As with Bloom's original taxonomy, each category builds upon the previous one and complexity increases throughout the hierarchy. Remembering focuses on definitions, lists, matching, and identification. It is viewed as the first step in learning. Remembering leads to understanding, which is the ability to summarize, interpret, compare, and explain information. Applying is the ability to use acquired knowledge in appropriate situations. The individual is also able to extrapolate ideas and meaning from information. Analyzing is the individual's ability to distinguish fact from fiction and to identify relationships among information and ideas. Evaluating requires that an individual judge the information given and determine its value for a particular purpose. Individuals can identify inconsistencies and fallacies in the data. Creating is the final category in Anderson's revision of Bloom's taxonomy. It is considered the highest level of learning and requires individuals to synthesize small bits of data or information and connect them in a pattern that was not evident (Kidwell et al., 2013).

Behaviorism. Behaviorists view learning as the acquisition of new behaviors. According to this theory, learning is the product of conditioning, or a response to a stimulus. Behavioral theorists focus on observable variables; therefore, thinking and mental activities are not emphasized in the learning process. Behaviorists focus on two types of conditioning: classic conditioning and operant conditioning. Classic conditioning consists of four phases: acquisition, extinction, generalization, and discrimination. The initial response to a stimulus is learned during the acquisition phase.

If this pattern of stimulus and response is not repeated, over time it will be forgotten. This is known as extinction. The final two phases are used by behaviorists to explain how knowledge is transferred within learners. Generalization is the belief that a conditioned response may occur with a stimulus similar to the original one. Discrimination is the opposite and states a conditioned response might occur with one specific stimulus but not with similar stimuli (Clark, 2018a).

Behaviorism has its place in health care education. According to behaviorists, learning is believed to be based on the development of technical skills and competencies. Behaviorism follows a teacher-centric approach in which the faculty member manipulates the learning environment in order to elicit specific responses from learners. This theory of learning is based on three fundamental beliefs. First, observable behavior is the sole focus. Second, the learner's environment shapes his or her behavior. Third, behaviors learned must be reinforced. Behaviorism is often employed in the clinical learning environment, laboratory settings, and case studies (Torre, Daley, Sebastian, & Elnicki, 2006).

Incorporating computers in the classroom may enhance the development of students' computer and technical skills, while offering faculty a digital avenue to present various learning materials. For instance, ClickShare is a wireless presentation system that allows students to interact with faculty's visual presentations (Barco, 2019). OneNote (Microsoft, 2019) and Notability (Ginger Labs, 2018) allow students to take digital notes during lectures. These technologies allow faculty to be the center of information delivery while actively engaging students.

Cognitivism. Cognitivism follows an andragogic approach to education, which is a learning philosophy that states adult learners are self-directed and take responsibility for their decisions (Culatta, 2018). Conversely, traditional educational settings often utilize a pedagogic approach that places faculty at the center of the learning process (De Bonis & De Bonis, 2011; Kong & Song, 2013). Additionally, cognitive learning focuses on mental activities such as perceiving, remembering, thinking, reasoning, interpreting, and problem solving (Swanwick, 2005). Cognitivists feel humans are not programmed merely to react to environmental stimuli; instead, humans learn through interaction and are capable of rational thought. In the educational setting, cognitive learners are active

participants in the learning process and seek ways to interpret the information presented. Although the learners are active members of the learning process, information is still delivered via a teacher-centric approach (Clark, 2018b). Furthermore, learning is the direct result of an individual's ability to apply knowledge to various contexts. The faculty's goal is to deliver the appropriate knowledge and information in the most efficient way possible. This entails simplification or simplifying knowledge into basic building blocks of information. Assimilation of simplified information is believed to be quicker and easier than assimilating complex theories (Ertmer & Newby, 2013).

The learning environment plays an important role in cognitivism because it facilitates learning. Faculty deliver knowledge and information through demonstrations, illustrations, and instructional explanations. Corrective feedback is vital (Ertmer & Newby, 2013). Digital technologies, such as Nearpod, ClickShare, and Respondus, provide faculty with tools that may meet the needs of cognitive learners. Nearpod is a digital application in which faculty utilize computers and networks in order to create interactive educational content for students. Such content includes slide presentations, quizzes, and student developed illustrations (Nearpod, n.d.). ClickShare, as previously mentioned, is a wireless presentation tool (Barco, 2019). Respondus is a digital assessment tool with the ability to lock down students' web browsers, proctor examinations via web cameras, and provide immediate feedback to students (Respondus, 2019). ExamSoft is another digital assessment tool that provides immediate feedback to students (ExamSoft Worldwide, 2019).

Constructivism. Constructivism tends to focus on the ways an individual's knowledge is constructed. Learners utilize personal perceptions and experiences to link new information with existing information. Unlike behaviorism and cognitivism, constructivism denotes a learner-centric philosophy. Learners take on the personal responsibility of discovering relationships and facts. Therefore, faculty present information that will guide the learner to self-discovery of pertinent information. It is believed constructivism promotes active engagement, autonomy, creativity, and problem-solving skills. The learning experience may be tailored to each individual student (Clark, 2018c).

In a constructivist-learning environment, instruction is focused more on learning than teaching. The transfer of information is an active process in which the learner is required to analyze and interpret given facts. The faculty's role in a constructivist-learning environment is two-fold. Faculty guide the learners in constructing meaning from the given information. Faculty must also design learning experiences that foster constructive learning. Apprenticeships and residencies are common examples of constructivism. In these settings, learners are acquiring, interpreting, and transforming information based upon personal experiences (Ertmer & Newby, 2013).

The flipped classroom may create a learning environment beneficial to constructivists. In a flipped classroom, learning takes place prior to attending class. Time in class is spent reflecting on the materials learned. Students are active participants in the learning process and faculty are facilitators of learning. The goal of the flipped classroom is to engage students in higher order learning (Eaton, 2017). This type of learning environment requires students to access information away from school. This may be accomplished via personal computers and tablets. These same devices may then prove beneficial in the classroom.

Knowles' theory of andragogy. Andragogy is the principle of adult, learner-focused education (Blackley & Sheffield, 2015). Knowles (1984) expanded upon the andragogy concept and described five characteristics that are important to adult learners: self-concept, experience, readiness to learn, orientation to learning, and motivation to learn. According to Knowles (1984), self-concept is the belief that an individual desires self-direction as he or she matures. Furthermore, adults use personal experience as a resource to improve learning. Additionally, adults appear more ready to learn due to their needs to develop tasks pertinent to their social roles (Knowles, 1984). In other words, adults want to learn information that may be applied to real world problems (Cox, 2015). Knowles (1984) described orientation to learning as a shift from subject-centered learning to problem-centered learning and the belief that knowledge gained should be applied immediately. Finally, as an individual matures, the motivation to learn is a byproduct of internal desires as opposed to external forces (Knowles, 1984). Knowles later expanded his definition of andragogy and pedagogy. According to Knowles, andragogy is a style of self-directed learning that is more typical of adult learners.

Conversely, pedagogy is teacher-directed learning which is more suitable for children (Merriam, 2001).

Andragogy focuses on deep learning skills important to adult learners. These include higher-order thinking, reflection, communication, peer-to-peer collaboration, and feedback (Blackley & Sheffield, 2015). Technology in classrooms may help foster deep learning in adult students. On-line blogs, wikis, or journals may be used to improve reflection and communication. Previously mentioned tools, such as Nearpod, ClickShare, Respondus, and ExamSoft, may also prove beneficial (Barco, 2019; ExamSoft Worldwide, 2019; Nearpod, n.d.; Respondus, 2019).

Connectivism. Connectivism is described as a "network phenomenon" in which learning is influenced heavily by technology and socialization. According to this theory, diversity of opinion is important and the "capacity to know is more critical than what is currently known" (Gerard & Goldie, 2016, p. 1064). Connections, both technical and social, are fundamental components of learning and all learning activities should focus on cultivating accurate, current knowledge. Participant autonomy is of great importance (Gerard & Goldie, 2016).

Bell (2011) described the adoption of Web 2.0 technologies in the classroom as a form of connectivism, and as universities and colleges continue to improve their networking capabilities, the use of connectivism in the traditional classroom should increase. The use of Nearpod, ClickShare, Respondus, and other digital educational materials in the classroom promote the connectivism learning philosophy (Nearpod, n.d.; Barco, 2019; Respondus, 2019). Currently, connectivism is used largely in on-line college and university courses due to increased availability and reliability of home internet services (Gerard & Goldie, 2016).

Learning Styles

Learning theories are important; however, learning styles and learning levels must also be considered. According to Project Life (n.d.), three learning styles describe today's students: visual learners, auditory learners, and kinesthetic learners. Additionally, each learning style should address all four levels of learning. The four levels of learning, listed from lowest to highest, include "awareness, knowledge and understanding, knows how to apply, and can or is able to" (Project Life, n.d.). Calvert (2019) mentions three

additional styles of learning that are utilized by adult learners. These additional learning styles include print learning, tactile learning, and interactive learning.

Visual learners. As the name implies, visual learners like things they can see. Assignments and educational materials that include handouts, posters, and pictures may be used to satisfy the awareness level of learning. Videos, mind maps, and computer games are helpful with knowledge and understanding. Assignments including case studies, demonstrations, and visual presentations demonstrate a student knows how to apply information. The "can or is able to" learning level may be reached using role-play and simulations (Project Life, n.d.).

Auditory learners. Auditory learners learn from hearing and talking. They typically appreciate small group discussions. Lectures, recordings, and panel discussions are useful assignments when focusing on the awareness learning level. Knowledge and understanding may be accomplished through the use of debates, storytelling, and brainstorming. Students must know how to apply information when completing assignments such as oral presentations, narrated demonstrations, and case study discussions. Finally, role-play, simulations, and experiments help students reach the "can or is able to" level of learning (Project Life, n.d.).

Kinesthetic learners. Kinesthetic learners prefer hands-on learning activities. Computer games are good tools to demonstrate student awareness. Demonstrations, puzzles, and crafting activities promote knowledge and understanding. Creating models, conducting demonstrations, and case studies show students know how to apply information. Role-play, simulations, and experiments are used to prove that students are able to apply learned information to various situations (Project Life, n.d.).

Print learners. According to Calvert (2019), print learners prefer to learn by writing information in the form of notes. These learners tend to write down everything they can. They take a substantial amount of notes; however, they may never read everything they have written (Calvert, 2019). Digital notetaking software is designed with the print learner in mind. Digital notebooks typically contain unlimited space, and handwritten notes are generally searchable (Microsoft, 2019).

Tactile learners. Tactile learners must complete tasks in order to learn information. These learners prefer a hands-on approach and are less likely to appreciate

written information. Tactile learners tend to begin a project or process and learn the nuances of the assignment as they work through it (Calvert, 2019). Digital and online simulations, digital laboratory experiments, and computer games may be used as hands-on assignments for tactile learners to apply information and knowledge.

Interactive learners. Interactive learners prefer group settings and expect to learn concepts through discussion. These learners are fond of discussion boards, wikis, and question and answer forums (Calvert, 2019). These tasks can be accomplished in a digital setting. Discussion board assignments can be managed and assessed through a learning management system, such as Canvas. Wikis can be created and shared via digital software, such as Google Docs. Additionally, question and answers sessions can be incorporated into lectures with various digital tools. These digital solutions offer immediate feedback to the student and can prompt open discussions regarding topics at hand.

The Traditional Classroom

Blackley and Sheffield (2015) described the traditional educational setting as a content-centered, surface level pedagogic approach that does not adequately develop skills needed in the professional world. Kivunja (2014) conducted a review of the literature produced by leaders in the education field. The purpose of the literature review was to identify theoretical perspectives of how digital natives learn and how faculty can facilitate the learning process. According to the literature, today's typical learning environment is a reflection of classrooms of the past because education continues to operate the same way it always has. Educational programs follow the TTWWADI approach in that they continue to do things the way they do because "That's The Way We've Always Done It" (Kivunja, 2014). According to Merrill (2013), classrooms of the past demonstrate characteristics that are not well suited for students of today. The learning environment has centered on the educator, while students work in isolation. Curricula can be fragmented and learning passive. Printed textbooks, assignments, and assessments are the primary media utilized to convey information and lessons are usually time-based (Merrill, 2013). Finally, Merrill (2013) described the traditional classroom as an educational setting that focuses primarily on assessing students' knowledge based on the lower levels of Bloom's taxonomy.

Technology in Health Care

The development of powerful computers has been a driving force in health care's adoption of new technologies (Bhavnani, Narula, Partho, & Sengupta, 2016; Thimbleby, 2013). One major development was the creation of electronic health records (EHR). This health care tool spawned multiple systems that are important today (Banova, 2018). Computers are becoming portable and more powerful; consequently, their roles in health care are expanding (Banova, 2018; Bhavnani et al., 2016; Morilla, Sans, Casasa, & Gimenez, 2017; Saleem, Savoy, Etherton, & Herout, 2018; Thimbleby, 2013).

Technologies of Health Care's Past

The turn of the century introduced several advancements in health care. Multiple computer-based systems, such as EHRs, computerized order entry systems (CPOEs), and electronic medication administration records (eMARs), were developed over this period of time (Bates, 2002), and these systems are heavily utilized today. At the time, these changes, particularly EHRs, had a profound effect on the computer skills that health care providers needed. According to Robinson et al., (2014), "the American Association of Colleges of Nursing Essentials of Master's Education require advanced practice nursing students to be familiar with electronic technologies and consult with other disciplines to coordinate care" (p. e93). Specifically, Essential V: Informatics and Healthcare Technologies addresses the importance of communication technologies in the care of patients (Robinson et al., 2014).

The Radiologic Sciences profession has moved from an analog world of film to a digital world composed of computed radiography and direct radiography. Radiologic technologists are expected to send and retrieve radiographic images to and from the picture archives and communication system (PACS), adjust image brightness and contrast using computerized algorithms, and enter and complete orders in a patient's EHR (Carter & Veale, 2019). Furthermore, in February 2011, the Food and Drug Administration (FDA) cleared a diagnosis software application developed by MIM Software Inc. This application made it possible to diagnose nuclear medicine, magnetic resonance imaging (MRI), and computed tomography (CT) images using Apple's iPad or iPhone. In 2016, the Consolidated Appropriations Act was passed to reduce reimbursements to health care facilities that are not performing digital flat panel imaging.

Facilities that were not in compliance by the year 2018 suffered a 7% reduction in reimbursements by Medicare. Facilities not in compliance by the year 2022 will incur a 10% reduction (Carter & Veale, 2019).

Professionals in the health information management (HIM) field acquire, analyze, and protect digital and written medical information. Today, the profession relies heavily on information technology (IT). Therefore, HIM professionals are highly trained in computer and information technologies. Advancements in technology expand the HIM field and the roles of its professionals. Professionals in this field must constantly adapt to new ways to store, capture, and access information electronically (American Health Information Management Association, 2018).

Technologies of Health Care's Future

Technology continues to evolve and its use in health care is expanding (Banova, 2018; Bhavnani et al., 2016; Morilla et al., 2017; Saleem et al., 2018; Thimbleby, 2013). Banova (2018) credits EHRs as the avenue for health care's rapid technological advancements. These advancements include big data, cloud computing, information and communication technologies, telemedicine, and health care mobility. The introduction of EHRs resulted in the ability to access electronic data not previously accessible. These data may be analyzed via adaptive computer algorithms and artificial intelligence. They are then referred to as big data. Big data may be used to predict future diseases and preventable deaths, improve quality of life, develop new treatments and personalized medicine, and improve health care outcomes (Banova, 2018; Thimbleby, 2013). All the data acquired requires significant storage space. This burden may be lessened by cloud storage (Banova, 2018).

Telemedicine and electronic health (e-health), defined as the delivery of health care via the internet, are continuing to introduce mobile devices into health care (Banova, 2018; Morilla et al., 2017). As a result, health care providers and patients are accessing and utilizing mobile health (mhealth) via smartphones, webcams, email, and wireless telemetry systems to share information (Banova, 2018). Mobile health technologies include smartphone-connected rhythm monitoring devices, wearable sensors, lab-on-a-chip monitors, and ingestible and implantable sensors (Meetoo, Rylance, & Abuhaimid,

2018). Because health care is implementing computer technologies at a rapid pace, the use of digital technologies in the educational setting is becoming more important.

Using Technology in the Educational Setting

Students of the current generation are raised with technology (Sedden & Clark, 2016) and employers expect their employees to possess computer skills; therefore, it is imperative that educational programs incorporate technology into their curricula (Robinson et al., 2014). Using technology in the classroom creates an opportunity to achieve the four levels of learning (awareness, knowledge and understanding, knows how to apply, and can or is able to) for each type of learner: visual, auditory, kinesthetic, print, tactile, and interactive (Calvert, 2019; Project Life, n.d.). Technology tools available to take advantage of this opportunity include e-textbooks, digital presentations, narrated presentations, digital worksheets, digital simulations, group discussions, case studies, role-playing scenarios, digital notetaking, and immediate feedback regarding knowledge assessments (Project Life, n.d.).

There are several approaches to infusing classrooms with newer computer technologies. These include online courses, active learning programs (ALP), Microsoft and Apple designated schools, bring your own device (BYOD) classrooms, and digital classrooms. Each of these technology-enhanced classrooms creates an environment that promotes self-directed learning (Rashid & Asghar, 2016; Sogunro, 2015), which is important to today's adult learners (Merriam, 2001).

Online Courses

One of the key distinctions of online courses is the elimination of the face-to-face aspect of the learning process. Online courses may be synchronous or asynchronous. Synchronous online courses are similar to traditional face-to-face courses in that they are scheduled for a specific time and the students and faculty are online together. In asynchronous courses, faculty provide educational materials and deadlines, and the students have the freedom to work on assignments at their own pace as long as faculty deadlines are met (Swanson & Swanson, 2019).

Active Learning Programs

Deveci et al. (2018) described an ALP as a state-of-the-art classroom with a computer for each student, interchangeable tables, all-round writeable walls, posters,

whiteboards, interactive projectors, and constant internet access. The classroom environment promotes work on collaborative group projects as well as individual assignments. Faculty are able to write and annotate on the projected educational materials and provide immediate feedback. Active learning programs are not all the same and may take on different layouts while utilizing an assortment of digital materials (Deveci et al., 2018).

Microsoft and Apple Schools

Currently, one-to-one technology-enhanced learning environments (1:1 TELs) are being utilized in all levels of education. In a 1:1 TEL, each student has his or her own laptop device. These devices are used to enhance the student's learning experience (Blackley and Walker, 2015). In Apple or Microsoft designated schools, schools purchase laptops for each student. According to Apple Inc. (2018), there are 400 Apple Distinguished Schools worldwide. These technology-enhanced classrooms support schools' visions and learning goals. Apple Inc. (2018) states this creates an exciting learning environment that inspires critical thinking, collaboration, and creativity. Microsoft Schools follow a similar philosophy. These schools integrate technology into the classroom in order to enhance the learning environment. There are currently more than 2,000 Microsoft Schools worldwide (Microsoft, 2018).

Bring Your Own Device Classrooms

Bring your own device classrooms incorporate technology into the classroom environment via students' personal computing devices, such as Apple's iPad, Microsoft's Surface Pro, and laptop computers. These are also considered one-to-one technology-enhanced classrooms (Blackley & Walker, 2015); however, they differ from Apple and Microsoft designated schools in that the student must supply his or her own computing device. The philosophy behind BYOD classrooms is to enhance students' learning. Incorporating personal computing devices into an education curriculum allows the use of digital media and learning materials (Livas et al., 2018). The BYOD concept also allows facilities to reduce costs by transitioning to a less paper-dependent environment (Arney et al., 2012; Hesser & Schwartz, 2013; Reed, 2018) and by requiring students to supply their own computers. Other cost saving may be realized because printed textbooks can be replaced with less expensive electronic books (e-books), notebooks can be replaced

with note-taking applications, and electronic testing can take the place of paper assessments (Livas et al., 2018).

The Digital Classroom in Health Care Education

A BYOD classroom and a digital classroom are not the same. According to Ozerbas and Erdogan (2016), simply incorporating computers into the classroom does not equate to a digital classroom. Instead, a digital classroom may be defined as a semi-paperless, face-to-face classroom environment, which utilizes digital educational materials to improve student engagement, provide student feedback, and assess student knowledge. In this setting, each student brings his or her own computing device (Wardley & Mang, 2016). These may take the form of a laptop or tablet computer. The idea is to transition the faculty member from a "sage on the stage" to a "guide on the side." This means focusing education more on the student than on the teacher (Guri-Rosenblit, 2018). Creating a digital classroom also means incorporating various forms of interactive education. When utilized in the classroom, these tools expand the faculty member's role from merely a presenter of information to a facilitator of interactive learning. The use of digital classrooms has produced benefits and challenges for students, faculty, and administrators.

Benefits

Kong and Song (2013) described the digital classroom as a constructivist learning approach that is ideal for teaching students skills that are needed in today's workplaces. Common skills needed are collaboration skills, communication skills, inquiry skills, and critical thinking skills. Digital classrooms also allow for a variety of activities and educational materials that can be used for visual learners, auditory learners, and kinesthetic learners. Examples of educational materials include pictures, handouts, lectures, videos, lectures, and recordings. Educational activities that may be used in the digital classroom include demonstrations, group discussions, debates, computer games, and simulations (Project Life, n.d.).

De Bonis and De Bonis (2011) explained that digital classrooms align with Knowles' Theory of Learning and shift student education from a pedagogic approach to an andragogic approach. Consequently, students need to know why they are learning materials and they need to approach learning as a problem to solve. Faculty must ensure

topics demonstrate immediate value to the student. According to De Bonis and De Bonis (2011), the digital classroom meets these needs and is an excellent way to contribute to the financial stability of a teaching institution while improving the efficiency of the learning environment. The digital classroom provides multiple other benefits from the perspective of students, faculty, and organizational administration.

Students. Deveci et al. (2018) conducted a mixed methods research study to determine student and faculty perceptions of the Project-X laptop initiative and its effects on learning and teaching. The researchers surveyed 64 students and 6 faculty members. The response rate for the student survey was 58%, or 35 of 64 students. Additionally, students and faculty supplied qualitative data via a weekly feedback log that contained open-ended questions.

Analysis of the quantitative data produced descriptive percentages, while the qualitative data produced emerging themes. Of the 35 students surveyed, 33 students were satisfied with the classroom design, felt laptop integration in the classroom was beneficial, and felt laptops facilitated the completion of assignments. The qualitative data supported the quantitative results. Emerging themes from student feedback logs suggested that laptop use in class had a positive effect on group assignments. Students felt it was easier to collaborate and make immediate changes to group projects. Feedback from faculty demonstrated a belief that laptops improved faculty-student interactions, increased student engagement, allowed for immediate feedback, and improved student motivation (Deveci et al., 2018).

Stec et al. (2018) conducted a convergent mixed methods research study to evaluate student perceptions regarding the use of iPads to deliver educational materials in a nursing program at a Midwestern university. One hundred eighty-seven students and 13 faculty members participated in the study. Surveys consisting of Likert questions ranging from “1” (strongly disagree) to “10” (strongly agree) were administered to collect quantitative data at three different time points. Point 1 occurred in August 2013, prior to students beginning fall semester classes. Point 2 data were collected in November 2013, at the end of the fall semester. Finally, point three data collection occurred in April 2014, after the spring semester. Focus groups were used to collect qualitative data during the three time points.

Quantitative data were analyzed via t-tests from the Statistical Analysis System (SAS) Version 9.3 statistical package. The results were displayed as time-point comparisons, which compared the means of the survey responses of each data collection time-point. Quantitative results of the time point one-two comparison (August 2013 versus November 2013) demonstrated that students became more proficient users of new technology (m = 6.06, SD 2.57 versus m = 7.07, SD 2.44; *p* 0.001). Quantitative results of the time point one-three comparison (August 2013 versus April 2014) revealed that proficiency with iPads continued to improve over time (m = 6.06, SD 2.57 versus m = 7.10, SD 3.15; *p* 0.031) (Stec et al., 2018).

Qualitative data from the focus groups were analyzed using exploratory thematic analysis to develop three major themes: drivers, moderators, and barriers. Drivers of successful iPad implementation were the benefits of the technology, portability and flexibility, e-books, and mobile nursing applications. Students also felt that iPads in class helped prepare them for portable technologies used in clinical nursing practice. Moderators of success included the emotional response of feeling overwhelmed by new technology in the classroom. There was also a learning curve associated with iPad use in class. Communication and the professor's use of the device were also important factors to consider (Stec et al., 2018). Barriers identified in the study are discussed later.

Rossing et al. (2012) conducted a mixed methods study to determine students' perceptions of the use of mobile technologies in the classroom. The study was conducted at Indiana University – Purdue University Indianapolis (IUPUI). Two hundred nine students participated and completed surveys composed of Likert scale statements and open-ended questions. The five-point Likert scale ranged from strongly disagree (1) to strongly agree (5). Quantitative data were analyzed via the Statistical Package for the Social Sciences (SPSS) Version 25 and qualitative data were organized by themes.

Quantitative results revealed that students felt mobile technology use in classrooms helped them solve problems (m = 4.092, SD 0.8), learn course content (m = 4.044, SD 0.818), connect ideas in new ways (m = 4.343, SD 0.792), participate in course activities (m = 4.188, SD 0.809), develop confidence (m = 3.923, SD 0.89), and develop skills needed in future careers (m = 4.044, SD 0.851). Students also felt the devices improved motivation (m = 3.612, SD 0.851), participation (m = 3.505, SD 1.148), and

attention span (m = 3.657, SD 1.087). Based on the qualitative themes derived, researchers concluded that new technology often leads to excitement for students and faculty. Students described the use of computers and mobile devices in the classroom as fun, and they felt they paid more attention in class when using them. Students found the devices to be a source of motivation to attend class. Furthermore, students appreciated the immediate access to course materials and feedback (Rossing et al., 2012).

Yang et al. (2018) conducted a study to determine how the use of computer-supported collaborative learning (CSCL), which is supplementing traditional lectures with collaborative activities, would affect student outcomes in a large university class. The mixed method study involved 220 university students and data were collected from surveys, interviews, forum logs, and student assessment scores.

Data were analyzed via descriptive statistics, inferential statistics using a mixed regression model, and thematic analysis. There were 76 student survey responses. Of these, 83% of the participants felt CSCL led to positive interaction with the faculty member, 63% experienced more positive interactions with peers, 90% felt faculty feedback was improved, and 53% felt they gained general skills from CSCL activities. Furthermore, CSCL activities resulted in a three-point increase in entrance scores. Based on these results, the authors concluded that CSCL improves the quality of teaching in large classes and can have a positive impact on students' academic performance (Yang et al., 2018).

Schleisman et al. (2018) discussed the effects digital educational materials and learning games had on neuroscience students. The randomized block design study utilized pretests and posttests. Participants in the study included 299 high school students from 20 classrooms among ten different schools. Students were assigned pseudo randomly to one of five experimental conditions: control, individual-nonlinear, individual-linear, group-nonlinear, or group-linear. All experimental groups, except control, utilized computer applications to enhance learning. Data were collected via pretests and posttests over four consecutive days of class. Data were then analyzed with R Core Team 2017 statistical software using the "nlme" package to create one-way ANOVAs and a linear mixed effects model that controlled for nesting in the data. The

results of the study demonstrated that students using the mobile device game had higher learning gains than those who did not (Schleisman et al., 2018).

Ozerbas and Erdogan (2016) discussed the results of an experimental study to determine the effects of digital classrooms on student outcomes of 58 students in a secondary school in Ankara. The researchers randomly placed students in a traditional classroom setting to act as the control group or in a digital classroom setting to represent the experimental group. The study lasted four weeks and utilized pretests and posttests as the study instruments. The SPSS 20 statistical package was used to produce two-factor ANOVA measures. Based on the results of the study, researchers concluded that students in the digital classroom group had higher academic success than those in the traditional classroom group. However, there was no significant difference in the self-efficacy levels of students in the digital classroom compared to the traditional classroom (Ozerbas & Erdogan, 2016).

Habler et al. (2016) conducted a review of the literature to identify articles that discussed the use of tablets in the classroom and the effect it had on student outcomes. In total, 23 studies were reviewed. Sixteen of those studies reported positive student learning outcomes. Authors cited the tablet device's high usability, variety of features, ease of customization, touchscreen, availability, and portability as reasons for outcome improvements.

Hofstein et al. (2013) conducted a quantitative survey to determine the effects iPads would have on students in a ten-week chemistry class. Faculty implemented iPads in the class in order to provide paperless instruction and note-taking capabilities. Additionally, mobile chemistry applications were installed on each device. Results from student surveys found that mobile devices in the classroom led to a more personalized learning environment that resulted in a more enjoyable classroom experience. Furthermore, the researchers found that using a digital classroom to teach chemistry, as opposed to the traditional classroom setting, led to an improvement of 10.4 points on randomized, multiple-choice final examinations.

Faculty. Faculty also stand to benefit from the use of digital classrooms. As mentioned previously, Deveci et al.'s (2018) Project-X study demonstrated that computer technology in the classroom offered faculty the ability to provide immediate and real-

time feedback to students. Yang et al.'s (2018) study identified that digital classrooms may be more suitable than traditional classrooms in courses with a high student-to-teacher ratio. The researchers concluded that a computer-enhanced learning environment promotes higher quality teaching and improved student engagement and collaboration in large university classrooms.

Zyad (2016) conducted a mixed method study utilizing a questionnaire and semi-structured interviews to investigate teachers' attitudes toward integrated computer technology (ICT) in their classrooms. Via convenience sampling, 56 teachers were selected to participate in the study. The questionnaire was composed of five-point Likert scale questions designed to elicit participant feedback regarding their level of agreement on multiple items related to computer use in the classroom. The semi-structured interview questions were designed to elaborate on participants' perceptions.

The quantitative data were analyzed using descriptive statistics displayed as graphs and tables and inferential statistics in the form of the Spearman correlation coefficients. The results of the study demonstrated that the respondents had positive perceptions of ICT. Teachers expressed positive perceptions of ICT's ease of use and usefulness in the classroom. Teachers also perceived computer use in the classroom as a benefit to students because it offered the ability to transfer information quickly and efficiently. Finally, more than 90% of teachers believed that ICT could improve their job performance (Zyad, 2016).

Ottenbreit-Leftwich et al. (2010) conducted a hermeneutical phenomenology study to investigate teachers' beliefs regarding the use of technology in the classroom. The study was comprised of eight participants based on convenient purposeful sampling procedures. The participants were teachers recognized for the Michigan Consortium for Outstanding Achievements in Teaching with Technology (MCOATT) award. A case study containing interviews, observations, and electronic teaching portfolios was developed for each participant. One-day site visits were conducted during a two-week period to gather data.

Within-case and cross-case data analyses were performed. Based on the results of the study, the researchers concluded that faculty believed technology in the classroom was useful to address professional needs and in classroom organization and operation.

Technology also allowed faculty to create customized educational materials and address student needs. Faculty were better able to motivate students, promote critical thinking, and improve student comprehension (Ottenbreit-Leftwich et al., 2010).

Administration. As discussed, students and faculty experience benefits from digital classrooms. This also benefits the teaching institution by improving public perception and possibly increasing enrollment. Moreover, the institution may also experience financial gains because educational strategies should be efficient and cost effective (Livas et al., 2019).

In 2018, the University of Cincinnati's College of Nursing (UC CoN) implemented iPads for self-directed learning and lectures. In fall of 2016, UC CoN began digital testing on the iPad to reduce costs associated with printing. In 2017, the school eliminated paper-based worksheets and transitioned to electronically submitted worksheets (Reed, 2018).

Faculty faced several challenges. Applications had to be tested and chosen and faculty had to learn to use the iPad in the skills laboratory setting. Additionally, many students were unfamiliar with the iPad device. To increase familiarity with the iPad's many functions, the College of Nursing offered students iPad orientation as part of its new student orientation. Although there were challenges, successes emerged. Most faculty quickly embraced the iPad classroom. They reported decreased turnaround time on assessments, the ability to provide immediate student feedback, and a reduction of $2200 due to the elimination of paper in the skills laboratory (Reed, 2018). Hofstein et al. (2013) described the tablet computer as the bridge between education and a paperless classroom because portable computing devices allow students to take notes digitally, download and store electronic textbooks, and complete and submit written assignments.

Hesser and Schwartz (2013) issued 20 first-year General Chemistry Honors students at the University of New Haven iPads to use in the laboratory and classroom. The goal was to move toward a paperless environment while developing students' computer skills for their future careers. The students were given a list of applications to install on their devices. These applications allowed students to take notes, collaborate on projects, and upload and download assignments. Students were surveyed to determine their perceptions of iPads in the classroom and laboratory. The survey consisted of open-

ended questions asking students to identify things they like most and least about iPads in the classroom.

Students' responses to the survey questions revealed positive experiences in a paperless classroom. Students felt the iPad enhanced the laboratory experience and cited the multiple tools available on the device as a benefit. Finally, students felt moving to a paperless environment may be beneficial to all involved. According to one student, "It certainly saves so much paper! In the end, it may be cheaper for everyone with the lack of paper used. I see how much paper my roommates use for their lab notebooks/reports… it's insane!" (Hesser & Schwartz, 2013, p. 8). Furthermore, Hesser and Schwartz (2013) estimated that converting one chemistry laboratory course to a paperless setting reduced paper use by 120 pages per student over the course of the semester.

Arney et al. (2012) conducted a study to determine student satisfaction with the paperless classroom and paperless feedback and cost savings associated with a paperless environment. The participants in the study included students in an Applied Business Technology department. The study focused primarily on submitting assignments and receiving feedback digitally. Throughout the semester, students utilized virtual hard drives and USB flash drives to receive, store, and submit assignments. After the semester, students were surveyed using Likert scale questions.

Descriptive statistics were utilized to develop percentage distributions. Ninety percent of respondents preferred to submit assignments and receive feedback via the virtual hard drive instead of paper. Eighty-four percent of the students who responded preferred the USB flash drive to paper. Finally, the researchers determined that the department was able to reduce spending for paper and toner by 48%. A greater reduction could be anticipated for departments that transition to a completely paperless classroom (Arney et al., 2012).

Challenges

Many studies have demonstrated the benefits of digital classrooms for students, faculty, and administrators. However, there are multiple challenges associated with digital classrooms. The same entities that experienced benefits from the use of technology in the classroom must also contend with the various challenges that may arise.

Students. Santos et al. (2018) conducted a study of the effects of digital devices in the classroom. One hundred eighty-nine individuals participated: 176 students enrolled in 4 different undergraduate programs and 13 faculty members. Descriptive data were acquired from students via a survey. The survey consisted of demographic questions and two different Likert scale sections. One section was designed to determine student usage of mobile devices in class for academic and nonacademic purposes. Choices ranged from frequently used (1) to never (4). The second section of Likert scale questions focused on in-class observations of mobile device use. This scale ranged from strongly agree (1) to strongly disagree (5).

Quantitative data acquired from the surveys were analyzed using SPSS Statistics software. Results were recorded as percentages, frequencies, means, and standard deviations. Pearson's product moment, with alpha levels of 0.05, was used to identify correlations. Shapiro-Wilk tests revealed the data were not normally distributed; however, Levene's test displayed homogeneous variances among groups. Two-tailed independent sample tests and Mann-Whitney U tests were used on each question. Qualitative data were acquired via open-ended questions, and thematic analysis was used to determine resulting themes (Santos et al., 2018).

Results demonstrated advantages and disadvantages of mobile devices in the classroom. For instance, 60 students felt mobile devices allowed them to better search for information. Twenty-six students felt this freedom allowed them to learn information beyond the lesson being taught. However, 80 students considered mobile devices a distraction in class. Fifty-eight students felt mobile devices negatively affected attention to lectures (Santos et al., 2018).

Flanigan and Kiewra (2018) referred to distractions in class caused by electronic devices as cyber-slacking. This phenomenon presents a challenge in technology-enhanced classrooms. Cyber-slacking occurs when students use their computer or mobile technology for non-educational purposes during class times (Flanigan & Kiewra, 2018). According to a review of the literature conducted by Flanigan and Kiewra (2018), 70% to 90% of college students send an average of 12 texts per class period. Students who bring laptops to class spend up to 60% of the class time on activities not related to the coursework. Results of cyber-slacking may be detrimental to student success. Flanigan

and Kiewra (2018) reported poor note taking, diminished test scores, lower course grades, and decreased grade point average might all be attributed to cyber-slacking.

Not all students feel comfortable with computing devices, such as tablets, in the classroom. Kontkanen et al. (2017) conducted a 3-year qualitative study of 84 students using iPads in class. The purpose of the study was to identify students' perceptions of the affect iPads in the classroom had on their studying habits and ability to learn new materials. Furthermore, the researchers were concerned with students' perceptions regarding incorporation of iPads into the course. Qualitative data were acquired via short stories written by students and four focus group discussions.

Data were analyzed using qualitative thematic analysis to develop themes. Analyses returned two overarching themes. First, students lacked the confidence to adopt new learning styles to take full advantage of the iPad. Participants in the study advised other students to take responsibility for learning useful functions of the iPad, develop effective methods for learning with the device, take care of the iPad, develop self-motivation, use the iPad for educational purposes, and behave appropriately during class time. Second, learning remained teacher-centric and the pedagogic approach remained unchanged. Study participants advised teachers to choose relevant applications for class, master the use of the iPad before introducing it, develop policies for use, allow students to learn autonomously, give clear instructions for iPad use, and make effective use of the device. Furthermore, some students expressed concerns regarding assessment outcomes. They felt the use of mobile devices in classrooms does not improve study skills or study habits, and, as a result, does not increase learning (Kontkanen et al., 2017).

Hesser and Schwartz (2018), whose study details were discussed previously, identified other challenges encountered by students in a digital classroom. Converting to digital content delivery will likely lead to a steep learning curve for students, regardless of their familiarity with computers. Students in the study found moving from application to application to be slow and frustrating, the inability to open two computer windows simultaneously inconvenient, and considered writing on the tablet as unnatural and uncomfortable. Students felt these issues slowed the learning process and would require experience to overcome (Hesser & Schwartz, 2018).

Not all evidence points to improved student outcomes when integrating technologies, such as laptops, into the classroom. Chou et al. (2017) conducted a quasi-experimental research study with a pretest and posttest control group design to answer the research question: "Does the BYOD instruction approach yield different learning outcomes than the traditional (paper-based) instruction approach among junior high school students?" (p. 65). The study occurred over a period of four weeks and included a combination of 46 eighth-grade students from two language-learning classes. Using the convenience sampling techniques, the researchers assigned 24 students to the experimental group, which utilized personal Android-devices in class, and 22 students to the control group, which was subjected to traditional paper-based teaching methods.

Multiple experimental controls were implemented to strengthen internal validity of the study. The same faculty member taught both classes, each class period lasted 45 minutes, identical learning materials were used in each class, both classrooms were similar physically, tests were administered on the same days of the week, the teacher used the same teaching methods for both groups, and the pretest results from the previous academic year were used as covariance variables (Chou et al., 2017).

Six formative quizzes were administered to both groups throughout the study timeframe. The summed score of these quizzes were identified as the formative score in the study. A summative assessment was administered before the conclusion of the study. One month later, a delayed summative assessment was administered to ascertain long-term knowledge retention. Students also completed a Likert scale questionnaire designed to describe their learning experiences (Chou et al., 2017).

Data were analyzed using t-tests and analysis of covariance (ANCOVA). Results of the formative quizzes demonstrated that students in the traditional classroom setting performed significantly better ($F = 9.83$, $p < 0.01$) than those in the digital classroom. There was no statistical difference ($F = 2$, $p > 0.1$) between the two groups when comparing summative evaluations. The same was true regarding delayed summative evaluations ($F = 0.003$, $p > 0.1$). Survey data were analyzed using descriptive statistics and demonstrated that students were highly satisfied with the BYOD classroom. Positive comments acquired via informal interviews reinforced the quantitative survey data. However, negative comments pertained to problems related to mobile devices,

unfamiliarity with the digital classroom structure, and personal attitudes toward a BYOD environment (Chou et al., 2017).

There is evidence that digital classrooms may affect students physically and emotionally. As mentioned previously, Stec et al. (2018) conducted a convergent mixed methods study to evaluate nursing students' perceptions of iPads in the classroom. As discussed, the study identified drivers, moderators, and barriers encountered when utilizing iPads in the classroom. Barriers included physical discomfort, primarily headaches and eyestrain, and distractions. Students mentioned that reading small words and staring at the lit screen for extended amounts of time could cause headaches and eye fatigue. Some students experienced such discomfort that they replaced their electronic textbooks with paper textbooks (Stec et al., 2018).

Students also mentioned monetary concerns as a potential barrier. Multiple students reported that the cost of the iPad should have been included in the tuition costs. This would allow students to use loans and other financial aid to help cover the out-of-pocket costs of the devices (Stec et al., 2018).

Faculty. Faculty buy-in is of critical importance to successful implementation of digital classrooms. Faculty must be ready and willing to adapt new and sometimes unfamiliar teaching styles (Stec et al., 2018). Hesser and Schwartz (2013) found that faculty buy-in could be challenging because of the time and effort needed to convert teaching materials into an electronic format and because of unfamiliarity with electronic learning materials. Chartrand (2016) stated faculty in a digital classroom must spend a significant amount of time training on hardware and planning lessons before implementing technology into coursework. However, students expect faculty to utilize the digital classroom efficiently and effectively; therefore, faculty should understand the technology they are using and must incorporate it into the learning process in meaningful ways. This is of utmost importance when students are required to purchase their own computing devices (Chartrand, 2016; Hesser & Schwartz, 2013; Kontkanen et al., 2017; Stec et al., 2018).

Hughes et al. (2018) discussed the use of digital technologies, such as Kahoot! and Google Suite, to improve collaboration, communication, and critical thinking in Physical Therapy Education. The purpose of the study, conducted in 2016 at the

American Physical Therapy Association's (APTA) Education Leadership Conference (ELC), was to identify challenges regarding technology implementation in the classroom. The researchers collected data via pre-tests and post-tests containing Likert scale questions.

Descriptive statistics were utilized to analyze the data, and results were displayed as percentages. More than 72% of the participants stated their institutions were moving toward digital technologies in the classroom. The two most common challenges mentioned by faculty were a lack of comfort level with technology and the time needed to implement new strategies. Respondents also believed that faculty who used technologies with which they are unfamiliar might create an environment of frustration, confusion, and intimidation for students (Hughes et al., 2018).

Tas (2017) investigated classroom management problems of a traditional classroom versus a digital classroom. The researcher utilized a quantitative survey instrument with four-point Likert scales to measure a participant's level of agreement with each question. A score of four (4) represented the highest level of agreement. Topics of interest in the survey included lesson plans and programs, time management, and physical organization. The survey was presented to 38 sixth and seventh grade students in various middle schools in Turkey.

Data were analyzed via the SPSS 15 statistical package. The survey results were tabulated as means and standard deviations, and independent t-tests were used to analyze the differences between traditional and digital classrooms. Student feedback on the surveys revealed that faculty sometimes changed teaching methods in the digital classroom (m = 1.95, SD 0.50). Students often acted shy (m = 1.95, SD 0.77) and faculty infrequently made eye contact with students (m = 1.73, SD 1.07). Students also expressed concerns that faculty did not pay attention to the individual differences of the students (m = 1.97, SD 0.76). Physical concerns regarding digital classrooms were also discovered. These will be discussed later. Based on the results of the survey, the researcher concluded that faculty in digital classrooms should consider physical variables of classroom management and rapidly adapt and utilize new teaching technologies so students do not become bored. Additionally, faculty should be educated continually on new technologies, classroom preparation, and presentation techniques (Tas, 2017).

Buy-in and proper utilization of technologies are not the only areas of concern in a digital classroom. Some faculty echo students' sentiments regarding distractions during class. Santos et al.'s (2018) research, which was discussed previously, demonstrated that students sometimes fail to complete assignments because of those distractions. Additionally, based on a review of the literature, Chartrand (2016) suggested that working solely on a device during class may alienate students from their peers and that using computers in class may enable students to cheat.

Administration. There are physical facility factors to consider prior to implementing digital classrooms. Previously discussed research by Deveci, et al. (2018), Stec et al. (2018), and Tas (2017) all returned results related to the physical structure of a digital classroom. In a digital classroom, students are expected to use their portable devices throughout the entire day of classes. However, battery life on portable devices vary and some devices may not sustain power for the duration of time necessary. Therefore, power outlets serve a high purpose in a digital classroom (Deveci et al., 2018; Stec et al., 2018). Depending on the number of students in a class, the classroom's infrastructure may not be able to accommodate the power supply needs of the course's population (Deveci et al., 2018). According to Deveci et al. (2018), Wi-Fi interference is another concern in digital classrooms. Chartrand (2016) reiterates the importance of reliable internet access when using digital educational materials and states network failures may bring the course to a halt. Many researchers mentioned the importance of reliable internet and Wi-Fi (Chartrand, 2016; Deveci et al., 2018; Stec et al., 2018; Tas, 2017); however, none of the studies identified solutions to issues that may arise due to technical difficulties.

As mentioned previously, Tas (2017) conducted a research study that evaluated traditional classrooms and digital classrooms in terms of time management, lesson preparation, and physical structure. According to the results of the study, technology-enhanced classrooms require different lighting schemes than traditional classrooms. More specifically, the brightness ratio in digital classrooms tends to be lower than experienced in traditional classrooms ($t = -9.90$, $p < 0.001$). This is likely an intended result because darker classrooms are necessary to reduce light reflected from computer screens. Therefore, window size, color, and placement, as well as the angles of ambient

light and types of curtains used, must all be considered in the physical design of digital classrooms (Tas, 2017).

Examples in Health Care Education Programs

There are multiple examples in the literature regarding the use of digital classrooms in education. This includes all levels of education ranging from elementary schools to university programs. Conversely, there are fewer literary works describing the use of digital classrooms in allied health programs.

Attenborough and Abbott (2018) conducted a research study in which the School of Health Sciences at City University in London, England introduced mobile devices into the classroom and clinical settings. The purpose of the study was to determine how students select and use mobile devices in each setting and to gage students' perceptions of the helpfulness of the devices to their education. Seventy-two students from eight disciplines volunteered to participate in the study. One student from each discipline was chosen to participate; therefore, eight participants were included in the study. Each student was allocated a mobile electronic device to use during class lectures and in the clinical setting. Additionally, each participant was required to attend two focus group meetings, an individual interview, and contribute to an online blog.

Thematic analysis was applied to the qualitative data, and two major themes were identified: factors relating to the device and factors relating to the course. The factors relating to the device theme was further divided into three subthemes. These included strengths and weaknesses, learning to use the device, and enjoying the device. The factors relating to the course theme contained two subthemes: use for university work and use on clinical placement. According to the results of the study, students quickly learned to use their devices and found using them enjoyable. Students felt mobile devices offered portability, flexibility, and ways to organize their days. These factors allowed students to maximize their time. The devices also allowed the students to be connected better to faculty and peers. However, some participants expressed concern that it was difficult to read and write on the small tablet screen. There were also problems connecting to the university's websites, and software compatibility was sometimes questionable. Finally, students felt they should be involved in the development of learning activities to ensure compatibility with each different type of mobile device (Attenborough & Abbott, 2018).

In a study discussed earlier, Hughes et al. (2018) researched the use of digital technologies, such as Kahoot! and Google Suite, to improve collaboration, communication, and critical thinking in Physical Therapy Education. The researchers performed pretests and posttests with the audience of the APTA ELC. The study results demonstrated challenges pertaining to technology implementation in a physical therapy classroom.

Reed (2018) discussed how the University of Cincinnati College of Nursing (UC CoN) utilized iPads in classrooms and skills laboratories to reduce the use of paper in the educational setting. The researcher explained challenges faced during the adoption of technology in UC CoN. Results of the study demonstrated positive aspects of the digital classroom. Among these benefits was a reduction in organizational costs. This reduction was due to less reliance on paper for classes and laboratories.

Wilkinson and Barter (2016) conducted a research study to determine the effects of tablet usage on student attendance, achievement, and course progression by implementing mobile devices as a learning tool in an anatomy class in the Undergraduate Sport and Exercise (SES) degree program in London, England. Two hundred fifty-one students participated in the two-year study. Of those, 191 students belonged to the iPad group, while the other 60 students were in the traditional group. Students used iPads to complete quizzes, view videos, and access three-dimensional images via application software.

Study data were acquired via quantitative and qualitative methods. Quantitative data were comprised of scores on four anatomy assessments for each student in each group. These assessments were tested for internal consistency and reliability via an expert panel and Alpha-Cronbach's coefficient. Acquired data were analyzed via independent t-tests set at a 95% confidence level. Qualitative data were collected using an online questionnaire. The questionnaire contained three open-ended questions to determine each participant's perceptions of positive aspects of using iPads, areas in which the student needed extra help, and areas in course design that might be improved. These data were analyzed using thematic analysis (Wilkinson & Barter, 2016).

The results of the study demonstrated improvement in the areas of student attendance, achievement, and course progression. The mean values for final grades of the

iPad group were significantly higher ($p < 0.05$) than those of the traditional group (57.9% +/- 13% versus 52.2% +/- 12.5%). Module completion rate was used to determine course progression. The iPad group completed 96.3% while the traditional group completed 93.6% of the assigned modules. Attendance was also significantly higher ($p < 0.01$) in the iPad group (88.6% +/- 8.9%) versus the traditional group (77.4% +/- 9.8%). Furthermore, qualitative themes showed that students considered iPad learning to be fun and an overall positive experience (Wilkinson & Barter, 2016).

Summary

As technology has advanced, so too have the needs of students, faculty, educational institutions, and health care employers. Adult learners in today's educational setting want autonomy, student-faculty relationships, and input in the education process (Chen, 2014; MacDonald, 2018). Faculty have the opportunity to create digital classrooms by incorporating computer technologies and digital learning materials into the traditional classroom setting. Digital classrooms may be the next step in education to engage and interact with today's college students. As mentioned previously, there are multiple benefits associated with digital classrooms; however, there are also challenges to consider. Nonetheless, studies have demonstrated that utilizing digital classrooms in an educational program's curriculum has the potential to improve student outcomes, facilitate collaboration and critical thinking, and reduce educational costs for the institution (Arney et al., 2012; Deveci et al., 2018; Habler et al., 2016; Hesser & Schwartz, 2013; Hofstein et al., 2013; Ottenbreit-Leftwich et al., 2010; Ozerbas & Erdogan, 2016; Reed, 2018; Rossing et al., 2012; Schleisman et al., 2018; Stec et al., 2018; Yang et al., 2018; Zyad, 2016). However, before a transition to digital classrooms is initiated, it is important to investigate the readiness and preparedness of faculty and administration and to develop strategies for challenges that may be encountered.

INVESTIGATION

CHAPTER III
INVESTIGATION

As defined in this study, a digital classroom is a traditional face-to-face educational setting that has transitioned to a paperless, one-to-one technology-enhanced learning environment (1:1 TEL). Students supply their own computing devices, and faculty utilize digital educational materials to promote student engagement and collaboration, provide student feedback, and assess student knowledge (De Bonis & De Bonis, 2011; Hofstein et al., 2013; Ottenbreit-Leftwich et al., 2010; Wardley & Mang, 2016). Research has demonstrated the benefits and challenges this classroom structure has on students, faculty, and the educational organization (Arney et al., 2012; Deveci et al., 2018; Hesser & Schwartz, 2013; Hughes et al., 2018; Livas et al., 2019; Ozerbas & Erdogan, 2016; Reed, 2018; Rossing et al, 2012; Santos et al., 2018; Stec et al., 2018; Tas, 2017; Yang et al., 2018; Zyad, 2016). Particularly, studies have shown that digital classrooms improve student outcomes through increased student engagement because of technology use in the learning environment (Hofstein et al., 2013; Rossing et al., 2012; Yang et al., 2018). Furthermore, technology-enhanced classrooms provide an opportunity to reduce organizational costs (Arney et al., 2012; Hesser & Schwartz, 2013; Hofstein et al., 2013; Livas et al., 2019; Reed, 2018). However, there is limited information regarding the use of digital classrooms in allied health education programs such as the School of Health Related Professions (SHRP) on the University of Mississippi Medical Center (UMMC) campus in Jackson, Mississippi.

Purpose of the Study

The purpose of this study was to address SHRP faculty and administrators' readiness to adopt digital classrooms, their desire to modify current instructional designs, and to identify educational technology experts' perceptions and experiences regarding digital classrooms. This study was conducted in two phases, a quantitative phase and a qualitative phase, and addressed two primary purposes. First, the quantitative phase utilized a questionnaire to investigate the readiness of SHRP faculty and administrators to transition to digital classrooms. This phase also investigated the need for such classrooms, as well as the technology skill levels of SHRP faculty and administrators.

Second, as part of the qualitative phase, UMMC educational technology experts were interviewed to identify themes pertaining to transitioning to a digital classroom design.

The information gained from the two phases of the research study were utilized to answer the following research questions:

1. How do teachers and administrators in SHRP rate their readiness to transition from a traditional classroom setting to a digital classroom setting?
2. What are UMMC educational technology experts' experiences and perceptions of transitioning from a traditional classroom setting to a digital classroom setting?
3. Based on integrated quantitative and qualitative data analysis, "what strategies might be beneficial to SHRP faculty and administrators if they elect to transition to digital classrooms?"

Research Design

This research study occurred in two phases and followed a sequential mixed methods design. Additionally, the researcher used an interdisciplinary approach to improve the generalizability of the research results throughout SHRP and the entire UMMC campus. The first phase was quantitative and consisted of an electronic questionnaire sent to SHRP faculty and administrators. The information gathered from phase one was used to determine the preparedness and the perceived need for digital classroom implementation in SHRP. The second phase was qualitative, and the data were acquired via semi-structured interviews with educational technology experts from each school on the UMMC campus. Maximum variation sampling was used to identify these experts. Data from phase two were analyzed to identify general themes that are common to the schools on the UMMC campus. The themes that emerged were used to develop transition resources and strategies that may prove beneficial if a need for digital classrooms in SHRP is established.

Setting

The study occurred on the UMMC campus located in an urban area of Jackson, Mississippi. The UMMC campus is home to the School of Medicine (SOM), School of Dentistry (SOD), School of Pharmacy (SOP), School of Population Health (SOPH), School of Graduate Studies (SOGS), School of Nursing (SON), and the School of Health

Related Professions (SHRP). The School of Health Related Professions is home to multiple allied health programs, including Health Administration (HA), Health Sciences (HS), Physical Therapy (PT), Occupational Therapy (OT), Health Informatics and Information Management (HIIM), Histotechnology (HT), Medical Laboratory Sciences (MLS), Radiologic Sciences (RS), Magnetic Resonance Imaging (MRI), and Nuclear Medicine Technology (NMT). The variety of schools on the UMMC campus is comparable to the variety of programs in SHRP. Therefore, data gathered from the schools on the UMMC campus should be applicable to the programs in SHRP due to the comparability of the two entities.

Participants

Participants in the quantitative phase of this study included faculty and administrators in SHRP. The researcher contacted the Dean of the School of Health Related Professions via email in order to obtain permission to send a questionnaire to each potential participant (Appendix A). Once permission to proceed was granted (Appendix B), the researcher acquired a list of all potential participants via the Microsoft Outlook SHRP email list. The questionnaire was then emailed to potential participants. Inclusion criteria included teaching in a face-to-face environment or being an administrator in SHRP. Respondents who teach strictly online courses were excluded from the study because they do not teach in a face-to-face classroom, which is a crucial component in this study's definition of a digital classroom. The researcher anticipated approximately 40 participants in the quantitative phase of this study. There were no incentives or compensation offered for participation.

Potential participants of the qualitative phase of the study were invited to participate through UMMC email. The email also included the purpose of the study and asked recipients to identify other individuals who are experienced in computer technologies in the classroom. This snowballing method was used to identify other key faculty, staff, and administrators who are involved in instructional design and other areas vital to the educational process.

Individuals identified as educational technology experts were invited to participate in the qualitative phase of the study due to their experience in implementing computer technologies in the classroom. Maximum variation sampling was utilized to

ensure participation from a variety of entities associated with technology and education across the UMMC campus. As a result, the qualitative phase included semi-structured interviews with instructional designers and project managers from the various schools at UMMC; the Chief Institutional Research Officer and Director of eCampus at UMMC; the Deputy Chief Academic Officer at UMMC; and program managers, training specialists, and support personnel from UMMC's Division of Information Systems (DIS). No compensation or incentives were offered to participants in this phase of the study; however, data obtained from the educational technology experts were utilized to identify challenges that may be encountered when implementing digital classrooms and to develop resources and strategies to overcome those challenges successfully.

Instrument Development

A REDCap (Harris et al., 2009) questionnaire was used in the quantitative phase of the study and was sent to SHRP faculty and administrators. Research Electronic Data Capture is a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources (Harris et al., 2009). The questionnaire was designed to obtain participants' demographic data, interest in digital classrooms, and current educational technology skills. Another point of interest identified was participants' preparedness to transition from a traditional classroom setting to a digital classroom. Qualitative interviews were conducted with educational technology experts in each school on the UMMC campus. Interview questions were developed to prompt participants to discuss and elaborate on the technical skills necessary to transition to a digital classroom, obstacles that may be encountered during the transition, and resources and strategies that may prove useful for overcoming challenges.

Questionnaire format. An introductory letter preceded the questionnaire. The letter provided the purpose of the research study and the definition of a digital classroom (Appendix C). A second email containing a link to the questionnaire was sent the following week (Appendix D). The questionnaire consisted of queries that established basic demographic information, Likert-scale responses that measured readiness for digital

classrooms, and full text questions that allowed individualized feedback from respondents regarding challenges of digital classrooms (Appendix E). In order to maintain anonymity, participants were never asked to submit their names with the questionnaire.

Pilot questionnaires were used to demonstrate internal consistency and validity of the quantitative questionnaire instrument. Cronbach's Alpha was not utilized due to an insufficient number of scaled questions in the questionnaire. The pilot questionnaire was emailed to three reviewers. These reviewers included the coordinator of the Radiologic Sciences Advanced Standing Program, a faculty member in the Occupational Therapy Program, and a faculty member in the Medical Laboratory Sciences Program. Feedback regarding the pilot questionnaire was utilized to improve the wording and formatting of the items in the questionnaire (Creswell & Creswell, 2018). Once the tool was finalized, the initial introductory letter was emailed to faculty and administrators in SHRP. One week later, the quantitative questionnaire was distributed via email to each potential participant. The questionnaire was available for four weeks, and a weekly reminder email was sent to participants during that period (Appendix F).

Interview format. The researcher conducted pilot interviews with a member of the SHRP Technology Committee and an administrator in the Dental Hygiene Department. A list of preliminary interview questions was utilized during the pilot interviews. Feedback from the pilot interviews was used to finalize the interview template.

The researcher sent an interview invitation to the educational technology experts on the UMMC campus who were identified via purposive sampling (Appendix G). The introduction letter defined the term "digital classrooms" and explained the purpose of this study. Within seven days, a follow-up phone call was placed to schedule dates and times for interviews (Appendix H). The researcher provided each participant with the purpose statement of the study, the definition of digital classrooms, and a visual aid to distinguish different types of classrooms (Appendix I). Each participant was asked to sign a letter of consent prior to his or her interview (Appendix J).

Qualitative interviews were semi-structured and contained a combination of general questions, questions derived from SHRP faculty input, and probing questions

(Appendix K). The general questions established the educational technology expert's background and experience with computer technologies in classrooms. The questions also identified successes and challenges each school on the UMMC campus experienced regarding digital learning environments. Additionally, resources and strategies utilized to overcome the challenges were identified. Finally, information gained from the questionnaire was used to formulate questions that were directly related to the challenges identified by SHRP faculty and administrators; whereas, the qualitative interview questions prompted participants to provide general strategies regarding ways to overcome identified challenges.

Each interview was scheduled based on participant availability and occurred in a face-to-face setting. The location of each interview was selected based on the interviewee's personal preference. These meetings occurred at the various schools on the UMMC campus; therefore, telephone interviews were not necessary. Each interview lasted approximately 30 minutes, and each participant permitted the researcher to record the conversation with a handheld voice recorder.

Data Collection and Analysis

Quantitative data were collected anonymously with a questionnaire. The researcher analyzed the data and produced descriptive statistics comprised of percentages. Percentages were used to evaluate the distribution of participant responses in categories such as primary job responsibility, number of years of teaching, and number of students in each class. Percentages were also used to demonstrate each participant's self-evaluation of computer skills, interest in digital classrooms, and common challenges of implementation. Additionally, data derived from the questionnaire responses were used to create the framework for the educational technology expert interviews and demonstrated the readiness of SHRP faculty and administrators to transition to digital classrooms.

Educational technology expert interviews were conducted after the quantitative phase of the study was complete. Interview questions were based on the data derived from the quantitative questionnaire, and all interviews were recorded. The researcher transcribed each recorded interview utilizing Temi transcription software and then compared each transcribed interview with the audio recording to verify accuracy. The

researcher and peer coder analyzed the transcribed interviews and utilized open coding to identify key concepts. Three primary themes emerged via data reduction. The researcher and peer coder applied constant comparative coding techniques to ensure reliability of the findings. Key quotes were gathered and themes and subthemes were categorized. Data saturation occurred after five interviews; however, the researcher conducted seven more interviews to verify saturation. No new insights were identified in the final seven interviews (Creswell & Creswell, 2018). A list of identified themes and subthemes was sent to the study participants for member checking to ensure the transparency and trustworthiness of the data analysis. Modifications of the themes were made based on member feedback. Figure 3 demonstrates the data collection and analysis process.

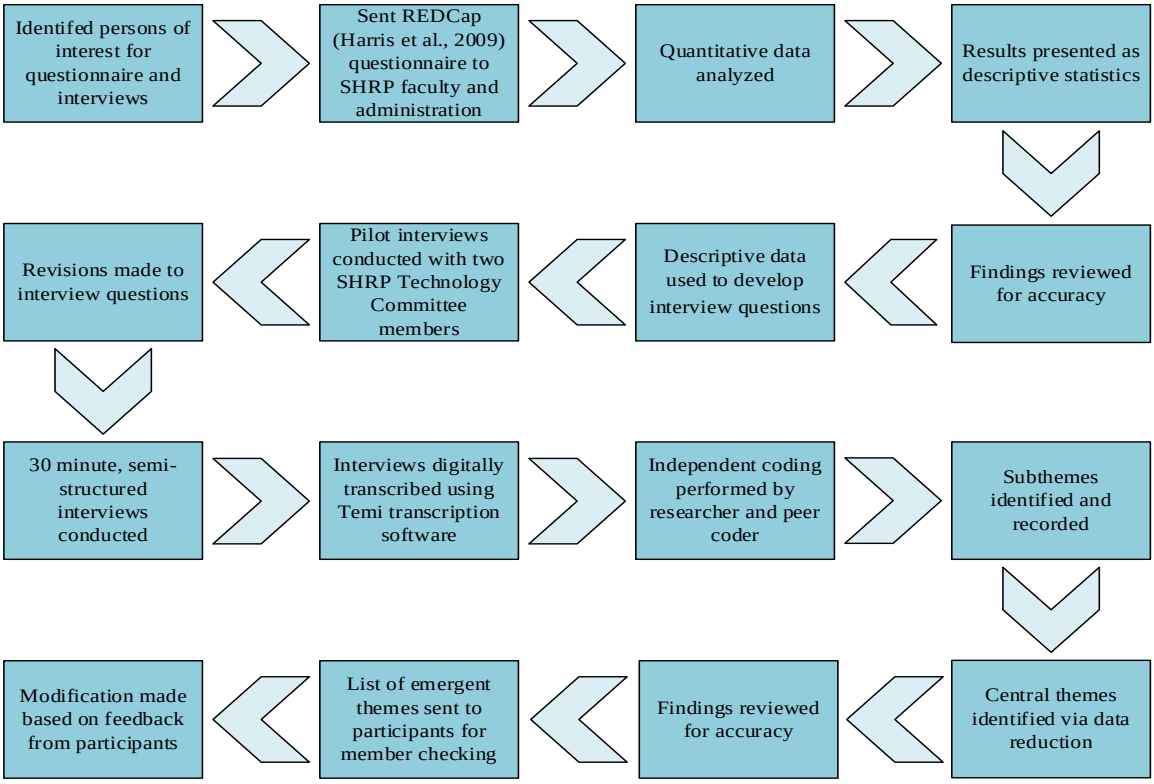


Figure 3. Data Collection and Analysis. This figure illustrates the systematic process outlining questionnaire and interview data collection and analysis.

Ethical Considerations

The Self-Certification Form for Determining Whether a Proposed Activity is Research Involving Human Subjects form was completed per UMMC's research protocol (Appendix L). This study was a systematic investigation; however, it was not designed to

contribute to generalizable knowledge. The knowledge gained from this study applies to SHRP and UMMC only. Based on this information, this study did not require Institutional Review Board (IRB) review.

Respondents participated in the research study on a voluntary basis. Participants' responses to the quantitative questionnaire were gathered anonymously through REDCap (Harris et al., 2009). The introduction letter alerted potential participants that completing the questionnaire was considered consent to use their responses for this study. Electronic data, including study results, audio recordings, transcribed interview data, and peer coder analyses, gathered in the qualitative interview phase of the study were kept on the researcher's password protected computer to maintain data integrity and anonymity of respondents. The researcher was the only individual with access to this data, and all data are being archived for six years. After that time, disposal of data will occur based on UMMC data disposal guidelines and regulations. Member checking was utilized to promote transparency, accuracy, and trustworthiness of the study. To accomplish this, emergent themes identified through the qualitative interviews were gathered and distributed to each interview participant for review.

Timeline

The first step in advancing this research study required two weeks and began with permission from the Dean of SHRP to contact faculty and administrators. Upon receipt of approval, the pilot questionnaires were sent to the questionnaire reviewers. Once the REDCap (Harris et al., 2009) questionnaire was finalized, a questionnaire introduction letter was emailed to each potential participant. During the next step of the study, the questionnaire was emailed to faculty and administrators and was available for four weeks. The researcher emailed a reminder each week during the four-week questionnaire period. After the questionnaire concluded, the researcher spent one week accumulating and analyzing the data. This information was used to develop additional questions for the educational technology expert interview.

Pilot interviews were conducted during the following three weeks, and the interview template was finalized. The researcher then spent the next three weeks interviewing educational technology experts on the UMMC campus. During the final three weeks of the study, the researcher and peer coder analyzed data and identified

themes and subthemes. These results were used to create a resources and best practices guide for faculty interested in implementing digital classrooms. The timeframe from the initial delivery of the introduction letter to the coding and analysis of educational technology expert interviews was 16 weeks. The researcher maintained a journal to ensure the accuracy of this timeline. Figure 4 is a visual timeline of the project.

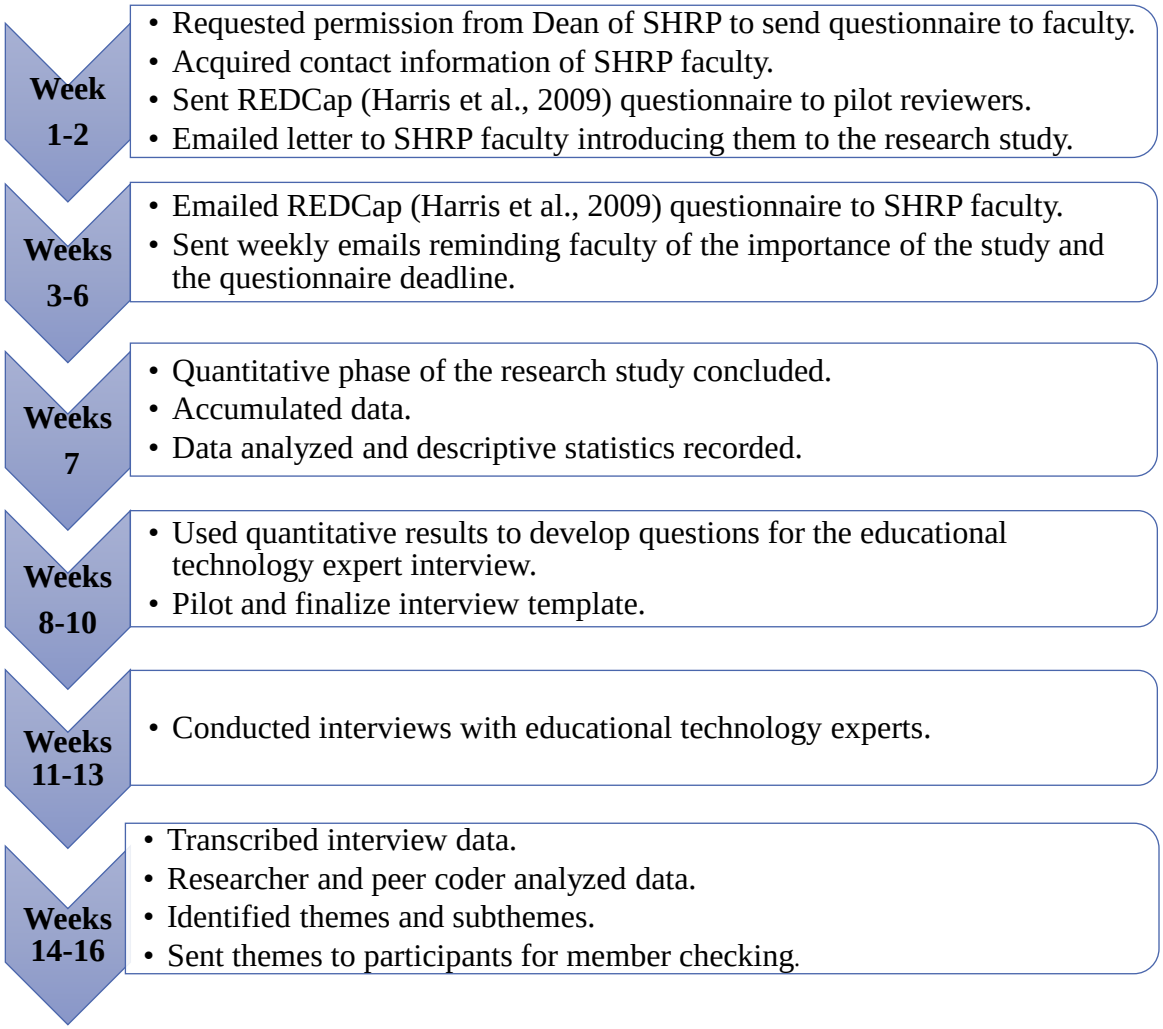


Figure 4. Research Study Timeline. This figure illustrates the estimated timeline for the investigation phase of the research study.

Resources

Human, software, and database resources were necessary for this research project. Human resources included a committee chair, committee members, questionnaire reviewers, interview reviewers, and a peer coder. The researcher sought mentoring and advice from researchers experienced in mixed methods design, committee members, and

members of the Doctor of Health Administration (DHA) faculty. Necessary software resources included REDCap (Harris et al., 2009), Temi transcription software, Microsoft Word 2016, Microsoft Excel 2016, and Microsoft Outlook 2016. Finally, the UMMC Microsoft Outlook SHRP email list was utilized to produce a list of potential study participants.

Summary

This sequential mixed method study occurred in two phases, a quantitative phase and a qualitative phase. The purpose of the quantitative phase was to investigate the readiness of SHRP faculty and administrators to transition to digital classrooms. The purpose of the qualitative phase was to analyze data acquired from educational technology experts to identify themes associated with transitioning to digital classrooms.

Quantitative study data were acquired utilizing an anonymous questionnaire. This aspect of the research study focused on SHRP faculty and administrators to evaluate the interest in digital classrooms; identify technical skills needed to teach in this type of setting; and determine each individual's readiness to transition to a digital environment. Quantitative data were also used to establish faculty's desire to transition to a digital classroom environment in SHRP. Additionally, data collected with the questionnaire tool were used to compose questions used in interviews of educational technology experts. The qualitative results of the interviews were used to develop resources and strategies to address specific challenges regarding a transition to digital classrooms in SHRP.

SOLUTION

CHAPTER IV

SOLUTION

The purpose of this study was to address School of Health Related Professions (SHRP) faculty and administrators' readiness to adopt digital classrooms, their desire to modify current instructional designs, and to identify educational technology experts' perceptions and experiences regarding digital classrooms. The researcher utilized a two-phase, mixed methods approach for this study. The first phase was quantitative and consisted of a Research Electronic Data Capture (REDCap) questionnaire (Harris et al., 2009) that was completed by SHRP faculty and administrators. The purpose of the quantitative phase was to determine SHRP faculty and administrators' readiness and willingness to transition to digital classrooms. Additionally, data acquired in this phase were used to create an interview template that was used in the second phase of the study. The second phase was qualitative and included data collected via face-to-face interviews with educational technology experts on the University of Mississippi Medical Center (UMMC) campus. The purpose of the second phase was to identify educational technology experts' perceptions of digital classrooms, the implementation process, and strategies for overcoming challenges. The themes and subthemes that emerged from qualitative data analysis were utilized to create *Digital Classroom Basics*, which is a resource guide that may be used by SHRP faculty and administrators to implement digital classrooms in the face-to-face learning environment.

Research Findings

Both quantitative and qualitative finding are discussed in the following paragraphs. Quantitative findings are represented as percentages, and figures are used to highlight data that were most relevant to the study. Qualitative results are discussed as themes and subthemes. In many cases, direct quotations from participants are provided to add depth to the discussion. However, participant names are not provided in order to maintain anonymity. Instead, each interview participant was assigned a letter, and direct quotations are credited to the interview participant (ex. Participant A).

Description of Participants

A quantitative questionnaire was developed utilizing REDCap (Harris et al., 2009) and distributed to the 76 faculty members and administrators in SHRP. These

individuals were identified via the UMMC Outlook email system. Fifty-one individuals responded to the questionnaire (67.1% response rate), and 50 completed it (98.0% completion rate); however, only administrators and face-to-face faculty were included in the quantitative phase of the study. Forty-five respondents (88.2%) identified as faculty, while six (11.8%) identified as an administrator. Thirty-three respondents (64.7%) identified as a faculty member or administrator that teaches in a traditional face-to-face setting. Twenty-four (47.1%) teach in a traditional face-to-face setting only, nine (17.6%) teach in both a face-to-face and online setting, and zero (0.0%) identified as an administrator with no teaching responsibilities. Eighteen respondents (35.3%) stated they teach solely in an online classroom; however, five were administrators and were included in the study. Therefore, a total of 38 face-to-face faculty members and administrators participated in the study (Figure 5).

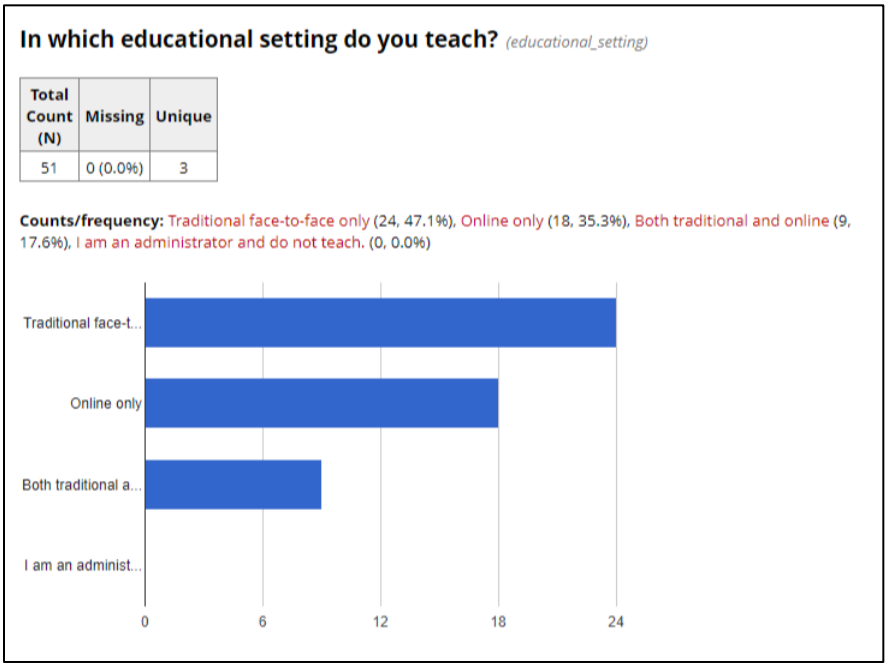


Figure 5. Educational Setting of Faculty and Administrators. This figure illustrates the educational setting in which each participant in the study teaches.

Semi-structured interviews were conducted to collect qualitative data from educational technology experts on the UMMC campus. Maximum variation sampling was used to identify 15 potential participants. Twelve individuals (80.0%) agreed to participate in the interview process. Of those, five (41.7%) are instructional designers in

the various schools on the UMMC campus, five (41.7%) are Division of Information Security (DIS) personnel, and two (16.6%) are UMMC academic administrators. Additionally, interview participants demonstrated a variety of educational backgrounds prior to their employment at UMMC (Table 1).

Table 1. Summary of the Roles and Backgrounds of Interview Participants.

Participant	Role at UMMC	Educational Background
Participant A	Instructional Designer	Teacher – High School
Participant B	Instructional Designer	Teacher – Elementary School
Participant C	Academic Administrator	Teacher – University
Participant D	Instructional Designer	Academic Advisor - University
Participant E	DIS/Technical Support	Academic Affairs - University
Participant F	DIS/Technical Support	Educational Support - University
Participant G	DIS/Technical Support	Financial Aid/Admissions - University
Participant H	DIS/Technical Support	Instructional Technologist - University
Participant I	DIS/Technical Support	Clinical Applications - University
Participant J	Instructional Designer	Director of Online Learning - University
Participant K	Academic Administrator	Faculty Development - University
Participant L	Instructional Designer	Teacher - University

Quantitative Findings

The quantitative findings were used to answer the first research question, "How do faculty and administrators in SHRP rate their readiness to transition from a traditional classroom setting to a digital classroom setting?" The primary goals of the quantitative phase of this study were to gauge SHRP faculty and administrators' interest and readiness to implement digital classrooms, identify perceived challenges of implementation, determine the types of educational software currently in use in the classrooms, and establish faculty's comfort level regarding technologies in education. Establishing a desire for digital classrooms was important because low interest in the concept would signify there was no need for the study. Of the 38 participants in the study, 18 (47.4%) stated they are interested, while 10 (26.3%) are very interested (Figure 6).

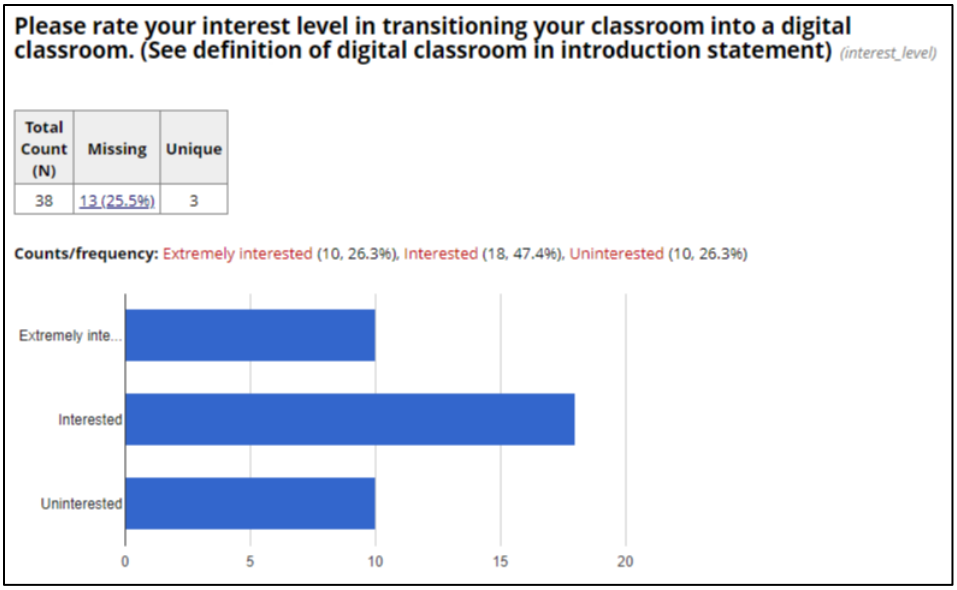


Figure 6. Interest Level in Digital Classrooms. This figure illustrates SHRP faculty and administrators' interest levels regarding implementation of digital classrooms.

Identifying specific barriers was important because they were a core component of the qualitative interview template. Respondents were provided a list of the five most common barriers associated with digital classrooms as identified in the literature. Respondents were instructed to select all barriers that they felt applied to SHRP, and they had the option to select "other" to provide their own perceived barriers. The top three barriers identified by SHRP faculty and administrators were 1) in class distractions due to electronic devices (22 of 38, 57.9%), 2) lack of faculty's personal knowledge regarding digital classroom technologies (21 of 38, 55.3%), and 3) current physical layout of classrooms are not compatible with digital classroom technologies (20 of 38, 52.6%). Faculty and administrators were less concerned about the cost of personal devices for students (6 of 38, 15.8%) (Figure 7). Concerns regarding increased costs for students were likely low because faculty members stated that many students bring computers to class even when they are not required.

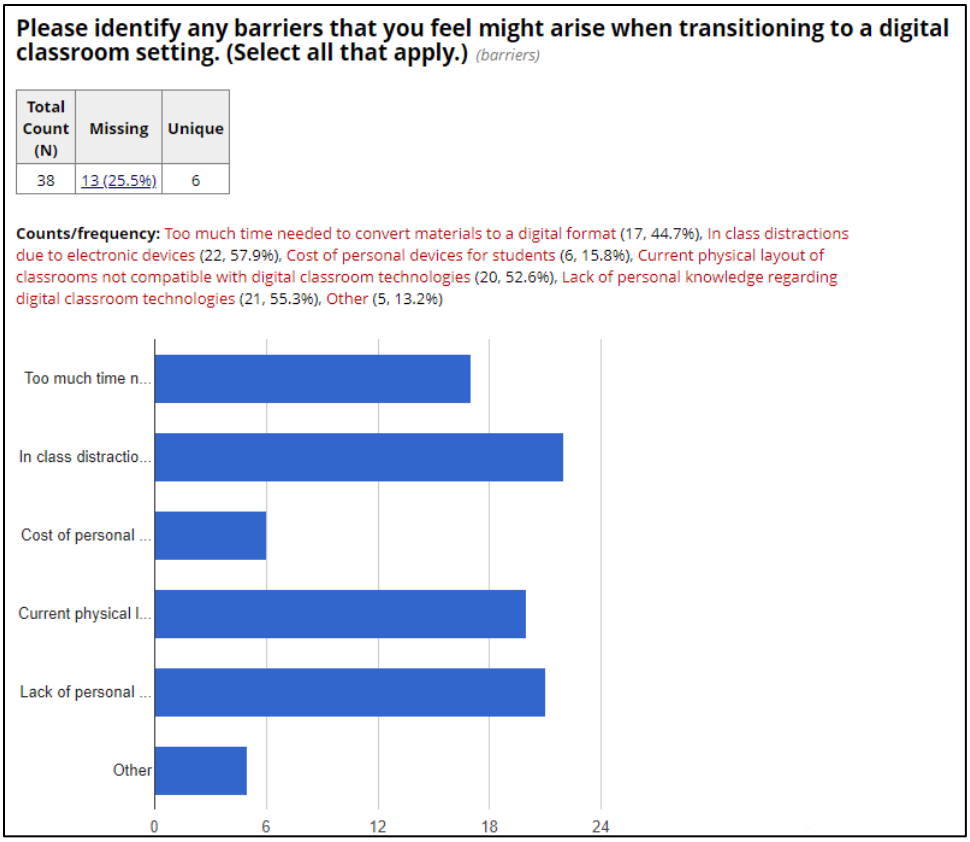


Figure 7. Challenges of Digital Classroom Implementation. This figure illustrates the perceived barriers to implementing digital classrooms as identified by SHRP faculty and administrators.

Identifying the types of educational software currently used by SHRP faculty offered insight into faculty's desire to implement new teaching tools and strategies. Educational software of particular interest included Canvas, Big Blue Button, Studio/Arc, and Respondus. Canvas is the learning management system (LMS) used by UMMC; therefore, it is reasonable that 33 of the 33 questionnaire respondents (100%) stated they use Canvas. However, only four respondents (12.1%) use Big Blue Button, six (18.2%) use Studio/Arc, and 10 (30.3%) use Respondus. These results were also incorporated into the qualitative interview template to explore why faculty may not be using the educational tools available to them.

Using a Likert scale, faculty members rated their comfort level with technologies in the classroom. Participants were instructed to select "1" if they considered their technical skills as novice, "2" as limited, "3" as adequate, "4" as advanced, and "5" as expert. Thirty-three participants provided a rating. Of those 33, 0 (0.0%) identified as

novice, eight (24.2%) selected limited, 18 (54.5%) chose adequate, six (18.2%) opted for advanced, and one (3.0%) stated he or she was an expert. Therefore, 75.8% (25 of 33) of the participants described their technical skills as adequate or better.

Based on the quantitative data, SHRP faculty and administrators are interested in implementing digital classrooms, and most of those individuals feel they have the technical skills necessary to do so. However, very few are utilizing the educational tools currently available, which is likely due to inadequate knowledge regarding such tools. Faculty and administrators also demonstrated concerns regarding in-class distractions created by electronic devices in the classroom and the physical layout of the current classrooms in SHRP. These topics are addressed in the qualitative findings.

Qualitative Findings

Qualitative data collected via face-to-face interviews were analyzed via the constant comparative method. Separately, the researcher and peer coder used the open coding technique to code the data. Each coder identified subthemes that were evaluated via a data reduction process until primary themes emerged. The researcher and peer coder then compared themes and subthemes to ensure accuracy. Through qualitative data analysis, three primary themes emerged: rationale, challenges, and implementation.

Rationale. There are multiple potential benefits of incorporating technology into the learning environment. As identified in the literature review, these benefits are not limited to students. Faculty and administration may also benefit from properly implemented digital classrooms. The rationale theme is characterized by two subthemes, interactivity and student motivation. The qualitative findings identified by the rationale theme and the challenges theme answer the second research question, “What are UMMC educational experts’ experiences and perceptions of transitioning from a traditional classroom setting to a digital classroom setting?”

Subtheme: Interactivity. Incorporating technology into the educational setting promotes student-to-student and faculty-to-student interactivity in the classroom and may lead to improved relationships between the groups (Yang et al., 2018). However, simply requiring students to bring computers to class does not create an interactive environment. Assignments and activities must be planned so that the process of learning flows at a natural and effective pace (Ozerbas & Erdogan, 2016). Without proper utilization of the

available technologies, the learning environment does not change. Many UMMC educational technology experts expressed these same beliefs.

> "So yes, you're getting students in an online environment, but they're not learning within that ecosystem." (Participant G)

> "…how can we make the learning that's happening in the classroom beneficial? Because if what or how we're instructing in the classroom is not of more benefit than them watching or listening to a podcast then there's no point of us having the classroom." (Participant A)

There are numerous ways to create interactive assignments and activities for students. These include case-based, hands-on, group, and cluster activities (Kong & Song, 2013). Each of these activities has the potential to change the learning environment and redirect the flow of learning for the students. Students will not only learn from instructors during these activities, but they will also learn from each other. This also benefits the instructor. When students are interacting with one another during group assignments, the instructor is free to move about the room to provide guidance and answer questions that are more specific to individual students.

One interview participant expressed that student accountability may be improved using interactive software tools such as Big Blue Button, Nearpod, and Kahoot!. These tools combined with the previously mentioned activities require students to be engaged constantly and consistently in the lesson. Students understand that they may be called upon at any time to answer an instructor's questions or respond to a poll related to the topic of discussion. Because of this, students are more likely to pay attention and participate in class so that they are prepared to be active in the classroom. Additionally, a common belief found in the literature and qualitative interviews is that interactive classrooms may decrease the boredom felt by students. In doing so, student engagement should increase while in-class distractions decrease (Deveci et al., 2018).

> "And so, there's more accountability there I would say. And the more interactive and the more accountability that you require of the students then that completely alleviates distractions." (Participant A)

Subtheme: Student motivation. Students are motivated by a variety of reasons to use technology in the classroom. Caruth (2016) and Sedden and Clark (2016) stated that many of today's students were raised using some form of computer technology, and multiple educational technology experts reiterated this belief. Furthermore, both

interview participants with an elementary school background stated that many students attend primary schools that incorporate computer technologies into the classroom, and, as a result, students expect that trend to continue into college and beyond. Moreover, according to the interview data and quantitative data gathered, students are currently bringing their devices to class with the expectation that they may need them to complete assignments. When that expectation is not met, students may perceive that the college or university is behind primary schools in the use of technology as a teaching tool. Additionally, several interview participants mentioned that students would prefer to use computers in the classroom for a variety of assignments rather than simply sitting through face-to-face lectures.

> "Kids today, my daughter's in seventh grade, she got a MacBook and so they're used to it. Why have we not thought of this sooner? They're going to expect it." (Participant H)

> "I mean, in every classroom everybody has a computer, an iPad, or tablets. Something. So while they're just sitting back with that, there's so much potential with that. What, how can that be leveraged?" (Participant B)

Incorporating computers into the learning environment also creates an opportunity for students to receive immediate feedback from instructors (Deveci et al., 2018). Instructor-to-student feedback is an essential component of several learning theories. Cognitivists generally react to stimuli in the environment or through interaction with others. Feedback received by cognitivist learners guide and shape the interaction between learner and learning environment (Clark, 2018b; Ertmer & Newby, 2013). Furthermore, immediate feedback allows instructors to identify quickly topics with which students are struggling. The behaviorism theory is based on using feedback to alter behaviors. Immediate feedback allows instructors to identify students' areas of weakness in order to correct unproductive behavior (Clark, 2018a; Torre et al., 2006). Corrective actions can be tailored for individual students, which is a key concept in constructivism (Clark, 2018c). Finally, Knowles' Theory of Andragogy states that adult learners want knowledge that may be applied immediately (Knowles, 1984); therefore, timely feedback is vital to them.

Many tools exist to provide the feedback that students desire. Multiple interviewees mentioned Nearpod and Poll Everywhere as educational software that may be used in the classroom to create interactive activities that allow instructors to monitor

student participation and conduct spontaneous quizzing. Additionally, Kahoot! and Big Blue Button offer similar interactivity. Respondus Monitor and ExamSoft are assessment tools that provide immediate feedback to students once their tests have been submitted. However, based on the findings of the quantitative phase of this study, these tools are underutilized in SHRP.

> "[By using Nearpod] I was able to know exactly in the moment what they were struggling with, what I needed to cover, and they were getting instantaneous feedback." (Participant A)
>
> "But yeah, [Poll Everywhere allowed] that instant feedback and being able to tailor your instruction, your discussion, right off hand was… I think they saw the value in that." (Participant B)

Challenges. There are many challenges that should be addressed before a faculty member or administrator makes the decision to convert a traditional classroom into a digital classroom. The most common challenges identified in this study pertain to time requirements, faculty's software and technical knowledge, faculty's resistance to change, and the physical layout of classrooms. Some of these challenges can be addressed with no financial implications for the organization; however, physical challenges often require a monetary commitment from leadership.

The rationale theme and challenges theme provided educational technology experts' perception of digital classrooms. In particular, these themes identified reasons to implement digital classrooms and perceived challenges that will arise during the transition. These perceptions were based on each expert's personal experience with technologies in the classroom and provided answers to the research question, "What are UMMC educational technology experts' experiences and perceptions of transitioning from a traditional classroom setting to a digital classroom setting?"

Subtheme: Time requirements. Time is needed to implement properly digital classrooms. The results of a study conducted by Hughes et al. (2018) demonstrated that a primary concern of faculty regarding digital classrooms was the time it takes to convert lessons from one format to another. While many believe that digital classrooms can save faculty time in the future, the time needed to accomplish these tasks may be in limited supply currently. Participant G reinforced the findings of the Hughes et al. (2018) study. As illustrated by interviews with the two academic administrators at UMMC (Participant C and Participant K), the issue of lack of time may be exacerbated by the workload of

faculty or administration. Typically, teaching is only a portion of the daily routine. It is common for a faculty member or administrator to be a member of multiple school and institutional committees, state, or national committees. Additionally, programs require faculty members to perform a range of administrative duties. These may include tasks such as interviewing applicants for acceptance into a program, recruiting new students, and monitoring current students in the clinical setting. Time constraints may be a greater issue in an academic medical center because many instructors and administrators also have clinical responsibilities and patient caseloads that drive funding for the institution.

> "We haven't done any specific studies on it, but from what I've seen among professional organizations, a lot of it boils down to faculty time. And there's the perception that they don't want to or don't have the availability to take these PowerPoint slides and move them into something like a Nearpod or a Captivate or something that requires an investment of their time." (Participant G)

> "But in my experience and my observation over the last five years, certainly that the outside pressure on clinical faculty to generate revenue has been the driving force to keep them from having the opportunity to explore new options." (Participant K)

Converting to new teaching formats is not the only task that requires faculty time. According to Participant E, after an instructor incorporates new teaching techniques, technologies, or educational programs into a course, he or she must practice using the technologies or delivery methods so that they are efficient and effective. Without practice, new teaching methods may have undesired outcomes. According to Hughes et al. (2018), students may become intimidated by the technology, confused by the information delivered in class, and frustrated by the learning process.

> "I always tell faculty, even when I do get done training them, you have to go back and practice with it." (Participant E)

Subtheme: Knowledge of software and device. Knowledge of the computing devices and educational software is important to students and faculty. Faculty must ensure they are continually updating their knowledge of the devices available to students (Tas, 2017). This is necessary in order for faculty to attain a level of comfort with a variety of devices that may be used in the classroom (Hughes et al., 2018). Additionally, faculty should use educational technologies in order to gain experience with them. Studying or reading about technologies or educational software that are available is insufficient. Data acquired in the interviews with Participant D and Participant L

reflected the need for faculty to experience the learning process as if they were a student in order to gain the perspective needed to manage a digital classroom and to feel comfortable with the technologies in use.

> "It's always some level of inexperience when it comes to educational tech or just regular technologies that can be used for educational purposes." (Participant D)

> "…it's not that they don't want to try it. I think that they're honestly afraid of it. So even though if I do all the hard work on the back end, they're afraid that they still won't be able to use it when they get in the classroom. Again, it goes back to their comfort level." (Participant L)

Device familiarity is also critically important to students. As Caruth (2016) and Sedden and Clark (2016) discussed, many students spend a significant amount of time during their elementary, high school, and college years using some type of electronic device or digital technology. However, multiple interview participants stated that this does not mean that students understand fully how to use a device or that they have a comfort level with technology that lends itself to a digital classroom. Therefore, training students on their devices is an important consideration when contemplating a transition to digital classrooms.

> "Although we always talk about these students are technology savvy; no, they're not necessarily technology savvy." (Participant C)

> "Because I think a lot of students are challenged by different devices and getting familiar with their device to begin with." (Participant I)

Subtheme: Faculty's resistance to change. One of the most important factors to consider prior to transitioning to digital classrooms is faculty buy-in. Faculty may be hesitant to change for a variety of reasons. As discussed previously, the effort and time required to convert established lessons to a digital format presents challenges (Hesser & Schwartz, 2013; Stec et al., 2018). The majority of educational technology experts interviewed stated that faculty at UMMC and SHRP rely primarily on face-to-face lectures and may find it difficult to deliver the same material in a different format. Furthermore, as data from Participant J indicated, student success, measured by in-class assessments and national registry examination scores, makes faculty buy-in even more difficult. Faculty members who have evidence that proves that their "tried-and-true" methods of teaching are effective may offer the most resistance to change.

> "A clear majority of our faculty are unfamiliar and unenthusiastic about something other than a face-to-face lecture-based approach." (Participant K)

> "So faculty say, 'We have a 95% or 100% pass rate on the NCLEX, so why would I need to do anything different?'" (Participant J)

Two educational technology experts, one who serves in an academic administrator capacity and one who was previously an academic advisor, surmised that faculty's mentality regarding teaching might be based partially on the individual's background. Specifically, many faculty members in an academic medical center were clinicians before they were teachers. In a hectic medical center environment, clinicians often discover processes that are effective and seldom veer from them. The result is repetition, and the same processes are followed until they are no longer effective. These same effective clinicians are often hired to teach newer generations of clinicians. However, many of those clinicians-turned-teachers have no formal background in education, and they were never taught to teach. Again, it may be difficult to convince faculty who were trained with the "if it is not broke, do not fix it" mentality to convert from a successful method of teaching to a newer, less familiar method.

> "Here you have teachers who are, who were never taught to teach." (Participant D)

Subtheme: Physical space. Implementing digital classrooms may be challenging because of the physical space used in the teaching environment and the funding necessary to change an existing space. Many of the physical challenges identified by educational technology experts in this study are echoed in the literature relating to digital classrooms. For instance, Deveci et al. (2018), Stec et al. (2018), and Tas (2017), discuss the importance of an adequate number of power outlets in the classroom. These are necessary for students to ensure their electronic devices remain charged and available throughout the day. Those studies also reference the need for reliable Wi-Fi and internet services. Without these services, digital classrooms are ineffective (Deveci et al., 2018; Stec et al., 2018; Tas, 2017). Additionally, Tas (2017) found that light and window placement must be considered when transitioning to a digital classroom.

> "Then by the time you get to fourth block, it's not charged anymore." (Participant A)

> "So talking with instructors, I got them to understand that sometimes the Wi-Fi, once it's so much on one access point and everybody is trying to push information through, it's too much traffic." (Participant F)

Other physical space concerns identified in this study include the placement of desks or tables in the current classroom setting and the use of projectors and screens versus monitors. Faculty desire a flexible, interactive classroom. They want students to be able to sit in groups and work on assignments or sit in rows to complete knowledge assessments. Many classrooms are not designed with this flexibility in mind. Most are simply tables, which are often bolted to the floor, and chairs. Some also believe that monitors are superior to projectors and screens when presenting visual materials. Finally, faculty want the classroom and technology to work correctly.

> "So all of our classrooms, as much as we want them to be more interactive, are still pretty much tables or desks with chairs." (Participant J)

> "Because you come to the classroom and you want things to work and when it doesn't, now you have a room full of people and everybody's looking at you." (Participant F)

Many interview participants mentioned that physical space concerns are often difficult challenges to overcome because of funding limitations. Simply outfitting a classroom that seats approximately 50 students with a power outlet for each student could cost up to $15,000 (Homewyse, 2020). Costs accumulate quickly if a school, such as SHRP, needed to update classrooms to accommodate the MLS, OT, and PT Programs. The RS Program is excluded because the classroom it utilizes is already equipped with a power outlet at each seat. Additionally, one other classroom that seats approximately 50 students is properly equipped for use. The OT and PT programs would each need a classroom with an adequate number of power outlets for each student. Therefore, SHRP would need to update a minimum of two additional classrooms. Each of the four programs mentioned also use a laboratory space, which could add four more classrooms to the equation. In total, SHRP administration would have to approve a $30,000 to $90,000 investment. This only ensures that each student is able to keep his or her devices charged the entire day. Replacing projectors with monitors is also an added expense. Replacing a projector with a $500 monitor in those same ten rooms would add another $5,000 to the total. This, of course, assumes that all updates are completed simultaneously.

> "We actually had been looking at several different options, but in our recent budget climate, we don't have the ability to be able to do this like we would hope." (Participant J)

"Anyway, money is an issue." (Participant A)

Implementation. An implementation plan is critical when undergoing a significant change, such as transitioning from face-to-face classrooms to digital classrooms. One of the goals of a digital classroom implementation plan should be to address potential challenges before they are encountered so that the transition is as efficient and effective as possible. Interview participants identified several strategies for addressing possible challenges SHRP faculty and administrators might face when implementing digital classrooms; therefore, the implementation theme is the third and final theme identified in the data. This theme encompasses the utilization, process, and resources subthemes. The utilization subtheme focuses on technologies available and ways they might be used. The process subtheme features student and faculty training, collaboration, and sharing networks. Finally, the resources subtheme is concentrated on physical space accommodations and human resources available to faculty who decide to transition to digital classrooms. The implementation theme provided the answers to the third research question, "What strategies might be beneficial if SHRP elects to transition to digital classrooms?" The answers to this question created the basis for the digital classroom implementation resource guide developed for faculty and administrators.

Subtheme: Utilization. There are a several educational software programs available to SHRP faculty and administrators. A few of these include Nearpod, Studio/Arc, Respondus Monitor, ExamSoft, and Big Blue Button. However, multiple interview participants expressed that faculty members often share a lack of familiarity with these tools. Additionally, faculty and administrators who are familiar with the tools are generally uncomfortable using them. Participants also felt that faculty and administrators underutilize Canvas or ExamSoft for testing purposes. One interview participant expressed the belief that using these testing tools could eliminate the need for Scantron forms and readers; thus, reducing the funding required for such products. Another interview participant suggested that faculty and administrators utilize Studio/Arc to upload videos into Canvas because the tool provides analytics that allow faculty members to identify how much time students spend viewing a video, if they skip segments of the video, and answer questions students have at a particular point in time in the video. Two interview participants discussed big Blue Button, which is a conferencing

tool in Canvas that could be used for group assignments. Several interview participants suggested using Nearpod in a digital classroom because it contains drawing features, quizzes, video links, and other tools that allow faculty to create interactive lessons. Additionally, Nearpod allows students to take electronic notes during class. Most interview participants felt using computers and digital education software in the classroom would create a more interactive environment that could alleviate the boredom experienced by some students, and, as a result, reduce in-class distractions.

> "So they're not just getting that we have these resources, but that they're understanding what they are, why they work, how they work, and that they do work." (Participant A)

> "…a lot of people don't use Respondus because, especially in the face-to-face environment, they're still using paper or a Scantron, whatever the system is that we use, because that's what they're more comfortable with." (Participant L)

Most interview participants spoke of the import role administration plays in implementing digital classrooms. Simply informing faculty of available educational technologies and software is unlikely to increase utilization of the available tools. Utilization begins with a top-down approach. School administrators must realize the value of digital classrooms and the ways technology can improve the educational setting. Administrators must then promote technology use and redefine the culture and expectations of the school. The culture may be redirected via faculty competencies regarding new technologies. When a new technology or educational tool is introduced, faculty should be required to attend structured training. After training, faculty members should complete tasks to demonstrate competency utilizing the new tool. These competencies could be contained in Canvas. An expectation such as this requires that training sessions be offered multiple times so that all faculty have an opportunity to attend. Training sessions could be conducted face-to-face, through virtual means, or as recorded presentations that may be viewed at any time.

Not all faculty members openly embrace change, and they will need motivation and direction from the leaders of the school. Faculty must realize that change is necessary, and they must understand the reasons for change. Participant K and Participant L provided a starting point for digital classroom implementation. According to these participants, administration should begin the transition with willing faculty. This would allow administration to demonstrate successes and best practices to less willing

faculty members. If less eager faculty see that a change is effective and efficient, buy-in may be easier to obtain; however, a transition to digital classrooms will not occur if it is not supported by administration.

> "We'll just kind of dribble along the way we have with a few people with the time and/or the interest to explore methods that are less traditionally used on this campus. I think what it is really going to take if we want to make a step change is it's going to take dictation from administration." (Participant K)

> "It's costing us money to rent that piece of equipment and it's costing us a ton of money to actually buy those sheets of paper. But until administration says we're not doing it, I don't think that they will ever get away from it." (Participant L)

Subtheme: Process. Transitioning to digital classrooms is a multifaceted process that requires a systematic implementation plan and adequate faculty training. According to Participant A, faculty may experience less stress and anxiety if the transition occurs in segments. It should not be an all-or-nothing overload of information; otherwise, faculty may become overwhelmed and abandon the transition.

Faculty training should be developed based on the electronic devices students will use, technologies in the classroom, and the educational software that will be employed. Participant G suggested personalized training when feasible because faculty are more likely to appreciate the value of new teaching methods if they can visualize how it will affect them on a personal level. Additionally, it may prove effective if an instructional designer works with a faculty member to incorporate a new teaching method specifically for that faculty member's course. This may simply be a new or updated assignment, reformatted lecture, or revisions of other content delivery methods.

> "I try not to bombard people with different things. I could throw a list out of all these different tools and technologies that they could use, but then they're on overload, then they can't process one thing. So I try to focus on a couple of things. If I know this group of people, they're already pretty good with this, I can start on something else. So break it down that way, but slowly. And it's a slow process." (Participant A)

> "So it's taking the time to ensure that people understand it, that they have the ability to navigate the software or the solution. And then making it personal, seeing how they can benefit from it and how their students can benefit." (Participant G)

Participant L suggested that training students on their devices should be part of the student orientation process. Students should spend a few hours becoming familiar with their devices and practicing various types of assignments, such as uploading

worksheets or completing quizzes in Respondus or ExamSoft. According to Participant E, faculty should develop a "tip sheet" based on commonly asked questions or expected challenges that students may face. The "tip sheet" should be a document that is updated regularly, and it should be available to students throughout their time in a program. Faculty should also ensure that students know how to contact the help desk and on-site IT personnel.

> "And then they spend a half-a-day learning how to use their actual Surface and all the programs that they're going to need to use throughout their program." (Participant L)

> "I would try to make a tip sheet or two that's focused towards the students. This is what the students will see or you can provide this to your students for utilizing this application." (Participant E)

Peer-to-peer collaboration and sharing is also an important component of successful change management. Participant B suggested that SHRP identify one or two faculty members in a department who understand and are comfortable with the technologies that will be used in the classroom. Those identified would act as super users for the group and would be expected to help others implement new technologies in their courses. Peers will be intrigued and encouraged when they witness new teaching methods being effectively and efficiently utilized, and encouragement leads to a desire to try new ideas.

Faculty who find success should be willing to share strategies with others in different departments so that a sharing network is created throughout the school. Participant C felt that those who successfully implement a digital classroom should be asked to present their ideas to other departments. This is a way for everyone to learn from mistakes as well as successes. However, faculty must understand that success on the first attempt is not guaranteed, and they must be willing to try again if their ideas are not as effective or efficient as they had hoped. As Participant E stated, even when ideas and methods do not work correctly the first time, it is important to remember that "students are fairly forgiving when you're trying something new and you're trying to do something to engage them differently."

> "I think having an expert in that area that can really support and help, somebody they know they can go to and ask questions or someone that they feel comfortable with saying, 'Hey, can you come to my class and watch me and give me pointers?'" (Participant B)

> "I think there are some people around campus that have gone this way and been successful. I think one thing that could be helpful is if you could get those people to present seminars to your faculty. I think that may be a useful thing." (Participant C)

Subtheme: Resources. Any faculty member or administrator who decides to transition his or her traditional classroom to a digital classroom has many resources at his or her disposal. These resources include physical resources and human resources. The physical resources discussed below may be used as solutions to the physical space challenges mentioned in the previous discussion of the challenges theme. Human resources expand beyond the peer-to-peer collaboration and sharing networks to include other essential personnel, such as on-site IT personnel, instructional designers, DIS, and eCampus. The University of Mississippi Medical Center's Office of eCampus provides "support to implement online classes and distance education through the various programs for all five schools at UMMC. The office is committed to providing students and faculty access to current and emerging technologies in an effort to educate health care practitioners for the future" (University of Mississippi Medical Center, n.d.c).

As mentioned previously, transitioning a traditional classroom to a digital classroom may become an expensive endevour. However, a few low-cost alternatives may be employed if funding cannot be procured. For example, adding power outlets for each student is expensive. Therefore, as one interview participant suggested, students may be required to arrive to class each day with a fully charged device. This practice may be adequate until power outlets are installed in the classroom. Additionally, replacing bolted tables and chairs with modular substitutes requires more funding. Multiple interview participants mentioned that wireless computing devices offer a cost effective solution because they allow students to move about the classroom, share both sides of tables, and form clusters to work on group projects. Replacing unreliable Wi-Fi access points drives the cost of transitioning to a digital classroom even higher. Participant F suggested that an inexpensive solution to this issue may be simply requiring students to turn off the Wi-Fi on their cellular telephones, smart watches, or other devices not required for class. Finally, moving to a digital classroom would create a near paperless environment. As discussed by Arney et al. (2012), a facility has the potential to reduce spending on paper and printing products by up to 48%. The School of Health

Related Professions spends approximately $35,000 to $50,000 annually on such products (R. Willis, personal communication, June 4, 2018). Based on this logic, SHRP could potentially save $16,800 to $24,000 annually. The money saved could be reinvested in remodeling the current classrooms.

> "The two main classrooms that we have, [tables] are just bolted to the floor, just a lecture style classroom. So that is a barrier I feel like, but it can be worked on. People can, you can turn around and you get around that." (Participant B)

> "So, if the room is only able to hold 150 bodies, we know that each person may have two or three devices. And even if they're not using it to do anything, it's still connected to the Wi-Fi." (Participant F)

Human resources are vital to the successful implementation of digital classrooms. Peer-to-peer sharing networks were discussed previously; however, interview participants explained that on-site IT personnel, instructional designers, DIS, and eCampus also play important roles in the use of educational technologies on the UMMC campus. Any faculty member or administrator would be wise to contact each of these sources of information prior to implementing a change from traditional classrooms to digital classrooms. According to Participant H, DIS should be consulted regarding the specifications that each student's personal computing device should meet. Faculty should then collaborate with on-site IT personnel to ensure that on-site support is available for those devices. Once specification guidelines have been established for student devices, Participant L suggested that faculty should meet with the instructional designer of the school in order to identify educational software that can be used in the classroom. At this point, faculty and instructional designers should work together to create a personalized lesson plan for that faculty member. Faculty should continue incorporating new technologies and information delivery methods with input from the instructional design team. Finally, Participant C stated that faculty should communicate with UMMC's eCampus to solicit new ideas, share best practices, and request new technologies. Faculty and administrators interested in digital classrooms have support available; however, they must choose to utilize it.

> "I know when we had students bring their own devices for Epic training; we did have to deal with the plethora of different machines that were brought. So maybe offering a standard of what they should have would help with a lot of those issues. You know, you need to have this type of processor or it needs to be this speed, this much memory or it's not going to connect." (Participant H)

> "I'm just getting to the point where some of the face-to-face programs are actually reaching out and using me for my expertise and knowledge for help. So they have support here." (Participant L)
>
> "…that's something that eCampus can help with. What we need to know is what they need. And we work closely with DIS and their TLC, which is our teaching and learning center. We work very closely with them in designing courses, both face-to-face and online courses." (Participant C)

Application of the Findings

The information acquired from educational technology experts on the UMMC campus offers insight into the resources and strategies needed to overcome the challenges of implementing digital classrooms at SHRP. This information was organized and structured to create multiple products. A PowerPoint presentation that discusses the research study and its findings was developed. This PowerPoint will be presented to SHRP administration, the Office of eCampus, and to the NextGenEd committee.

The study findings were also used to create a digital classroom resource guide, titled *Digital Classroom Basics,* for SHRP faculty and administrators (Appendix M). The guide will be available to all SHRP faculty and administrators via the SHRP Faculty Resource course in Canvas. This guide is designed to cover a variety of topics including Tips to Remember, *Digital Classroom Basics,* A Change in Thinking and Content Delivery, Navigating Digital Classroom Challenges, Device Specifications, Device and Educational Software Training, Be Part of the Sharing Network, Other Human Resources, Student Orientation, and Best Practices and Pitfalls. As digital classrooms are implemented in SHRP, *Digital Classroom Basics* will be updated with new ideas, strategies, and pitfalls.

Finally, the findings of this study were used to develop a research poster for presentation at the 26th Annual SHRP Research Day in April 2021 (Appendix N). This event is designed to "bring attention to research within the health related professions and encourages SHRP faculty and students to explore different avenues of discovery. The school-wide event is designed to allow for more collaborative interaction between UMMC faculty, staff, and students" (University of Mississippi Medical Center, n.d.d).

Summary

Analysis of the quantitative data demonstrated that SHRP faculty and administrators are interested in transitioning to digital classrooms, and most feel they

have the technical skills necessary to do so. However, the quantitative data also indicated that these same individuals have concerns regarding in-class distractions, lack of faculty knowledge of available technologies, and the physical structure of classrooms. These concerns were used as talking points in face-to-face interviews with educational technology experts across the UMMC campus. As the qualitative data acquired from the interviews were analyzed, three primary themes emerged. The first theme was the rationale for using digital classrooms and the educational software available to SHRP faculty. The second theme was other challenges that SHRP faculty might encounter when implementing technology into the educational setting. The third theme was implementation resources and strategies for individuals who decide to enact a change in their methods of information delivery.

The rationale for implementing digital classrooms focused on interactivity and student motivation. Educational technology experts were clear that interactive content delivery and assignments keep students engaged at a higher level. More engagement leads to less boredom, and, as a result, students are less likely to become distracted. Furthermore, engaged students are more accountable for their education. Interactive classrooms also provide access to immediate feedback from faculty. Additionally, today's college students grew up using technology (Caruth, 2016; Sedden & Clark, 2016), and, according to Participant H, many of these students attended elementary schools and high schools that use computers in the classrooms, and those students expect that trend to continue into college and university classrooms.

Educational technology experts focused on challenges involving faculty time, knowledge of software and devices, resistance to change, and physical space. Successfully implementing digital classrooms requires time for faculty to develop and practice new teaching methods. Most of the educational technology experts agreed that time is a limited commodity. Furthermore, faculty's lack of knowledge and familiarity regarding the educational software that is available compounds the issue of time. It takes time and training to become comfortable with new teaching methods. Even if faculty have time and training to design new lessons, there must be a desire to change. Many faculty members and administrators in an academic medical center are hired from the clinical area and are not taught to be teachers. These faculty members may not realize

the value of adapting teaching styles and methods to meet the expectations and needs of today's students. Student successes, such as high pass rates on national registry examinations, may be perceived by faculty as a reason not to change what is currently working. Finally, educational technology experts stressed the importance of flexible classroom spaces, reliable Wi-Fi and internet, and the funding issues these would present. Specifically, budgets must be considered for items such as monitors to replace projectors and power outlets for each student. While those needs may sound simple, they can be expensive.

Implementing digital classrooms requires that faculty and administration address the previously mentioned concerns. Analysis of the qualitative data demonstrated that faculty must understand how technology can be utilized. This includes knowing what is available and how it is designed to work. Many of the tools at faculty's disposal are available in Canvas. Such tools include Nearpod, Respondus, and Studio/Arc. Other tools, such as Kahoot! and ExamSoft are also available. Educational technology experts also explained that after faculty know what tools are available and how they are used; they must be trained to use them properly. However, training should be approached as a systematic process. Accomplished faculty should share their successes and failures with other faculty. Likewise, students must be trained on the software and their devices. As one interview participant suggested, this can be accomplished via orientation as students begin a program and as tip sheets that are available throughout their academic journey. Finally, interview participants stressed that physical and human resources must be used wisely. The organization may save money because of a reduced need for paper products and printing supplies; however, physical space concerns should be addressed one classroom at a time in order to reduce the cost of installing power outlets and monitors in each teaching space. Until a classroom has power outlets for every student, faculty should instruct students that they must arrive to class each day with a fully charged device. Replacing table and chairs in each classroom is likely an unrealistic expectation; however, using portable devices in the classroom allows students to sit in groups at tables. This creates a more collaborative environment. Finally, faculty must utilize the human resources available. These resources include on-site IT personnel, instructional

designers, e-Campus, and DIS. Successful implementation of digital classrooms will not occur without a team-based approach.

IMPLEMENTATION

CHAPTER V

IMPLEMENTATION

The purpose of this study was to address SHRP faculty and administrators' readiness to adopt digital classrooms, their desire to modify current instructional designs, and to identify educational technology experts' perceptions and experiences regarding digital classrooms. The findings of the study were used to develop a resource guide that SHRP faculty and administrators may use to convert traditional classrooms to a digital classroom format. Information regarding digital classrooms was gathered from three sources: the literature review, quantitative data provided by SHRP face-to-face faculty and administrators, and qualitative data collected from educational technology experts on the UMMC campus. Findings from the study were used to create a resource guide, called *Digital Classroom Basics*, which faculty and administrators may use when implementing digital classrooms in SHRP. Additionally, the researcher developed a presentation of findings to be presented to UMMC's academic administrators and leadership during future eCampus and NextGenEd meetings.

Discussion

Digital classrooms offer faculty and administrators a way to incorporate educational technologies into the traditional face-to-face classroom in order to meet student and employer expectations (Hilty & DeJong, 2018; Sedden & Clark, 2016) and instructor needs (Deveci et al., 2018; Yang et al., 2018). However, implementation of digital classrooms requires a desire to change and buy-in from faculty and administration (Stec et al., 2018). Responses to the quantitative questionnaire indicated that face-to-face faculty and administrators in SHRP have an interest in digital classrooms.

According to the literature, there are multiple benefits to implementing digital classrooms. Faculty have the ability to create more interactive lessons and assignments (Hofstein et al., 2013; Hughes et al., 2018), provide immediate student feedback (Deveci et al., 2018; Rossing et al., 2012), and adapt instruction to students' specific needs (Ottenbreit-Leftwich et al., 2010; Zyad, 2016). Additionally, creating a paperless environment through the implementation of digital classrooms could save a facility money over the course of a few years (Arney et al., 2012; Livas et al., 2019). The qualitative data collected from educational technology experts were analyzed and three

themes emerged: rationale, challenges, and implementation. Many of the benefits mentioned in the literature were echoed in the rationale theme.

The challenges identified via qualitative analysis aligned closely with the digital classroom challenges identified in the literature. For instance, faculty time is a primary concern discussed in both. It takes time and practice to convert existing lessons and assignments to a new format (Chartrand, 2016; Hesser & Schwartz, 2013). Many faculty members in an academic medical center have clinical practice duties in addition to teaching duties and may find it difficult to devote the time necessary to implement educational technologies into the classroom. Time is also required to train faculty to use educational materials with which they are unfamiliar. Furthermore, students will likely need to be trained to use their devices to meet faculty expectations. However, training is a key factor when implementing new teaching strategies and cannot be ignored (Chartrand, 2016; Hesser & Schwartz, 2013; Kontkanen et al., 2017; Stec et al., 2018). The need for training faculty of an academic medical center is vital because most faculty were not trained to be instructors. Additionally, one-on-one training delivered by instructional designers may be an effective method to reduce faculty's resistance to change.

The physical design of the traditional classroom was identified as a challenge in the literature and reiterated by educational technology experts at UMMC. Specific to both groups were the number of power outlets in the room, the flexibility of the furniture, and reliable Wi-Fi and internet. If students are expected to use an electronic device for their classes, they must be able to charge the devices throughout the day. Ideally, each student should have access to a power outlet (Deveci et al., 2018; Stec et al., 2018; Tas, 2017). Furthermore, an interactive learning environment, which is one of the goals of a digital classroom, would benefit from flexible furniture that allows students to arrange themselves in groups for collaborative purposes or to complete group assignments. Other physical space concerns involve the lighting in the room and how the windows are covered (Tas, 2017). Finally, reliable Wi-Fi and internet are a requirement of a digital classroom. Interruptions in student connectivity will challenge the efficiency and effectiveness of digital classrooms (Deveci et al., 2018; Stec el al., 2018; Tas, 2017). This fact mandates that instructors in a digital classroom have a backup plan in place in

the event that the Wi-Fi or internet connection to the classroom is unavailable or intermittent.

The final theme identified via qualitative analysis was implementation. This theme is specific to SHRP and UMMC and is the basis for the product of this study. Faculty and administrators must be familiar with the educational tools available to them, and they should understand how those tools might be used to convey information in an efficient and meaningful way to students. The University of Mississippi Medical Center provides faculty with a variety of educational tools; however, many faculty members fail to use the tools the way they were intended. A portion of this issue can be attributed to the fear of trying new things or of failing in front of students. In-depth faculty training is a way to alleviate those fears. Group training is an effective way to introduce new software products and provide an overview of product features, while one-on-one training may be necessary for faculty members to understand how the new product can be utilized in a meaningful way. Additionally, peer-to-peer training may be beneficial. Faculty members are more likely to try new teaching methods if they can visualize that teaching method in action. Furthermore, creating a sharing network between departments allows the entire school, such as SHRP, to work together to implement digital classrooms. This creates an environment in which success spreads rapidly throughout the facility.

Educational content experts provided information regarding the physical and human resources necessary to convert to digital classrooms. A majority of the classrooms in SHRP contains stationary furniture; however, this does not mean that the classroom cannot be an interactive environment. In a digital classroom, students use portable devices in class; therefore, they have the flexibility to move to other locations in the room or sit on both sides of the table. Content experts also addressed reliable Wi-Fi concerns. Faculty should ask students to disconnect from the Wi-Fi any devices that are not necessary for class. Finally, students should be expected to arrive to class with a fully charged device. This practice will serve as an effective way for students to ensure they can use their devices throughout the day. This also allows SHRP to add power outlets to one classroom at a time in order to minimize the effect on the budget. Additionally, converting to digital classrooms will eliminate much of the need for paper and printing products, which should have a positive effect on the school's budget. Money that would

have been spent for printing supplies may be used to offset the funding issues related to the conversion of traditional classroom spaces into spaces that contain an adequate number of power outlets, flexible furniture, and monitors to replace projectors and screens.

Research Product

Based on the findings in this study, the researcher created a PowerPoint presentation focused on the background of today's college students, students' expectations of the educational process, and the digital classroom concept. Additionally, benefits and challenges of digital classroom implementation found in the literature are compared to the results of this study. Finally, the presentation concludes with resources and strategies that may benefit faculty and administrators when converting their classrooms into digital classrooms.

Digital Classroom Basics is a resource guide that faculty and administrators may follow when implementing digital classrooms in SHRP. The guide is comprised of the resources and strategies collected by the researcher during this study. Strategies include training tips, suggestions regarding utilization of the educational software available, device specifications for students and faculty, an orientation plan for students, and guidance for converting to digital classrooms. Ideally, *Digital Classroom Basics* will be published in the SHRP Faculty Resources Canvas course and will be available to faculty and administrators at all times.

The findings of this study were used to create a research poster. The research abstract and poster will be presented at the 26th Annual SHRP Research Day in April 2021. This is an annual event conducted by SHRP at which, students present their research study and findings via a research poster or clinic table. Posters and clinic tables are judged and top research awards are presented at SHRP Honors Day.

Product Effectiveness

Faculty and administrators who utilize *Digital Classroom Basics* will be asked to complete an evaluation of the implementation tool after the first semester in a digital classroom. Feedback from the evaluation will be used to modify the implementation tool to improve its effectiveness. Faculty and administrators will also be encouraged to compare the outcomes of digital classroom cohorts to those of their previous cohorts to

determine the effectiveness of content delivery. Faculty and administrators should utilize the results of outcome comparisons to identify areas of content delivery that need to be strengthened. Armed with that knowledge, faculty are encouraged to schedule a one-on-one meeting with a member of the instructional design team to adapt content delivery to meet better the needs of the students.

Implementation Plan

This study identified the rationale for implementing digital classrooms in SHRP, challenges to consider before implementation, and resources and strategies for overcoming those challenges. These data were used to create a presentation of findings that will be presented in the third and fourth quarters of 2020 to SHRP administrators, the Office of eCampus, and the NextGenEd committee. The data collected during this study were also vital in the creation of *Digital Classroom Basics*, a resource guide to assist faculty and administrators who want to convert their traditional face-to-face classrooms into interactive digital classrooms. *Digital Classroom Basics* will be presented to SHRP administrators for inclusion in the SHRP Faculty Resources course in Canvas. The study abstract and research poster will be submitted in March 2021 for inclusion in the 26th Annual SHRP Research Day.

Limitations of the Study

There were limitations associated with this study. The quantitative phase of the study contained only 51 possible respondents to the questionnaire. Of those, only 38 met the inclusion criteria. Additionally, the responses provided on the quantitative questionnaire may have been biased due to the work relationship between the researcher and participants. Finally, respondents may have been influenced by the fear that their technical skills and abilities would be perceived as insufficient.

Recommendations for Future Actions

As digital classrooms are implemented at SHRP, other research opportunities related to the topic will arise. The following are suggested future studies to expand upon the information gained from this research study.

1. Compare student grades after one year of digital classroom instruction to the five-year average of grades in those same courses.
2. Compare the national board exam pass rates and scores of students from a

digital classroom environment to those of students from a traditional face-to-face setting.

3. Conduct qualitative studies to determine faculty and student perceptions of digital classrooms after implementation.
4. Conduct observational studies in digital classrooms to identify the learning activities that are being utilized and their impact on student engagement, interaction, and outcomes.

Digital classrooms offer an excellent contingency plan for face-to-face courses in the event that students are prohibited from being present on campus. The ultimate goal of digital classrooms is to convert face-to-face lessons to a digital format. When lessons, assignments, and assessments are delivered in an electronic format, transitioning to online content delivery becomes much more manageable for faculty. This is important in emergency situations so that each student's ability to complete educational requirements is hindered as little as possible and so that faculty and administrators can focus better on student needs.

Conclusion

The University of Mississippi Medical Center's School of Health Related Professions has the opportunity to pioneer new teaching strategies to better meet the expectations and needs of today's college students. Digital classrooms have demonstrated a positive effect on student outcomes, student engagement, and faculty effectiveness. In addition, many facilities have reported a reduction in costs associated with printing and paper products. Finally, incorporating newer technologies into the learning environment may prepare students for a career in health care, particularly those professions that rely heavily on emerging technologies.

Post-Study Addendum

As this study was concluding, the Covid-19 pandemic significantly altered the educational setting in the United States. Many measures were taken at the national and state levels to reduce the spread of the virus and to protect the student and faculty populations. In March 2020, UMMC followed directions from state government and required all schools and programs to cease on-campus meetings. Since the data for this study were collected before these mandates were established, it is logical that some of the

findings of this study would be much different. Specifically, the challenges surrounding faculty buy-in and the need for administration to lead the transition to digital classrooms are no longer issues. Faculty were required to convert face-to-face coursework to a digital format in order to accommodate online delivery. Other findings of the study, however, would most likely be magnified. For example, the importance of faculty training would likely be emphasized. Because all face-to-face faculty were directed to convert to online content delivery, the training required to do so had to be provided promptly. Faculty members who had not attended such trainings in the past were faced with implementing new educational tools within a condensed period. To address this issue, training courses related to Canvas, Respondus, Studio/Arc, and Big Blue Button were offered frequently, with faculty having very little time for experimentation. This should serve as evidence that all faculty should be required to attend training sessions regarding new teaching methods and educational tools, both for reasons addressed earlier in this study, as well as to prepare for a disaster or other event that requires remote teaching.

The challenges of faculty buy-in and administration's role in driving change are not diminished. The Covid-19 pandemic will end, and the educational system will return to some form of normalcy. Face-to-face courses in SHRP and UMMC will resume. When this happens, it is possible that faculty buy-in will become a challenge once again. Faculty will choose to continue their transition to digital classrooms or they will revert to their previous methods of content delivery. Administration will have a strong voice in this decision. The choices made by both faculty and administration will play a key role in determining the future of content delivery in SHRP.

APPENDICES

APPENDIX A

Permission Letter to the Dean of SHRP

Dr. Bailey,

My name is Lee Brown, and I am currently a student in the Doctor of Health Administration program in the School of Health Related Professions on the University of Mississippi Medical Center campus. I am developing a research study to investigate the readiness of SHRP faculty and administrators to transition to digital classrooms in the traditional face-to-face setting and to identify practical strategies for implementation.

For the purpose of this study, I have defined a digital classroom as a face-to-face learning environment that has transitioned to a one-to-one technology-enhanced learning (1:1 TEL) environment. In this setting, each student is responsible for acquiring a computing device, such as a laptop or tablet, which meets specific requirements set forth by each program's faculty. These devices are utilized to complete learning activities.

I am requesting permission to send an on-line REDCap questionnaire to each faculty member and administrator in SHRP. The information gained from this questionnaire will be used to determine the need and readiness for transitioning to a digital classroom format. Data will also be analyzed to develop interview questions for educational technology experts. These interviews will provide practical strategies and lessons that should prove useful for implementing this type of change.

Thank you,

Lee Brown

APPENDIX B

Permission Letter from the Dean of SHRP

From: Jessica H Bailey
Sent: Wednesday, November 6, 2019 8:35 AM
To: Ottis L. Brown
Subject: RE: Request to deploy REDCap questionnaire in SHRP

You certainly have my permission and support to conduct this project.
JHB

Jessica H. Bailey, PhD, RHIA
Dean and Professor
Health Administration
School of Health Related Professions

From: Ottis L. Brown
Sent: Tuesday, November 5, 2019 3:13 PM
To: Jessica H Bailey
Subject: Request to deploy REDCap questionnaire in SHRP

Dr. Bailey,

My name is Lee Brown, and I am currently a student in the Doctor of Health Administration program in the School of Health Related Professions on the University of Mississippi Medical Center campus. I am developing a research study to investigate the readiness of SHRP faculty and administrators to transition to digital classrooms in the traditional face-to-face setting and to identify practical strategies for implementation.

For the purpose of this study, I have defined a digital classroom as a face-to-face learning environment that has transitioned to a one-to-one technology-enhanced learning (1:1 TEL) environment. In this setting, each student is responsible for acquiring a computing device, such as a laptop or tablet, which meets specific requirements set forth by each program's faculty. These devices are utilized to complete learning activities.

I am requesting permission to send an on-line REDCap questionnaire to each faculty member and administrator in SHRP. The information gained from this questionnaire will be used to determine the need and readiness for transitioning to a digital classroom format. Data will also be analyzed to develop interview questions for educational technology experts. These interviews will provide practical strategies and lessons that should prove useful for implementing this type of change.

Thank you,

Lee Brown

APPENDIX C

REDCap Questionnaire Invitation

SHRP Faculty Members and Administrators,

My name is Lee Brown, and I am currently a student in the Doctor of Health Administration program in the School of Health Related Professions on the University of Mississippi Medical Center campus. I am developing a research study to investigate the readiness of SHRP faculty and administrators to transition to digital classrooms in the traditional face-to-face setting and to identify practical strategies for implementation.

For the purpose of this study, I have defined a digital classroom as a face-to-face learning environment that has transitioned to a one-to-one technology-enhanced learning (1:1 TEL) environment. In this setting, each student is responsible for acquiring a computing device, such as a laptop or tablet, which meets specific requirements set forth by each program's faculty. These devices are utilized to complete learning activities.

Because of your role in SHRP, I feel you have information that is valuable to this project. I will be emailing a REDCap questionnaire on Monday, November 11, 2019 to all faculty and administrators in SHRP and would greatly appreciate your honest feedback. Items in the questionnaire will explore your knowledge and interest in a digital classroom. The questionnaire should only take 10-15 minutes to complete and will be available until December 8, 2019. Participation is voluntary; however, completing the questionnaire will serve as your consent to participate. All responses will remain anonymous and will only be used to further this study.

Thank you,

Lee Brown

APPENDIX D

Questionnaire Deployment Email

SHRP Faculty Members and Administrators,

My name is Lee Brown, and last week I emailed you an invitation to participate in a study I am conducting to fulfill the requirements of the Doctor of Health Administration degree offered in the School of Health Related Professions. As a reminder, the purpose of the study is to investigate the readiness of SHRP faculty and administrators to transition to digital classrooms in the traditional face-to-face setting and to identify practical strategies for implementation. Additionally, I have defined a digital classroom as a face-to-face learning environment that has transitioned to a one-to-one technology-enhanced learning (1:1 TEL) environment. In this setting, each student is responsible for acquiring a computing device, such as a laptop or tablet, which meets specific requirements set forth by each program's faculty. These devices are utilized to complete learning activities.

I ask that you please take 10 to 15 minutes to complete the questionnaire. The questionnaire is available until December 8, 2019. All responses will remain anonymous and will only be used to further the study. Completing and submitting the questionnaire will serve as your consent to participate. The survey may be accessed via the link below.

https://is.gd/digitalclassrooms

Thank you for your consideration.

Lee Brown

APPENDIX E

REDCap Questionnaire Instrument

Confidential

SHRP Digital Classroom Questionnaire

The purpose of this questionnaire is to assess the interest in digital classrooms at the School of Health Related Professions on the University of Mississippi Medical Center campus. You have been identified as a SHRP faculty member or administrator and your responses to the questionnaire are essential to this discussion. Participation in this is voluntary, and your responses will remain anonymous. The questionniare should take approximately 10-15 minutes to complete and will be available for four (4) weeks. The questionnaire will close on December 8, 2019. Due to the variety of participants included in this study, not all participants will answer all questionnaire items. Submitting the questionnaire will be considered consent to participate.

For the purpose of this study, I have defined a digital classroom as a face-to-face learning environment that has transitioned to a one-to-one technology-enhanced learning (1:1 TEL) environment. In this setting, each student is responsible for acquiring a computing device, such as a laptop or tablet, which meets specific requirements set forth by each program's faculty. These devices are utilized to complete learning activities.

1. What is your primary role in SHRP?
   - ○ Faculty
   - ○ Administrator

2. In which educational setting do you teach?
   - ○ Traditional face-to-face only
   - ○ Online only (Branching logic - questionnaire ends)
   - ○ Both traditional and online
   - ○ I am an administrator and do not teach. (Skip to #10)

3. How long have you taught in a traditional, face-to-face setting?
   - ○ 5 years or less
   - ○ 6-10 years
   - ○ 11-15 years
   - ○ 16-20 years
   - ○ More than 20 years

4. On average, approximately how many students are in each class you teach?
   - ○ 15 or fewer
   - ○ 16-30
   - ○ 31-45
   - ○ More than 45

5. In your opinion, which of the following learning styles best describes the students in the classes you teach? (Select all that apply)
   - ☐ Visual learners - prefer to learn via written information
   - ☐ Auditory learners - prefer to learn via hearing information
   - ☐ Print learners - prefer to take notes and learn by writing information
   - ☐ Tactile learners - prefer to complete hands-on activities to learn information
   - ☐ Interactive learners - prefer to discuss and learn information in group settings
   - ☐ Kinesthetic learners - prefer role-playing and training exercises; learn by moving
   - ☐ Other

5 (a).You chose "Other" as a student learning style. Please use this space below to describe your students' learning styles not mentioned on the previous item.

Confidential

6. Please select the three (3) learning activities you use most in your classroom.

- ☐ Collaborative group projects
- ☐ Hands-on simulations
- ☐ Laboratory exercises
- ☐ Lecture presentations
- ☐ Printed lecture handouts
- ☐ Video presentations
- ☐ Worksheet activities
- ☐ Other

6 (a).You chose "Other" as a learning activity you frequently use. Please describe this activity in the space provided.

7. On a scale of 1 to 5, how would you rate your proficiency using technology in the educational setting?

- ◯ 1 - Novice
- ◯ 2 - Limited
- ◯ 3 - Adequate
- ◯ 4 - Advanced
- ◯ 5 - Expert

8. Are your students required to bring a computing device (laptop, tablet, etc.) to class?

- ◯ Yes (Skip to #9)
- ◯ No

8 (a).Approximately what percentage of students bring a computing device to class even though it is not required?

- ◯ 25% or less
- ◯ 26%-50%
- ◯ 51%-75%
- ◯ More than 75%

9. Which of the following educational software programs have you used? (Select all that apply)

- ☐ Arc
- ☐ Big Blue Button
- ☐ Canvas
- ☐ eTextbooks
- ☐ Evernote
- ☐ Evolve
- ☐ ExamSoft
- ☐ Google Docs
- ☐ Google Drive
- ☐ Kahoot!
- ☐ Moodle
- ☐ Nearpod
- ☐ Notability
- ☐ OneNote
- ☐ Periscope
- ☐ Respondus
- ☐ Thinglink
- ☐ Other
- ☐ I do not use educational software programs in my classroom. (Skip to #9c)

9 (a).You chose "Other" as an option for educational software programs you have used. Please list any educational software programs that you have used that were not mentioned in the previous item.

Confidential

9 (b). Which option describes the frequency in which you use educational software programs in your classroom?

- ○ I use at least one of the educational software programs on a daily basis in my course. (Skip to #10)
- ○ I occasionally used at least one of the educational software programs in my course. (Skip to #10)
- ○ In the past, I used at least one of the educational software programs in my course; however, I no longer do so.

9 (c). Please use the space below to explain the reason(s) you do not use digital educational software programs in your class.

10. Please identify any barriers that you feel might arise when transitioning to a digital classroom setting. (Select all that apply.)

- ☐ Too much time needed to convert materials to a digital format
- ☐ In class distractions due to electronic devices
- ☐ Cost of personal devices for students
- ☐ Current physical layout of classrooms not compatible with digital classroom technologies
- ☐ Lack of personal knowledge regarding digital classroom technologies
- ☐ Other

10 (a). You chose "Other" when asked to identify any barriers that may arise when transitioning to digital classrooms at SHRP. Please list those barriers here.

11. Please rate your interest level in transitioning your classroom into a digital classroom. (See definition of digital classroom in introduction statement)

- ○ Extremely interested
- ○ Interested
- ○ Uninterested

12. Please use the space below to provide any additional comments or information.

APPENDIX F

Weekly Reminder

SHRP Faculty Members and Administrators,

Recently you received an invitation to participate in a digital classroom study by completing a questionnaire in REDCap. The deadline to complete the questionnaire is December 8, 2019. Your input is valuable to my study, and I greatly appreciate the time you take from your busy schedule to complete the questionnaire. You may access the questionnaire via the following link.

https://is.gd/digitalclassrooms

Thank you,

Lee Brown

APPENDIX G

Interview Invitation

(Name of Participant),

My name is Lee Brown, and I am currently a student in the Doctor of Health Administration program in the School of Health Related Professions on the University of Mississippi Medical Center campus. I am conducting a study to investigate the readiness of SHRP faculty and administrators to transition to digital classrooms in the traditional face-to-face setting and to identify practical strategies for implementation.

For the purpose of this study, I have defined a digital classroom as a face-to-face learning environment that has transitioned to a one-to-one technology-enhanced learning (1:1 TEL) environment. In this face-to-face setting, each student is responsible for acquiring a computing device, such as a laptop or tablet, which meets specific requirements set forth by each program's faculty. These devices are utilized to complete learning activities. The attached illustration provides a visual representation of digital classrooms, online classrooms, and flipped classrooms.

Because of your experience in instructional design and educational technologies, I feel you have knowledge that is valuable to this project. I would like to conduct a face-to-face interview with you to understand better your role in instructional design and your experiences and perceptions of computer technologies in classrooms. The interview is strictly voluntary, and it should last approximately 30 minutes.

I would like to conduct interviews within the next six (6) weeks, so please reply to this request to either accept or decline the invitation to participate. If you agree to participate, I will contact you within seven days to schedule a date, time, and location for your interview. Furthermore, if you have professional contacts on the UMMC campus that may have knowledge of educational and/or computer technologies, I would like to interview them. If there are any contacts you would like to share, I will collect their information when I call you to schedule our interview.

Thank you,

Lee Brown

APPENDIX H

Follow-Up Phone Call Script for Scheduling Interviews

(Name of Participant),

My name is Lee Brown and I am currently a student in the Doctor of Health Administration program at the School of Health Related Professions. Recently, I emailed you to invite you to participate in a research study regarding digital classrooms. I am calling you today to set up your interview date, time, and location. I also want to remind you that if you choose to participate, your responses will be anonymous and will remain confidential. You will also have the opportunity to review a list of themes identified for accuracy. Furthermore, the data acquired via the interviews will only be used to advance my research study.

Interviewee:
Interview Date:
Interview Time:
Interview Location:

Thank you for your consideration.

Lee Brown

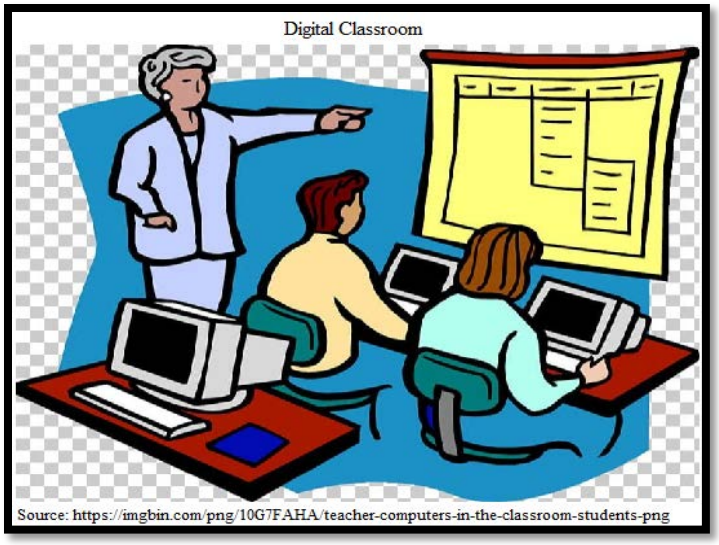
APPENDIX I

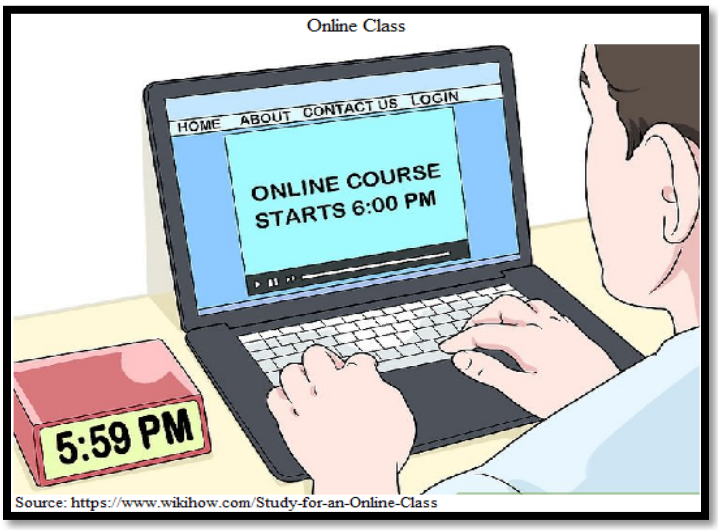
Handout for Interview

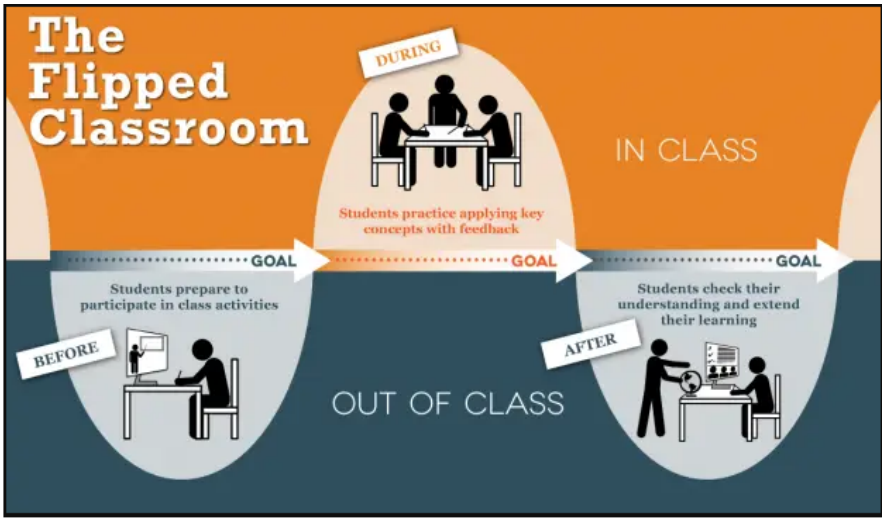
Handout for Interview

The interview should last approximately 30 minutes and will be recorded with your permission. I will then transcribe and de-identify the data collected. With the assistance of a peer coder, I will identify themes, and you will have the opportunity to review these themes for accuracy. Your responses will remain confidential and will be used to inform the research under investigation.

I have defined a digital classroom as a face-to-face learning environment that has transitioned to a one-to-one technology-enhanced learning (1:1 TEL) environment. In this face-to-face setting, each student is responsible for acquiring a computing device, such as a laptop or tablet, which meets specific requirements set forth by each program's faculty. These devices are utilized to complete learning activities. The following page provides a visual representation of digital classrooms, online classrooms, and flipped classrooms.







Source: https://facultyinnovate.utexas.edu/flipped-classroom

APPENDIX J

Letter of Consent for Personal Interview

Consent for Participation in Interview Research

I volunteer to participate in a research project conducted by Mr. Lee Brown from the University of Mississippi Medical Center. I understand that the research project is designed to acquire information regarding educational technologies used on the University of Mississippi Medical Center campus. I will be one of approximately 15 people being interviewed for this project.

1. My participation in this project is voluntary, and I understand I will not be compensated for participating.
2. I understand that I may decline to participate or withdraw from the study at any time.
3. I understand that I may decline to answer any question without penalty.
4. I understand that the researcher will record and transcribe this interview. If I do not wish to be recorded, I understand that I cannot participate in the study.
5. I understand that transcribed data will be de-identified and that my name will not be used in any of the final documents.
6. I read and understand this consent form, and I voluntarily agree to participate in this study.
7. I have been given a copy of this consent form.

_____ _____

My Signature Date

_____ _____

My Printed Name Signature of Researcher

For additional information, please contact:

Mr. Lee Brown
obrown@umc.edu
(601) 984-6368

APPENDIX K

Educational Technology Expert Interview Instrument

Thank you for taking the time to meet with me today. As mentioned in the interview invitation, you have been identified as an expert in instructional design and incorporating computer technology in the learning environment. I would like to ask a few questions regarding your experience with digital classrooms. As a reminder, *I have defined a digital classroom as a face-to-face learning environment that has transitioned to a one-to-one technology-enhanced learning (1:1 TEL) environment. In this face-to-face setting, each student is responsible for acquiring a computing device, such as a laptop or tablet, which meets specific requirements set forth by each program's faculty. These devices are utilized to complete learning activities.*

The interview should last approximately 30 minutes and will be recorded with your permission. I will then transcribe and de-identify the data collected. With the assistance of a peer coder, I will identify themes, and you will have the opportunity to review these themes for accuracy. Your responses will remain confidential and will be used to inform the research under investigation. If you agree to participate, I would like you to sign a letter of consent for my records. Do you have any questions before we begin?

Name of interviewee:
Date of interview:
Time of interview:

- Describe your background in education.
    - *Probe:* With which educational or computer technologies that may be utilized in the face-to-face learning environment are you familiar?

- Describe your current role at the University of Mississippi Medical Center.
    - *Probe:* What are your primary job responsibilities?
    - *Probe:* How long have you served in this capacity?

- What is your perception of the current face-to-face classroom settings in your school (UMMC campus for DIS)?
    - *Probe:* Approximately what percentage of the curriculum in your school is face-to-face versus online?
    - *Probe:* Discuss the educational and computer technologies that faculty are utilizing in the classrooms in your school (UMMC campus for DIS).
    - *Probe:* Describe the most commonly used teaching strategies employed by faculty of your school (UMMC campus for DIS).

- If budget limitations were nonexistent, what would be the ideal face-to-face classroom for your school (UMMC campus for DIS)?
    - *Probe:* Describe the types of technologies it would employ.
    - *Probe:* Discuss the educational software that would be used.
    - *Probe:* Discuss the importance of the physical layout of classrooms based on your choices.

- Tell me about a time you assisted a faculty member with a new technology or educational product for the face-to-face classroom environment, and the outcome was positive.
    - *Probe:* Elaborate on the ways this benefited the faculty member.
    - *Probe:* Discuss the benefits to the students.

- Tell me about a time when the outcome was negative.
    - *Probe:* Explain the challenges that resulted in the negative outcome.
    - *Probe:* Discuss things that may have improved the outcome or experience.

- In the previous phase of this study, 100% of the SHRP faculty that teach in a face-to-face setting stated they use Canvas as an educational software program; however, most are not utilizing the tools available in Canvas. For instance, only 12% use Big Blue Button, 18% use Arc, and 30% use Respondus. How would you explain this?
    - *Probe:* Have you encountered this same trend in your school?
    - *Probe:* (if yes) Discuss ways you assisted faculty to utilize the tools available.
    - *Probe:* (if no) Explain steps you took to ensure this did not happen.

- The top three barriers to digital classrooms identified by SHRP faculty were in class distractions due to electronic devices, lack of personal knowledge regarding digital classroom technologies, and incompatibility of the current physical layout of classrooms. Have you encountered any of these concerns at your school?
    - *Probe:* (if yes) Discuss ways you addressed these concerns with your faculty.
    - *Probe:* (if no) Explain steps you took to ensure this did not happen.

- Describe strategies that SHRP faculty members and administrators should consider if they decide to implement a digital classroom.

- Do you know any other UMMC employees that have experience related to computer technologies in the classroom?

- Is there anything you would like to add?

APPENDIX L

Human Subjects Research Self-Certification Form

Self-Certification Form for Determining Whether a Proposed Activity is Research Involving Human Subjects

When to Use this Form:

1. If you need documentation for funding agencies, administrators, or collaborators
2. If you are unsure whether or not you need to submit your project to the IRB
3. If you are unsure if your project is research
4. If you are unsure if your research involves human subjects

This form is not an Exempt Certification or IRB review
Exemptions are a type of IRB review. If your project meets the definition of human subjects research you must submit the project to the IRB for review.

Administrative Information

Your Name	Lee Brown	Degree(s) + Department	Doctoral Degree/Department of Health Administration
Mailing Address		Phone	(601) 984-6368
		Email	obrown@umc.edu
Project/Study/Grant Title/Award#	Experiences and Perceptions of Implementing Digital Classrooms at an Academic Medical Center		

1) Is your project "research"?

"Research" is defined under 45 CFR 46.102(d) as a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge. Activities, which meet this definition, constitute research for purposes of this policy, whether or not they are conducted or supported under a program which is considered research for other purposes.

Is your project a "systematic investigation"?

☐ No
X Yes

"***Systematic investigation***" *is an activity that involves a prospective research plan that incorporates data collection, either quantitative or qualitative, and data analysis to answer a research question.*

Systematic investigation involves a predetermined method for studying a specific topic, answering a specific question, testing a specific hypothesis, or developing theory.

Examples of systematic investigations include, but are not limited to, *observational studies, interview (including those that are open-ended) or survey studies, group comparison studies, test development, program evaluation and interventional research.*

Is the primary intent of the project to develop or contribute to generalizable knowledge?

X No
☐ Yes

Investigations designed to develop or contribute to ***generalizable knowledge*** *are those designed to draw general conclusions (i.e., knowledge gained from a study which may be applied to populations outside of the specific study population), inform policy, or generalize findings.*

To develop or contribute to generalizable knowledge requires that the results (or conclusions) of the activity are intended to be extended beyond a single individual or an internal program.

Intent to publish results/conclusions in a peer-reviewed journal or to present at a regional or national meeting does not determine this response. Thesis or dissertation projects conducted to meet the requirements of a graduate degree are usually considered generalizable.

Examples of activities that are not considered research under the above definition:

- **Quality Assurance/Improvement:** Activities whose purposes are limited to: (a) implementing a practice to improve the quality of patient care and then (b) collecting patient or provider data regarding the implementation of the practice for clinical, practical, or administrative purposes. Planning to publish an account of a quality improvement or quality assurance project does not necessarily mean that the project fits the definition of research
- **Case Reports:** The external reporting (e.g., publication, poster or oral presentation) of an interesting clinical situation or medical condition of up to three patients. The patient information used in the report must have been originally collected solely for non-research purposes as the result of a clinical experience.
- **Public Health Surveillance:** A series of ongoing systematic activities, including collection, analysis, and interpretation of health-related data essential to planning, implementing, and evaluating public health practice closely integrated to the dissemination of data to those who need to know and linked to prevention and control.

If you answered **No** to one or both questions, you may stop here. You are not conducting research that needs to be reviewed by the IRB. A copy of this completed form should be maintained in your project file. Do not submit a copy of this form to the IRB.

If you answered **Yes** to both questions above, continue below.

2) Does your project involve "Human Subjects"?

Human Subject is defined under 45 CFR 46.102(f) as a living individual about whom an investigator conducting research obtains:

1. data through intervention or interaction with the individual, or
2. identifiable private information.

Does the project involve "intervention" or interaction with a human subject?	☐ No ☐ Yes *"Intervention" includes both physical procedures by which data are gathered (for example, venipuncture) and manipulations of the subject or the subject's environment that are performed for research purposes. Interaction includes communication or interpersonal contact between investigator and subject.*
Does the project involve access, by PI or project personnel, to identifiable private information?	☐ No ☐ Yes ***Private information** includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, a medical record).* *Private information must be individually identifiable (i.e., the identity of the subject is or may be ascertained by the investigator or associated with the information) in order for obtaining the information to constitute research involving human subjects.*
Does the project involve receipt of data/specimens that were collected by another with identifiable private information?	☐ No ☐ Yes (and answer two questions below)

Are the data/specimens coded such that they could be re-identified?	☐ No ☐ Yes
Is there a written agreement that prohibits you and your staff access to the link?	☐ No ☐ Yes

If you answered **No** to all 3 questions in section 2, or **No** to the first two questions and **Yes** to the third question and both sub-parts you are not conducting research that needs to be reviewed by the IRB. A copy of this completed form should be maintained in your project file. Do not submit a copy of this form to the IRB.

Any other combination of answers means that the proposed activity may be research that involves human subjects. You must submit an application to the IRB before starting your project. Visit the IRB's website, umc.edu/irb or call the Human Research Office, 601 984-2815 for more information.

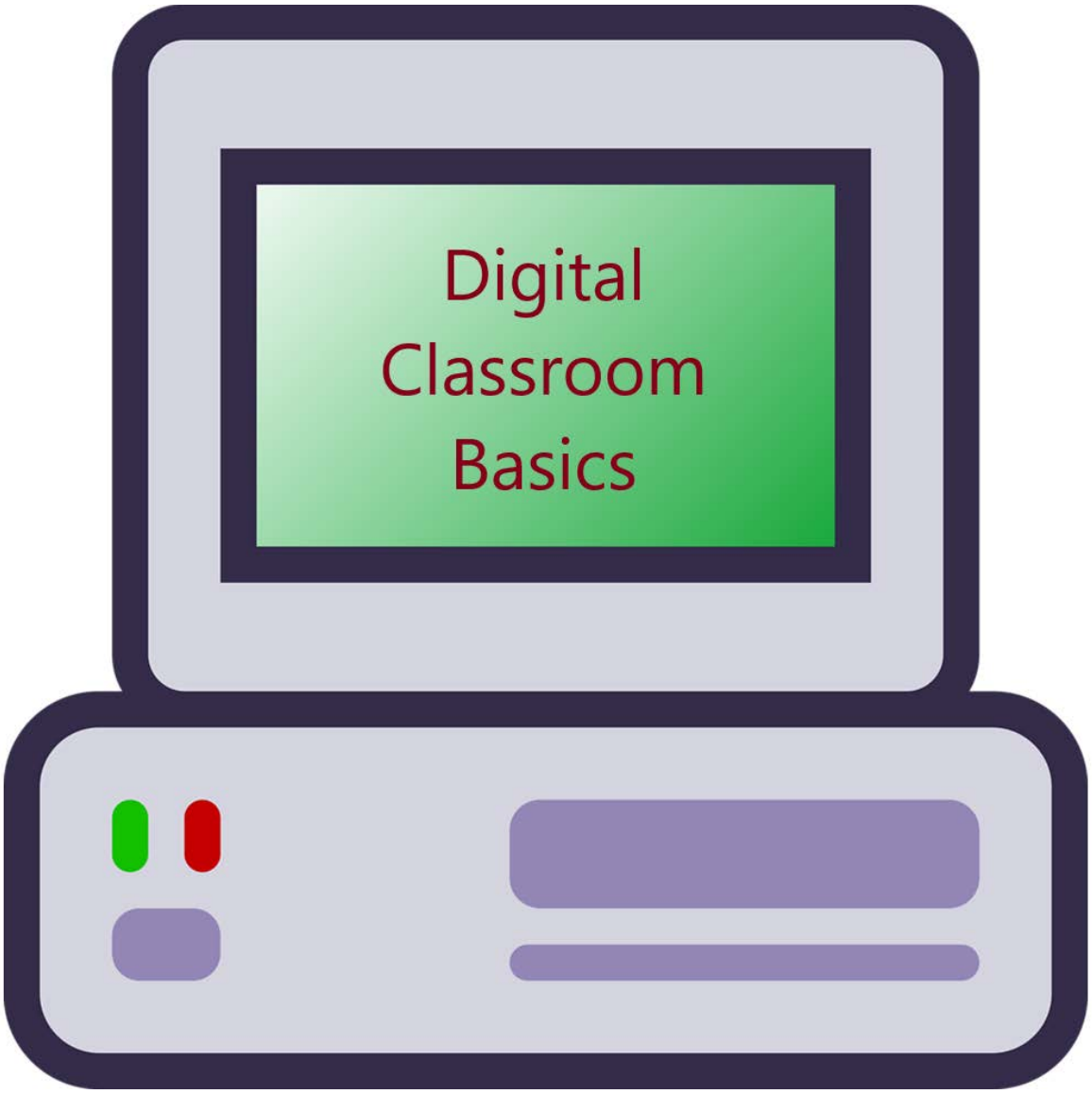
Your Signature

Date	August 19, 2019
Print Name	Lee Brown
Signature	

I certify that the information above is true and accurate.

APPENDIX M

Digital Classroom Basics



University of Mississippi Medical Center
School of Health Related Professions

Faculty Guidelines for Implementing Digital Classrooms in the Face-to-Face Learning Environment

SHRP Faculty Member or Administrator,

Thank you for your interest in digital classrooms. For the purpose of this document, a digital classroom is defined as a face-to-face learning environment that has transitioned to a one-to-one technology-enhanced learning (1:1 TEL) environment. In this setting, each student is responsible for acquiring a computing device, such as a laptop or tablet, which meets specific requirements set forth by each program's faculty. Students use these devices to complete learning activities and knowledge assessments. Some benefits of digital classrooms include immediate feedback from instructors to students, a more interactive learning environment for students, and decreased reliance on paper and printing supplies.

Digital Classroom Basics serves as a resource guide for any faculty member or administrator that plans to implement computer technologies into their classroom. This guide is not an exhaustive list of topics; however, the topics discussed are those deemed most important by educational technology experts across the UMMC campus. *Digital Classroom Basics* will continue to grow to incorporate new ideas and best practices as faculty and administrators implement digital content into their face-to-face courses.

Thank you, again, for your interest in digital classrooms and your willingness to adapt to the changing needs of your students, health care system, and institution.

Topics Covered in this Document

Tips to Remember 

- There is no magic wand. Change is not easy, and it takes time, effort, and desire.
- Requiring students to bring computers to class does not create a digital classroom.
- Implementing digital classrooms does not have to be an “all or nothing” process.
- Do not be afraid to try new ideas.
- You must become comfortable with the devices students will likely use for class.
- Know which educational programs are available and how they function.
- Do not be embarrassed to ask for help.
- Use your resources, both physical and human.
- Become
- Make sure you have a backup plan in place in case of unavoidable technical issues.

Digital Classroom Basics

The fact that you are reading this document means you are probably interested in incorporating digital technologies and educational software into your classroom. Throughout the document, questions are posed and answered. As digital classrooms are implemented in SHRP, this document will expand and new information will be added. In time, *Digital Classroom Basics* will become the location for pertinent digital classroom information and implementation strategies.

A Change in Thinking and Content Delivery

Who should be involved?

The short answer to this question is "everyone." It is true that face-to-face instructors likely stand the most to gain from this document; however, that does not mean on-line instructors will find it meaningless. Instructors of either content delivery method may use many of the educational tools discussed later. Keep in mind, if you choose to implement a digital classroom you must accept that it will take time, effort, and perseverance. Additionally, you must be willing to try new things even if they are difficult and be willing to adapt your content delivery methods until you find what works best for you and your students.

What are some advantages and challenges of digital classrooms?

There are many advantages and challenges of digital classrooms found in the literature. There are advantages and challenges for students, faculty, and the organization. This document will not identify all of the advantages, but it will provide insight on a select few that will likely benefit you, your students, and SHRP.

Students may appreciate digital classrooms because of new content delivery methods. Instructors in SHRP rely heavily on face-to-face lectures. This may hurt your feelings, but students often find this form of content delivery to be boring. What happens when your students get bored? They tend to get distracted and stop paying attention. This could hurt them when test time arrives. Vary your content delivery, use new teaching methods, and keep them engaged. However, computers can be expensive, and we just added that cost to the students. Is there a way to offset some of the costs?

A primary advantage of digital classrooms for faculty members actually comes at a cost. Faculty have to spend time to save time. It is true. It takes time to convert lessons and presentations to another format. Your paper tests are not going to appear in Canvas or ExamSoft via osmosis. You have to enter them in there yourself. However, once they are there, they are there. How does that help? Okay, you spent time this year converting your educational materials and tests to a digital format. What do you do next year? You copy your Canvas course from the previous year, you adjust your due dates, and you select "Publish." Congratulations, time saved. Do you want to save more time? Who grades your paper test? You? Or does your administrative assistant grade them by running them through the Scantron system? The answer to these questions are irrelevant. If your tests are in Canvas or ExamSoft, the computer grades the test for you. Instantaneously. Your students are now receiving instantaneous feedback. More

time saved. The time required to convert your educational materials is a one-time investment. The time you save will accumulate year after year.

What does every organization want? More money. Over time, digital classrooms have the potential to save SHRP money. Imagine this scenario. All face-to-face faculty in SHRP have converted to digital classrooms. How much paper is SHRP using? How many toner cartridges? Say goodbye the Scantron System and all the paper Scantron forms. By the way, those things are expensive. However, it is not that easy. It is never that easy. Administration would have to be willing to spend money to make money. The classrooms in SHRP are not set up to be interactive like those needed in a true digital classroom. For starters, most of the tables are bolted to the floor, and it would be expensive to refurnish every classroom in the building. No flexibility there. Or is there? What else do digital classrooms need? If students bring their computers to class, they have to have power to use them. Looks like we need a power outlet for every student. Well, maybe not.

Finally, implementing digital classrooms in the face-to-face educational environment can serve as a contingency plan when students are not permitted to be on campus. Faculty and administrators may have few alterations to make to convert to an online learning environment. Of course, this depends on the degree to which faculty and administrators have adopted digital classrooms. Some may simply need to convert Canvas tests from Respondus Lockdown to Respondus Monitor. Others may only need to record narrated presentations and upload them into Canvas. Those who use Respondus Monitor in the face-to-face environment and record their lectures for students to reference via Studio may be ready for emergencies in a moment's notice.

Did you notice a pattern in the preceding paragraphs? Here is the simplified version: advantages for students, challenges for students, advantages for faculty, challenges for faculty, advantages for administration, challenges for administration. What, then, is the plan to overcome all of those challenges? Keep reading, and you will learn more.

Navigating Digital Classroom Challenges

- *How can we keep costs for students as low as possible?*

  Some instructors have suggested that SHRP require students to buy their own Scantron forms. Additionally, some instructors upload their PowerPoint presentations to Canvas and have students print their own copies. There is nothing wrong with these tactics; however, they do not answer the questions posed.

  Converting to digital classrooms allows instructors to utilize e-textbooks for their courses. Fortunately, the digital textbooks are generally less expensive than their paper counterparts are. This offsets some of the cost of a device for students. Additionally, students should be able to take handwritten notes directly on their computers. As such, students have less need for paper, pencils, and other paper related products. Finally, instructors should ensure that the cost of the devices students will need are represented in the cost of attendance analysis that is sent to the Financial Aid Department.

- *How will students ensure their devices are ready for class each day?*

  Installing power outlets for each student in every classroom in SHRP would be an expensive endevour. If it does happen, it could be one classroom at a time or all of them at once. Until each classroom is properly equipped with power outlets, however. Instructors should require their students to arrive each day for class with a fully charged device.

- *How can you create an interactive space when the furniture is stationary?*

  Installing flexible furniture options in each classroom would also be expensive. The tables are bolted to the floor in many classrooms in SHRP; however, most rooms have moveable chairs and the students' devices are portable. Therefore, the inexpensive solution here is to have students use both sides of the table when group sessions are desired. There is less need for students to face the projector screen because students have their devices.

Device Specifications

What minimum specifications should those devices meet?

The following specifications and verbiage are taken from the syllabus of a course in the Radiologic Sciences Department in SHRP. Currently, computers that meet these specifications have worked well for the digital activities required in the program. This does not mean these specifications will meet each programs' needs; however, they are a good starting point.

Technology Requirements: The student will need internet access and a computer/device that meets minimum standards to function with UMMC platforms. It must at least function at the following levels:

- Windows 7 or Windows 10; Mac OS 10 or better;
- Must be patched by Operating System Company regularly;
- Modern browser such as the latest Chrome, Firefox, or Internet Explorer/Edge; and
- Must run a modern and updated anti-virus solution.

Note: Your device needs to allow you to both type and write using an electronic pen/pencil. You will use your device to perform the following tasks:

- Type papers, etc.
- Download PowerPoint presentations
- Download worksheets, etc. and complete using an electronic pen/pencil.

We do not recommend any thin client devices such as Chromebooks or Google books. Refer to the student orientation module in Canvas for course-related technology requirements regarding accessibility and privacy statements.

What types of devices will your students use?

Your student will likely use one of four options as a device for class. These include a laptop PC, a MacBook, an Apple iPad Pro, or a Microsoft Surface Pro. The good news is these devices seem to work well in the classroom. The not-so-good news, most instructors do not own all four of these devices.

Device and Educational Software Training

Are you comfortable with the devices your students will bring to class?

You have already determined the specifications you want your students' devices to meet, and you know the device will probably be one of four standard options that work well in the classroom. That was the good news. Remember? Time for the not-so-good news. Most instructors do not own all four of those devices. So what is an instructor to do? You can begin by answering the following questions. Do you own a device that meets the same specifications you required of your students? Is it one of the four most common options? Do you use it on a regular basis? If you answered yes to all three of those questions, then you are on your way. If not, you need to become familiar and comfortable with the technologies your students will use. One way to do this is to talk other instructors in your department and determine if they own one of those four devices. You will likely find that your peers have knowledge regarding these devices and will be happy to provide you with tips and suggestions. What if that is not an option? What options exist then? It is probably time to "Be Part of the Sharing Network" and begin looking to "Other Human Resources" for guidance.

What educational software programs are available in Canvas?

Canvas has several tools that may be utilized in a digital classroom. A few of those include Canvas Quizzes, Nearpod, Big Blue Button, and Studio. You must understand how to use these tools in meaningful ways. Otherwise, you will probably create confusion and irritation for your students.

How might those programs be used to create meaningful assignments?

Have you ever made a mistake in front of your students? It happens. We have to accept that reality and be prepared for it to happen with new technologies as well. You cannot let that fear stop you. If you find new ways to reach students, they will likely appreciate it, and you may even find that they are fairly forgiving of your mistakes. You learn from these mistakes, you adapt your content delivery, and you become comfortable with the technologies and educational software you have employed. You have other options that will help you learn how various educational programs function. You can Be Part of the Sharing Network, check your Other Human Resources, and learn from others' Best Practices and Pitfalls.

As faculty and administrators develop ways to utilize Nearpod, Studio, Big Blue Button, Respondus, ExamSoft, etc., their ideas and suggestions will be added here.

How do you learn to use the available tools?

The short answer here is to Be Part of the Sharing Network and utilize your Other Human Resources. Additionally, you should attend training sessions that are available in SHRP. Typically, the instructional design team conducts training sessions; however, the SHRP Technology Committee also provides training. What do you do if you need training on a specific topic and that training is not being offered? Contact your instructional designer. Instructional designers across the UMMC campus state they are not being utilized to their full potential. They do not know what you need help with unless you tell them. The same goes for the Technology Committee. Contact the committee chair and inform him or her that there are training opportunities in SHRP. The committee is always trying to identify ways to assist better the faculty and administrators in SHRP. If your needs are outside their knowledge base, the committee can point you in the right direction.

Be Part of the Sharing Network

- *Who is your instructional design expert?*

  In order to avoid using actual employee names, this question will be answered in the document published in the Faculty Resources Canvas Course.

- *Who are the technology experts in your department?*

  In order to avoid using actual employee names, this question will be answered in the document published in the Faculty Resources Canvas Course.

- *Who are the technology experts in SHRP?*

  In order to avoid using actual employee names, this question will be answered in the document published in the Faculty Resources Canvas Course.

Other Human Resources

- *Who is your contact if you need immediate assistance?*

  In order to avoid using actual employee names, this question will be answered in the document published in the Faculty Resources Canvas Course.

- *Who is the contact if you want to request educational software that is not available currently at UMMC?*

  In order to avoid using actual employee names, this question will be answered in the document published in the Faculty Resources Canvas Course.

Student Orientation

Educational technology experts on the UMMC campus suggested that faculty and administrators who transition to digital classrooms should create a program specific student orientation. The purpose of the orientation is to help students get more familiar with their devices and the nature of the assignments and expectations of the program's instructors. As such, each department needs to answer the following questions based on its student requirements. This section will be updated periodically based on feedback from faculty and administrators.

- *What type of learning activities will students complete most often?*

  Typically, the answer to this question will vary from course to course. However, common activities will be added as faculty incorporate digital educational materials.

- *What can you do to help students prepare to meet departmental expectations in a digital classroom?*

  One suggestion is to create examples in Canvas of all of the various assignments students will be expected to complete in the course. During student orientation, students can log into Canvas and submit these practice assignments. The time spent practicing will be worth it when students' grades are on the line.

Best Practices and Pitfalls

- *What strategies worked for you?*

  The answers to this question will develop over time as faculty and administrators discuss their successes and challenges.

- *What are some pitfalls to avoid?*

  The answers to this question will develop over time as faculty and administrators discuss their successes and challenges.

APPENDIX N

Research Poster

Transitioning to Digital Classrooms at an Academic Medical Center

Ottis L. Brown, Jr., Elizabeth Franklin, Shelia Bullock, Judy Gordy, Mark Gray, Kenneth Heard, & Pamela Jones
University of Mississippi Medical Center

INTRODUCTION

Advancements in technology have occurred rapidly and affect health care professions and educational programs. Particularly, health care employers are seeking individuals with the technological skills necessary to adapt to an evolving workplace (Hilty & DeJong, 2018). Additionally, today's college students were raised using multiple forms of technologies, such as personal computers, tablets, and smart phones (Caruth, 2016). Therefore, today's students and health care employers expect the educational system to provide students with the technological skills necessary to be successful. However, the current educational environment employed by colleges may not be adequate to meet these demands.

Some believe digital classrooms may be an optimal way to address the educational needs of today's college students. For the purposes of this study, digital classrooms are defined as a face-to-face learning environment that has transitioned to a technology-enhanced learning environment. In this setting, each student is responsible for utilizing a personal computing device that meets specific standards in order to complete course work.

Digital classrooms have multiple benefits; however, there are challenges that must also be considered. For instance, many students feel that digital classrooms create a more interactive learning environment (Deveci et al., 2018); however, some believe personal devices in classrooms lead to student distractions (Flanigan & Kiewra, 2018). Faculty are able to provide instantaneous feedback to students (Deveci et al., 2018), but faculty must spend additional time converting existing lessons to a digital format (Hesser & Schwartz, 2013). Finally, the facility could save money because digital classrooms create a near paperless environment. Therefore, less printing resources are necessary (Arney et al., 2012). Physical facility factors must be considered. Ideally, each student needs a power outlet for his or her device, classroom furniture should be flexible, and room lighting should accommodate students' ability to view their computer screens (Deveci et al., 2018).

PURPOSE

The purpose of this study was to address the School of Health Related Professions (SHRP) faculty and administrators' readiness to adopt digital classrooms, their desire to modify current instructional designs, and to identify educational technology experts' perceptions and experiences regarding digital classrooms. The study was designed to answer the following research questions:

1) How do teachers and administrators in SHRP rate their readiness to transition from a traditional classroom setting to a digital classroom setting?
2) What are UMMC educational technology experts' experiences and perceptions of transitioning from a traditional classroom setting to a digital classroom setting?
3) What strategies might be beneficial to SHRP faculty and administrators if they elect to transition to digital classrooms?

METHODS

The mixed method study was conducted in two phases: a quantitative questionnaire phase, then a qualitative interview phase.

Participants:

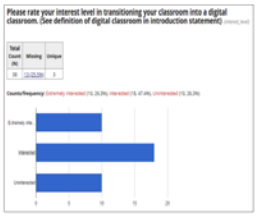
Quantitative Phase: 51 face-to-face faculty and administrators in SHRP responded to the questionnaire; 38 met the inclusion criteria, and 33 of those teach in a face-to-face setting. Respondents rated their technical skills and interest level regarding digital classrooms. They also identified possible challenges that SHRP faculty might face if implementing digital classrooms.

Qualitative Phase: Face-to-face interviews were conducted with 12 UMMC educational technology experts with various backgrounds. The interview template was designed based in part on the questionnaire data acquired.

Participant	Role at UMMC	Educational Background
Participant A	Instructional Designer	Teacher – High School
Participant B	Instructional Designer	Teacher – Elementary School
Participant C	Academic Administrator	Teacher – University
Participant D	Instructional Designer	Academic Advisor – University
Participant E	DIS/Technical Support	Academic Affairs – University
Participant F	DIS/Technical Support	Educational Support – University
Participant G	DIS/Technical Support	Financial Aid/Admissions – University
Participant H	DIS/Technical Support	Instructional Technologist – University
Participant I	DIS/Technical Support	Clinical Applications – University
Participant J	Instructional Designer	Director of Online Learning – University
Participant K	Academic Administrator	Faculty Development – University
Participant L	Instructional Designer	Teacher - University

QUANTITATIVE RESULTS

The quantitative results demonstrated that of the 38 questionnaire participants, 18 (47.4%) are interested in digital classrooms, while 10 (26.3%) are very interested. Additionally, of the 33 respondents who teach in a face-to-face setting, 25 (75.8%) stated their technical skills are at least adequate. Finally, respondents identified "in class distractions," "lack of personal knowledge regarding digital classroom technologies," and "current physical layout of classroom" as potential challenges SHRP would need to address when implementing digital classrooms.



QUALITATIVE RESULTS

The qualitative results were analyzed via an open coding technique to identify subthemes. Data reduction was then used and 3 specific themes emerged:

Rationale. Participants felt the rationale for digital classrooms is based on interactivity and student motivation. Using technology to create interactive assignments could decrease boredom felt by students in the classroom, which, in turn, could reduce in-class distractions. Many participants agreed that engaged students are generally more motivated.

Challenges. Implementation challenges centered around faculty's time requirements, faculty's knowledge of software and devices, faculty's resistance to change, and physical space constrictions. Faculty must find time to convert traditional teaching materials into a digital format. Faculty must also be familiar with various electronic devices and educational software. Faculty may be resistant to change because their current methods are successful as evidenced by student outcomes. Finally, many classrooms in SHRP are not flexible. Tables are bolted to the floor, and there are limited numbers of power outlets in each room.

Implementation. Implementation of digital classrooms is contingent upon proper implementation, efficient processes, and utilization of available human and physical resources. Each of these address the challenges identified in the study. Participants felt that faculty who convert their traditional teaching materials into a digital format can save time because they will no longer need to print materials or hand-grade assignments and tests. Training and practice should increase familiarity with devices and software. Faculty of SHRP should create a sharing network and utilize the human resources available for training. Portable devices in the classroom allow students to move about the room and sit in different arrangements regardless of the flexibility of the furniture. Finally, students should be required to arrive to classes each day with a fully charged device.

CONCLUSION

Implementing digital classrooms has the potential to meet the technology expectations of today's college students. However, faculty buy in is crucial. Additionally, faculty must create an action plan to address potential challenges before making a transition. Finally, faculty must identify and utilize all available resources in order to successfully implement digital classrooms at SHRP.

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APPENDIX O

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