Higher Education and Mobile Learning: How Innovative Instructors Use Mobile Applications for Learning

Nicolas Poppens

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Higher Education and Mobile Learning:
How Innovative Instructors Use Mobile Applications for Learning

by
Nicolas Poppens

A DISSERTATION SUBMITTED TO THE EDUCATION FACULTY OF THE
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Higher Education and Mobile Learning:
How Innovative Instructors Use Mobile Applications for Learning

We certify that we have read this dissertation and approved it as adequate in scope and quality. We have found that it is complete and satisfactory in all respects, and that any and all revision required by the final examining committee have been made.

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ABSTRACT
This qualitative case study investigated the experiences of innovative higher education instructors from the Midwest United States regarding their use of mobile devices in their classes for student learning. Fourteen participants discussed how they specifically use mobile devices and applications for knowledge acquisition in interdisciplinary fields and to prepare students for professional roles in advanced fields. This study revealed innovative examples from interdisciplinary scholars regarding their use of mobile applications for real-time feedback, formative assessment, and continuous engagement. Professors also used mobile applications to give students technical opportunities to acquire knowledge and produce content through project-based learning. Professors described student use of relevant, industry-standard mobile technology for creating webpages, videos, and social media. Mobile devices and applications were used to promote student engagement, comprehension, and creative expression. An analysis conducted using Vygotsky’s (1978) theory of social constructivism and two frameworks widely adopted in the field of education: technological pedagogical content knowledge (TPACK; Mishra & Koehler, 2006) and universal design for learning (UDL; Meyer et al., 2014) revealed how students were successful and more engaged through introduction to mobile technology. This study confirmed students reached a higher level of knowledge related to their discipline because their instructors leveraged mobile technology in innovative ways. This study included recommendations for faculty development and strategic planning to address the skills and information necessary to allow faculty to effectively use mobile technology in their courses.
Keywords: mobile devices, higher education, mobile applications, technology, student engagement, TPACK, UDL, professors, project-based learning, innovation, collaboration

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I dedicate this work to my family.

I am forever thankful for my loving and supportive wife, Ronna. She is my best friend and forever love. I could not have done this without her by my side. I am also thankful for my parents, Lloyd and Gloria for empowering me to be the man I am today. I am so proud to be their son. I am deeply grateful for my dissertation chair, Dr. Sarah Noonan for her constant guidance to “Keep going!” and for committee members Dr. Thomas Fish and Dr. Candace Chou for their insight and support.

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I never could have imagined that I would finish my doctorate in the midst of a pandemic, but here we are. Dr. Poppens is finally here!
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CHAPTER ONE: INTRODUCTION

My passion for technology in education stems from my history as a high school and college instructor. I taught Media Arts to high school students in a Midwestern school for three years before becoming associate professor of media studies at a Midwestern university. My initial experience teaching technology-based high school courses in a school district proved difficult and disappointing. The district did not allow the use of smartphones for learning in school, and restricted access to many useful websites to avoid student access to “mature” content. The district feared students might use their devices for recreation instead of learning. The moment after students left school, they used mobile devices and returned to the “real world.”

I noticed students used these devices in all aspects of their lives, including classroom use, despite the policy forbidding their use. They wanted to use their mobile devices for learning and I agreed with them. Now several years later, more high school and college students routinely use mobile devices for learning.

My experience teaching high school and now undergraduate college students has convinced me of the power of mobile learning and sparked a fire within me to research their use. My current role as an assistant professor of media studies led me to my research issue. I felt curious about the practices in higher education and wanted to learn and document how professors across various disciplines use mobile devices for student learning in innovative ways.

I strongly believed instructors reluctant to incorporate mobile devices miss the opportunity to offer students relevant learning experiences. As a doctoral student and
researcher, I hope to add to current knowledge concerning mobile technology and higher education by studying the way “pioneering” professors using mobile devices for learning.

**Problem Statement, Purpose, and Significance**

The purpose of my study was to investigate how “pioneering” professors and undergraduate college students use mobile devices in various disciplines for learning. I hoped to feature the best and most innovative uses of technology in undergraduate education. I believe this study may prove significant because as mobile device usage continues to grow, mobile learning may emerge as the next step in education (Koszalka & Ntloedibe-Kuswani, 2010). The educational landscape is shifting, and students may have higher expectations regarding the use of mobile devices in classrooms. The number of teens with cell phones continues to increase. For example, according to the Pew Research Center (2019), 96% of Americans now own a cellphone with 81% percent of those being smartphones. Additionally, the Pew Research Center (2019) reported nearly three-quarters of adults in the United States own a desktop or laptop computer and about half own a tablet.

Students may need teacher support to use their mobile devices for learning. For example, Philip (2013) argued young adults might simply need to learn how to transition from using their mobile devices as toys to using them as tools. Traditional, technology-lacking pedagogy often leaves the instructor without tools for tracking student engagement and progress throughout a lecture (Voelkel & Bennett, 2014). Engaging students through the use of mobile devices seems like a natural fit (Philip, 2013).

Many students use mobile devices for “living” but lack the opportunity to use the same devices for “learning” (Robledo, 2012; Thompson, 2013). Separately, classroom
management problems have continuously tested the patience of instructors, so unsurprisingly some would argue that mobile devices, such as cell phones, should have no place in a formal classroom (Tindell & Bohlander, 2012). Some school districts, like New York City, forbid students from bringing mobile devices to class citing distractions (Robledo, 2012). Instructors continue to attempt to understand how to embrace new classroom technologies while still providing quality education (Finnegan, 2006).

But others argue these devices offer great promise for learning. Modern-day mobile devices offer access to the Internet, social networks, and countless applications (Tossell et al., 2015). According to Lucy Gray, project director of the Consortium for School Networking’s (CoSN) Leadership for Mobile Learning initiative, mobile devices offer “measurable learning benefits” (as cited in Robledo, 2012, p. 1).

Even students believe that apart from using devices, they also learn more through such use (Mango, 2015). Mobile devices may become valuable educational tools to foster collaboration, participation, and student engagement. Because technological shifts may enhance learning, many K-12 institutions are implementing one-to-one programs (one device per student), providing students with mobile devices for use in classrooms (Mango, 2015).

To introduce and incorporate mobile devices as learning tools, educators must gain strengths in new areas (Philip, 2013).

Like any classroom technologies, students should learn that having the ability to use this tool is a privilege that can be taken away if used inappropriately. Simply disallowing and prohibiting the use of cell phones by students, especially as they grow in educational capabilities, marginalizes their ability to serve as twenty-first-
century tools that allow students to access information, communicate, and present new information. (Norris & Soloway, 2008, p. 90)

My study addressed a central concern in the more recent shift to mobile learning by showing how professors successfully leverage the power of mobile devices for learning. My research findings, featuring innovative uses of mobile devices for learning in a variety of disciplines, add to current knowledge changes in pedagogy and the co-creation of “knowledge” among 21st century professors and students. I planned to specifically discover, describe, and document the experiences of pioneering professors using mobile devices in their classrooms.

**Research Question**

I adopted the following question to frame my study: How do innovative higher education instructors in a variety of fields use mobile devices to engage students in seamless learning in and outside of the classroom? The following sub-questions added to my study:

1. How do professors design learning for college students in resource-rich, mobile-enabled learning environments?
2. What pedagogical changes do professors make when incorporating mobile devices? How does learning change?

**Overview of Chapters**

My study describes how higher education instructors use mobile devices in innovative ways in their classrooms for learning. I interviewed 14 higher education instructors from institutions around the Midwest United States. I introduced the research topic in Chapter One and give my background and interest in this topic. I offered a brief
background of mobile technology and higher education. Next, I established the research question, significance of the problem, and definition of terms.

In Chapter Two, I summarize a review of the literature regarding mobile devices and higher education. I offer a background and definition of mobile learning and discuss distractions versus engagement in the classroom with mobile devices. I also discuss uses of mobile devices for learning in higher education classrooms along with gaps and tensions in the literature. Next I introduce analytical theory including Vygotsky’s (1978) theory of social constructivism and Bloom’s Taxonomy.

In Chapter Three, I describe my methodology including qualitative research methods, my role as researcher, and how I recruited and selected participants. I describe the process of data collection and analysis, and explain ethical considerations with regard to this study. In Chapter Four, I discuss the research findings from interviews regarding innovative uses of mobile devices for learning. I categorized my findings by knowledge acquisition in interdisciplinary fields and preparing students for professional roles in advanced fields. I offer specific instructor examples in each category and summarized my findings.

I analyzed my findings using Vygotsky’s (1978) theory of social constructivism, technological pedagogical content knowledge (TPACK; Mishra & Koehler, 2006) and universal design for learning (UDL; Meyer et al., 2014) in Chapter Five to interpret my data. Lastly, in Chapter Six, I summarize my study and discussed implications, limitations, and recommendations. Finally, I end with my final thoughts.
Definition of Terms

I adopted the following terms for use in my study:

**Innovative Instructors** – Instructors introducing new, advanced, or original methods of mobile device use in classrooms for learning.

**Mobile Device** – For this study, mobile device will be defined as a laptop, tablet, or smartphone. These are wireless mobile devices that are able to access the Internet.

**Higher Education Institution** – Colleges and universities post high-school education.

**M-Learning** – Learning through the use of small, mobile technological devices such as a laptop, tablet or smartphone.

**Web 2.0** – Websites that emphasize content created by users through collaboration and online interactions.
CHAPTER TWO: LITERATURE REVIEW

I conducted a review of the literature to find how pioneering higher education instructors use mobile devices to engage in and outside of the classroom. To find an answer, I began a literature review regarding higher education, mobile devices, and pedagogy. My search terms included “higher education,” “mobile devices,” “technology,” and “pedagogy.”

I used Academic Search Premier and ProQuest to locate scholarly research. I adopted two main search terms: “higher education” and “mobile devices.” I added the other two terms “technology” or “pedagogy” to narrow the search. I organized my findings into three main categories and eight sub-categories: (1) background regarding the use of mobile devices for learning, and a sub-category explaining pedagogical change among classrooms and higher education instructors; (2) distractions versus engagement in the classroom with mobile devices, and two sub-categories for distractions in the classroom and mobile devices as tools of engagement; and (3) uses of mobile devices for learning in higher education classrooms, and five sub-categories for usage statistics in higher education, specific uses of mobile technology, innovative uses of mobile technology in classrooms, innovative instructors, and mobile devices as tools of engagement across disciplines.

Background and Definition of Mobile Learning

Classroom technology continues to change as it has for decades. Instructional technology has changed over the last 50 years—from typewriters and television to computer labs, and later laptop carts and now mobile devices (Al-Emran et al., 2015;
Mobile devices are the current technological fixation in classrooms (Al-Emran et al., 2015; Patten & Harris, 2013).

Mobile learning is oftentimes a blanket statement representing all things related to mobile technology and the classroom. It frequently stands for students taking online and hybrid courses or conducting fieldwork via mobile technologies such as forums, chat rooms, as well as other web and mobile applications (Welsh et al., 2015). However, for the purposes of this study, mobile learning represented student learning utilizing mobile devices such as smart phones, laptops, and tablets.

School administrators attempt to put relevant, “real world” technologies into classrooms while still enduring drastic budget cuts (Hill, 2011). In 2010, Apple introduced the iPad and the movement to use portable tablets for learning changed dramatically. Now innovative teachers stock carts with tablets and are testing bring your own technology (BYOT) programs (Hill, 2011; Patten, & Harris, 2013). Instructors adopting mobile devices for classroom learning have discovered exciting results (Hill, 2011). For example, Hew (2009) studied classrooms incorporating audio podcasts into the curriculum so students could listen to course content on various mobile devices. These methods gave students more opportunities to interact with the assigned curriculum.

There are even schools such as Virginia Tech, where mobile technology provided emergency communication functionality improving school safety (Tindell & Bohlander, 2012). Success stories describe a returned focus toward teaching and student learning, and a more positive, optimistic learning environment (Hargis et al., 2014). Examples included implementing iPads at the college level in order to “transform the classroom by bringing the world into the classroom and extending the classroom into the world”
(Hargis et al., 2014, p. 47) and introducing mobile device polling for instant results in large class settings (Voelkel & Bennett, 2014).

There are many aspects of mobile learning to consider including technical specifications of such devices. Mobile devices are not standardized objects (Ellaway et al., 2014). For example, the variety of mobile devices and their capabilities caused concern when expecting students to be able to perform various tasks with their device (Song, 2007). These specifications include, but are not limited to, device design, screen size, speed, input method, and connectivity capabilities (Song, 2007).

Device specifications became a concern for educators when attempting to bridge the digital divide between students with access to mobile devices and those without (Hill, 2011). Yet, students own mobile devices and bring them to school despite varying socioeconomic statuses (Hill, 2011). Device specifications are not the only variations to consider, enrollment status and age also affect the rate students use mobile devices for educational purposes (Ellaway et al., 2014).

Higher education institutions face the challenge of delivering relevant learning experiences through the use of technology to keep up with society (McDonald et al., 2014). School administrators are excited about the potential of BYOT programs because of the savings to the school budget (Hill, 2011). When nearly every educational institution is facing budget cuts, school administrators see BYOT programs as a way of embracing technologies that are already in classrooms at no cost to the institution (Hill, 2011). When given the choice between school-issued devices versus utilizing previously owned devices, students prefer control over mobile device selection (Ellaway et al., 2014).
Unfortunately, Geist (2011) said many educators grew up when little mobile
device technology was available and are therefore forced to play catch up. Students
access media content much differently than educators and are used to instantly streaming
content without waiting for a broadcast date (Geist, 2011). Despite these drastic changes
in how students use mobile technologies, most classroom practices mirror those of 50-
100 years ago (Geist, 2011).

Geist (2011) explained how resistance and opposition typically came from
educators uncomfortable with these new technologies. More experienced, tech-savvy
educators accept the use of mobile devices for learning (Al-Emran et al., 2015). Those
opposing the use of mobile devices at school usually claim mobile devices are a
distraction to students rather than an engagement tool (Al-Emran et al., 2015; Geist,
2011). Students with mobile device access in the classroom are prone to becoming
distracted by web browsing and social media. However, students explain how such
activities are actually positive and help them pay closer attention much like doodling in a
notebook (Geist, 2011).

When higher education instructors use mobile devices, they experience
pedagogical change (Holschuh et al., 2014). For example, mobile devices facilitate
instant communication between students and faculty. This supports group work and
collaboration, changing the role of the professor from sage on the stage. In the next
section, I describe what happens to professors once they begin to use mobile devices for
learning more effectively.
**Pedagogical Changes**

The educational system is constantly in a state of flux (Geist, 2011). If faculty resist updating pedagogy to harness the potential of mobile devices for learning, they may become irrelevant to students. It is increasingly more impractical to forbid the use of mobile devices as mobile technologies evolve and improve (Geist, 2011). Instructors must be prepared for the time when students have had access to mobile device technology since the time they were born. Geist (2011) stated,

> Just as college students of 2010 do not remember a time in their lives when the internet did not exist, the young children of today and the future college students of 2025 will not remember a time when there was not pad-based mobile devices and smart phones. (p. 758)

As previously stated, it is typically up to the individual higher education instructors to adopt syllabus and course changes regarding mobile device usage for learning (Sevillano-Garcia & Váquez-Cano, 2015). Philip (2013) believed educators must first recognize the possibilities of mobile devices before looking for student buy-in. Mobile devices can be incorporated into lessons and classroom activities with minimal instructor efforts (Geist, 2011). The mobile device as a convenient and entertaining connection tool can be transitioned to a data-collection tool for students (Philip, 2013).

To introduce and incorporate these pedagogically, the educators must gain strengths in new areas (Philip, 2013). These new focuses include new methods of observing and introducing intriguing questions. The goal of adopting these classroom technologies should be to align pedagogy with the ever-improving technologies of the
working world (McDonald et al., 2014). Interest and acceptance of mobile devices by instructors proves necessary for their effective classroom use for learning (Geist, 2011).

McDonald et al. (2014) provided qualitative and quantitative data suggesting a focus toward technology-aligned pedagogy encourages mobile technology adoption by students. Student responses indicated faculty need to allow more time for students to learn new technologies in order for the value of their learning to increase (McDonald et al., 2014). Because these technologies are constantly changing and updating, the findings of technology-related case studies will differ depending on when the study is conducted (Ellaway et al., 2014).

Some of the key issues with regard to mobile learning involve both engagement of students in technology-rich environments as well as the potential distraction and disengagement of students in learning. Next, I review studies focusing on some negative aspects versus those discussing opportunities for student engagement.

**Distractions Versus Engagement in the Classroom with Mobile Devices**

**Distractions in the Classroom**

Some have described learning with mobile devices as a trend within the educational system and the learning environment of classrooms using mobile devices for collaboration has also been described as disruptive and different (Koszalka & Ntloedibe-Kuswani, 2010). For example, if students are sending text messages during class, they are not engaged in classroom content and can even distract the instructor; yet universities still typically leave these cell phone policies up to the discretion of the individual instructor (Tindell & Bohlander, 2012). Tindell and Bohlander (2012) surveyed college students across disciplines regarding the amount cell phones are used in classrooms. A majority of
students surveyed believed that instructors are not aware of cell phone use such as texting and believed it is exceptionally easy to receive messages in large, crowded classrooms (Tindell & Bohlander, 2012).

Despite potential benefits, many professors believe mobile devices have no place in higher education classrooms because of the level of distractions they bring with them (Tindell & Bohlander, 2012). Examples of such distractions include texting on smartphones, notification sounds from incoming messages, and even cheating opportunities. Students use mobile devices for all sorts of items not related to learning, but they also use them as an educational tool under the proper circumstances (Tindell & Bohlander, 2012).

To maintain a collaborative and interactive learning environment that includes mobile devices, instructors need professional development related to such technology incorporation (Sevillano-Garcia & Váquez-Cano, 2015). Many university policies fail to provide the quality professional development necessary to create a culture of support for mobile device adoption (Sevillano-Garcia & Váquez-Cano, 2015). Mobile device usage for learning becomes problematic due to this lack of support.

However, these perceptions regarding mobile devices are starting to shift. McFarlane (2019) discussed how students are already used to drastically different social interactions and expression due to digital technology.

It is now something of a cliché that pupils in the school system are growing up in a world that has been affected in almost every sphere by the development and adoption of digital information and communication systems. They will leave
school to enter a world that will continue to change and be changed by digital technologies. (McFarlane, 2019, p. 7)

Crompton and Burke (2018) reviewed the literature to gain a holistic view of what research exists regarding the use of mobile technologies in higher education and subsequently determine what gaps exist in the literature. Of the 23 research outcomes studied, 16 reported positive data. However, Crompton and Burke (2018) said that a limitation of their study is that mobile learning has not been explored across all subject areas. For this purpose, I also searched for studies discussing engagement opportunities.

**Mobile Devices as Tools of Engagement**

Students view mobile devices as useful tools when carrying out learning activities and data acquisition (Sevillano-Garcia & Váquez-Cano, 2015). A study investigating the use of iPads in higher education foreign language classrooms found students enjoyed using such devices while staying fully engaged in the learning process (Mango, 2015). The iPads proved to be tools fostering full participation and collaboration. The iPad has also been recognized as an effective e-reading device (Geist, 2011). Despite proving to be an engaging device, student preferences with regards to individual mobile devices are subjective (Ellaway et al., 2014). Not only does each learner use his or her devices differently than others, but they also have personal preferences with regards to screen size and portability.

Brett (2011) conducted a study of university students’ experiences using text-messaging technologies aimed at student learning. Brett provided background data regarding mobile phone use among the student age group and found 97% of students owned a mobile phone. Students filled out questionnaires showing that engagement with
certain types of texting varied (Brett, 2011). For example, interactive feedback-based text message interaction was much lower than push (long-form, 640 characters) types of messages. Overall, students reported positive experiences using personal mobile devices for learning. Brett (2011) suggested schools promote further staff development and more open dialogue with students to improve student experiences with mobile technology use for learning.

Richardson and Lenarcic (2008) also researched text-messaging technology as a way to identify and evaluate innovative uses for mobile technology in higher education classrooms. The study specifically targeted classroom incorporation of Trigger, a short messaging service (SMS) prototype, to assess how universities are responding to higher student demand for new media technologies (Richardson & Lenarcic, 2008). Students responded to survey questions regarding perceived usefulness and ease of use, offering quantitative data from a five-point Likert scale.

Data collected shows popular views amongst the student population of both input and output triggers (Richardson & Lenarcic, 2008). Findings claim evidence of ease of use, relevance, and usefulness among students. Other benefits concluded are minimal costs to both students and institutions, as well as increased student engagement (Richardson & Lenarcic, 2008). A more recent study by Fabian et al. (2018) also found mobile technologies to increase student positivity and performance when introduced into mathematics courses. Benefits included student engagement through learning with mobile technology and transferable skills (Fabian et al., 2018).
Uses of Mobile Devices for Learning in Higher Education Classrooms

My study concerned the innovative uses of mobile devices for learning taking into account the advantages and distractions of mobile devices for learning. To distinguish between “typical” uses and “innovative” uses, I reviewed literature to general uses of mobile device for learning and found a gap in studies of innovative practices. I viewed the “typical” uses to innovative uses as a continuum. For example, a typical use of a mobile device might involve a search for general information. Using mobile devices to have multiple students collaborate on a single project in the field represents a more innovative use of technology.

Rogers (2003) described the process of labeling something as innovative. An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. It matters little, so far as human behavior is concerned, whether or not an idea is “objectively” new as measured by the lapse of time since its first use or discovery. The perceived newness of the idea for the individual determines his or her reaction to it. If an idea seems new to the individual, it is an innovation. (p. 12)

Many studies begin with good intentions but become unfocused by content-specific issues. These studies offering specific, innovative uses are far less common than the typical uses. I describe the range of these uses in the next section.

Usage Statistics in Higher Education

Higher education institutions typically do not create overarching policies or bans on mobile devices (Tindell & Bohlander, 2012). Instead, many administrators leave the issue to the preference of the instructors, thus creating inconsistent classroom policies.
For this reason, it is up to the instructors to incorporate mobile device initiatives and adapt their course syllabuses to clearly define mobile device policies (Sevillano-Garcia & Váquez-Cano, 2015). This establishment of classroom technology philosophies reflects a mobile-device innovation-oriented environment to the students (Sevillano-Garcia & Váquez-Cano, 2015).

Some professors humbly prefer traditional, technology-free classroom lectures (Churchill & Wang, 2014). Some feel mobile devices are more of a distraction than an educational tool. Associate professor of strategic communication at the University of Missouri, Cynthia M. Frisby, does not allow students to bring their own mobile devices into her lecture hall (Churchill & Wang, 2014). She said, “Hand-written notes and textbooks work just as well,” and has subsequently noticed increased comprehension.

Davidson and Lazaros (2015) studied the use and adoption of mobile technology within a single mid-sized Indiana university. They surveyed 20,503 graduate and undergraduate students through an online questionnaire regarding frequency, preference, and utilization of classroom mobile technology. Davidson and Lazaros found students widely preferred to use laptops as a mobile learning tool, followed by smart phones and tablets. They suggested similar studies with larger sample sizes to give a broader picture as mobile technology advances over time.

According to Koszalka and Ntloedibe-Kuswani (2010), about 80% of US citizens between the ages of 18 and 29 now own a mobile device so student access to these devices continues to increase. Koszalka and Ntloedibe-Kuswani also stated there are two advantages to utilizing mobile devices instructionally: portability and connectability. Students have instant and open access to instructional tools for the purpose of learning
(Koszalka & Ntloedibe-Kuswani, 2010). This instant connection offers a valuable communication tool for use with file exchanging, assignment delivery, and instant messaging (Song, 2007). These are specific examples of uses for mobile device technologies in higher education classrooms, which I explain next.

**Specific Uses of Mobile Technology**

When exchanging files, “Students and the teacher can share information anytime, anywhere with handheld devices, often in fixed physical settings” (Song, 2007, p. 40). Other benefits of typical mobile device usage in the classroom include data collection, note-taking, and file management (Song, 2007). Various studies like these reviewed in the literature explain what could seemingly be considered innovative uses but ended up offering the same type of student and instructor experience as traditional, non-digital classrooms but on a mobile device.

These studies often became sidetracked by the technology itself rather than the specifics of how instructors and students are using these specific technologies for learning (Gikas & Grant, 2013). Gikas and Grant (2013) stated, “there is little applied research into how these tools are actually being used to support teaching and learning with few descriptions of how mobile computing devices and social media are used by university students” (p. 18). For example, Voelkel and Bennett (2014) studied student engagement and feedback with the use of mobile device polling systems in higher education science courses. It has conventionally been difficult for teachers to track student progress using traditional methods.

Voelkel and Bennett (2014) tracked the introduction of the *Poll Everywhere* audience response system throughout the 2010-2011 academic year and found teacher
experiences to be quick and reliable but offering the same student feedback as traditional methodology. Student responses were overwhelmingly positive and attendance rates increased (Voelkel & Bennett, 2014). Exam performance also increased following the introduction of mobile polling systems.

Seale et al. (2010) studied digital technology inclusion in higher education to conceptualize how such tools might affect disabled students. They argued that the complexities of technology access and interaction amongst students are often “glossed over” in the literature in favor of focusing on the technology itself (Seale et al., 2010). Thus, their research focused on exploring and describing the experience of disabled learners in technology-rich environments through online surveys and focus groups.

Results showed the importance of student familiarity with digital technologies in order for such inclusion to be successful (Seale et al., 2010). Furthermore, specific technological examples such as Google resources, social media, and university portals were mentioned in terms of frequency of use. The study ended up focusing more on the decision-making of students regarding their choices to use various technologies and their own digital agility rather than the specific uses of the various applications discussed (Seale et al., 2010).

Stacy and Aguilar (2018) provided an intergenerational case study focusing on a fascinating multilingual digital storytelling program. However, the study became focused on cultural and intergenerational differences with regards to technology instead of the specific applications used for student engagement. For example, there were examples given with regard to the content-specific storytelling by students but the research lacks a broad discussion of mobile device applications used (Stacy & Aguilar, 2018). While such
studies are extremely important and culturally relevant, they often do not contain useful information for everyday classrooms. As these studies demonstrated, a majority of the research reviewed in the literature began by exploring the incorporation of mobile device technologies into classrooms but seemed to get sidetracked by something related to the specific content or technological incorporation along the way. This was a gap in the literature related to specific, innovative uses.

Gan et al. (2017) even stated this need specifically in their study limitations and directions for future research. They said, “This study focused only on the intention to adopt mobile learning without consideration of actual use. Future research could focus on the actual use of mobile learning” (p. 856). Next, I explain a few quality examples of innovative uses and how my study would build upon their research.

**Innovative Uses of Mobile Technology in Classrooms**

Broader, more innovative examples of mobile device capabilities include videoconferencing, reading digital documents, sound recording, and audio/video/photo editing (Sevillano-Garcia & Váquez-Cano, 2015). Cloud services, language translation, and interactive map access are among the plethora of resources found within mobile device capabilities. These resources provide alternative learning resources and interactions as well as a variety of previously untouched content (Sevillano-Garcia & Váquez-Cano, 2015).

Content-specific research has been conducted naming particular mobile applications for classroom learning (Holschuh et al., 2014). For example, mobile learning applications used to engage and prepare college science students include *Explain Everything*, *iAnnotate*, and *Mind Canvas* (Holschuh et al., 2014). *Explain Everything*
promotes improvement in student understanding of content and aids in moving between various bits of text with ease.

*iAnnotate* is an annotation application used by students for reading, marking, and sharing digital files (Holschuh et al., 2014). *Mind Canvas* graphically displays scientific materials in ways not possible in the conventional printed textbook and allows for collaboration within the application (Holschuh et al., 2014). A common theme within these mobile applications is the ability for students to use and see digital images as visual cues for understanding content. These mobile applications become powerful tools when paired with appropriate disciplinary strategies and pedagogical changes (Geist, 2011; Holschuh et al., 2014).

Pechenkina et al. (2017) researched the efficacy of using mobile gaming applications for increasing interdisciplinary student engagement, retention, and academic success. The quantitative study focused on student app use analytics in relation to academic performance and retention (Pechenkina et al., 2017). They found significant proof of effectiveness of the gaming mobile app for student learning and increased academic performance (Pechenkina et al., 2017). All things considered, Sevillano-Garcia and Vázquez-Cano (2015) gave examples of such innovative uses but similar to Holschuh et al. (2014) they are often content specific, quickly become outdated, and examples infrequently transcend content areas.

**Innovative Instructors**

Welsh et al. (2015) conducted a study regarding iPad use by students in the field. When introducing the framework for their study Welsh et al. (2015) gave six brief, yet specific, examples of how mobile devices are used innovatively among higher education
institutions. Examples included University of Cincinnati students using iPads to record and analyze data relating to archaeological excavations of Pompeii, and Duke University medical students using iPads in research methods courses for collecting and analyzing data as well (Welsh et al., 2015). These specific examples, ranging from application use such as Dropbox, Twitter, and Bamboo Paper, are rich with information for higher education instructors looking to incorporate mobile technologies into their own classrooms. However, these were meant to illustrate the popularity of the devices, rather than be the focus of the study.

Cochrane et al. (2013) studied journalism education and the effects of mobile and social media on pedagogy. This study thoroughly examined the use of some specific mobile device applications such as blogging and QR codes, but only focused on how such integration affects the changing world of journalism (Cochrane et al., 2013). Cochrane et al. believe curriculum should acknowledge the significance of social media and insert such use into classroom pedagogy. However, such a study might not be helpful for the average instructor looking to incorporate mobile technology into alternate disciplines.

My study fills this gap by detecting the underlying pedagogy of learner engagement and mobile learning by interviewing professors noted for their creative and innovative uses of mobile learning devices to advance, enrich, and extend student learning. I asked questions of innovative instructors such as, “How does the use of mobile technology in your classroom create new ideas about your teaching and student learning?,” and “What types of transformation in thinking and practice occurred as you leveraged the potential of mobile devices for learning?”
Cochrane and Flitta (2009) followed two academics over the period of two years and outlined pedagogical changes related to mobile technology integration. The first professor had much experience with educational technology and the second was recently introduced to mobile learning tools. This study was conducted in 2009 and therefore there have been innumerable changes in mobile technology since then. In 2009, fewer students were using mobile technologies for educational purposes and content creation (Cochrane & Flitta, 2009). Also, the small sample size of two education professors did not offer a wide enough scope. I intend to fill this gap by researching cutting-edge technologies by 10 to 15 pioneering professors in a variety of fields.

**Mobile Devices as Tools of Engagement Across Disciplines**

There are certainly studies in the literature discussing various positive engagement opportunities with mobile technologies but many of them focused on the distracting aspects (Tindell & Bohlander, 2012). Crompton and Burke (2018) stated, “Research with positive outcomes are typically published in academic journals; however, it is important to explore what is similar across those studies that brings about that positive outcome.” I focused my study specifically on how mobile devices help foster student engagement across disciplines rather than how they might become classroom disturbances and hoped to obtain relevant examples of such use for future instructors.

Koszalka and Ntloedibe-Kuswani (2010) gave examples throughout literature of mobile devices as a disruption to traditional learning models. This can be troublesome and unsettling to instructors accustomed to being conveyors of information rather than collaborative participation with students (Koszalka & Ntloedibe-Kuswani, 2010). However, Koszalka and Ntloedibe-Kuswani (2010) pointed out that although this may
sound like a negative aspect of incorporating mobile technology into classrooms, it simply means a change in the status quo for the sake of immersive, cooperative learning. With my study I further explored their notion that mobile devices may be a positive learning tool rather than a distracting challenge to overcome.

Tindell and Bohlander (2012) conducted a survey of students to determine their perceived level of classroom distraction by mobile devices, specifically sending text messages. Students were also asked questions regarding their observations of other students using mobile devices during class time. Their findings were clear that students are in fact using their cell phones during class and also cheating on exams (Tindell & Bohlander, 2012). However, only 3% of survey participants admitted to such negative use. Tindell and Bohlander (2012) suggested articulating mobile device policies clearly in the course syllabus as well as forming and enforcing such course-specific policies at the discretion of the faculty member.

Such studies are beneficial for faculty to see broad-spectrum mobile device usage statistics in higher education classrooms and help lay groundwork for a more specific study like my own. Some limitations of the Tindell and Bohlander (2012) study included only questioning students as survey participants and only questioning students from one small private university. My study included in-depth interviews with 14 higher education instructors from across a variety of disciplines and schools.

My study was the next natural step in a wide-ranging group of previous studies regarding mobile technology and classrooms. By interviewing pioneering higher education instructors across multiple disciplines, I gained specific hands-on examples that all future instructors can use in their own classrooms.
Summary, Gaps, and Tensions in the Literature

There have been a variety of studies conducted relating classroom technology adoptions with varied results of value (Davison & Lazaros, 2015). However, by the time these articles are published, new technologies have been released and findings are already changing (Geist, 2011). I updated my initial literature review to include more recent articles. I was able to find a limited number of relevant articles and included them in the review but still found there to be an inadequate amount in 2020. My study adds to the literature on this topic because there were two clear gaps in the literature.

The first gap was a lack of studies that focus on the effectiveness of innovative use of mobile technologies for instructional activities in higher education. My study explored the benefits and advantages of innovative uses of such technologies for learning. The second gap was in regard to the specifics of how mobile devices are tools of engagement rather than classroom distractions. A significant gap existed between the arguments against mobile devices as distraction versus the opportunity for supporting engaged student learning. The classroom of the future needs studies explaining positive, specific uses for learning.

Analytical Theory

I adopted two theories to analyze my literature review findings and serve as a theoretical lens for my qualitative study of how higher education instructors use mobile devices for learning. Theories, when appropriately aligned with relevant content, can conceivably empower instructors to adopt mobile technologies in substantial ways (Herrington & Herrington, 2007). Numerous studies reviewed in the literature used Vygotsky’s theory of social constructivism because mobile devices are frequently used
for social collaboration; thus, mobile devices become powerful instruments for supporting social constructivist education (Cochrane, 2014). Social constructivism views learning as a shared experience where students are able to uncover information together (Vygotsky, 1978).

After using this theory to analyze my review findings, I continued my analysis using a revised version of Bloom’s taxonomy of educational objectives to evaluate how the use of mobile devices for learning meets higher level goals for learning (Anderson & Krathwohl, 2001). I chose these two complimentary frameworks as the lenses through which to view my literature review findings.

**Social Constructivism**

I began with Vygotsky’s (1978) theory of social constructivism. Many studies that I reviewed in the literature used social constructivism. Since the 1990s, with the emergence of multimedia technologies, many scholars have based their research on constructivism theory (Zhang & Lin, 2018). Constructivism is a general theory of learning regarding the nature of knowledge and how students involved make meaning of their reality (Green & Gredler, 2002). It focuses more on how we absorb ideas rather than memorization of these ideas and recitation of such information (Liu & Chen, 2010).

There are two main types of constructivism—cognitive and social (Powell & Kalina, 2009). First, cognitive constructivism stems from Jean Piaget, a French Swiss developmental psychologist, who wrote many books regarding education (Powell & Kalina, 2009). This form of constructivism concentrates on how individuals construct knowledge throughout development, whereas social constructivism—formed after Piaget by Lev Vygotsky focuses on the collaborative aspects of learning (Powell & Kalina,
Contemporary critics of Piaget’s emphasis on individualism believe his work neglects how most students learn from collaboration with one another (Noddings, 2012).

Soviet Psychologist Lev Vygotsky, often referred to as the founding father of social constructivism, believed that the social interactions among learners were an “integral part of learning” (Powell & Kalina, 2009, p. 243). Vygotsky believed, “Every function in children’s cultural development appears first at the social level; that is, children can perform certain tasks in social settings with the help of others” (Noddings, 2012, p. 16). Internalization occurs more successfully when students are interacting socially throughout the learning process (Powell & Kalina, 2009).

Vygotsky (1981) addressed artifacts, or mobile devices as it pertains to my study, as having implications to the construction of knowledge:

The inclusion of a tool in the process of behavior (a) introduces several new functions connected with the use of the given tool and with its control; (b) abolishes and makes unnecessary several natural processes, whose work is accomplished by the tool; and alters the course and individual features (the intensity, duration, sequence, etc.) of all the mental processes that enter into the composition of the instrumental act, replacing some functions with others (i.e., it re-creates and reorganizes the whole structure of behavior just as a technical tool re-creates the whole structure of labor operations). (pp.139–140)

Through the use of mobile device technologies, students are engaging with professors to seek answers to questions and determining outcomes to create their reality. Constructivism assumes a qualitative view of reality—how learners construct their reality and more specifically social constructivism focuses on how they construct this reality.
through collaboration with others (Powell & Kalina, 2009). For example, Vygotsky’s (1978) theory regarding the zone of proximal engagement allows the student to engage in a challenging project at their developmental level.

This theory known as the zone of proximal development is described as a zone where a child learns when assisted while learning a classroom concept (Powell & Kalina, 2009). Vygotsky believed students regularly learn more easily when helped by others such as their instructor (Powell & Kalina, 2009). This leads to scaffolding, where the student through encouragement from others gets to the next level of internalization and is able to move on to more difficult projects.

In reviewing the literature, Pechenkina et al. (2017) researched the efficacy of using a mobile gaming application for increasing student engagement and academic success. In this example, and through the lens of the social constructivist method, Pechenkina et al. researched students acting on their own versus those achieving through assistance with the mobile gaming application. Pechenkina et al. found substantial proof of effectiveness of the gaming mobile app for student learning and increased academic performance thus demonstrating scaffolding where the students are able to move onto the next level of class activity.

In many studies reviewed in the literature, mobile devices put students in the role of meaning making and this matches their level of engagement. For example, Holschuh et al. (2014) engaged higher education science students through the use of mobile learning applications such as Explain Everything, iAnnotate, and Mind Canvas. These types of studies reviewed in the literature often used Vygotsky’s theory of social constructivism
because of the collaborative nature of mobile technologies—especially in classroom settings.

The social media capabilities of mobile device technologies are significant and directly related to social constructivism as previously explained. The Cochrane et al. (2013) study regarding journalism education explored the effects of mobile devices and social media on pedagogy. These researchers believed that future studies should acknowledge and incorporate social media aspects of mobile devices and include such use into classroom pedagogy (Cochrane et al., 2013).

These examples illustrated how Vygotsky’s theory of social constructivism fit perfectly with my study of mobile device usage amongst higher education instructors. My review of literature also established the need for studies related to innovative instructors using mobile device technology to help students overcome classroom objectives, which is why I used Bloom’s Taxonomy to measure student achievement. However, Bloom viewed his taxonomy as more than just a simple tool of measurement (Krathwohl, 2002).

**Bloom’s Taxonomy**

Bloom’s Taxonomy of Educational Objectives can be seen as a framework and a way to organize classroom objectives (Anderson & Krathwohl, 2001). Teachers dealing with a massive number of ambiguous objectives often require such an organizational structure. The benefit of Bloom’s Taxonomy is that it can translate across disciplines. It should be possible to translate any educational objectives that have importance cognitively into one of the levels of the taxonomy.

Distinguished professor at the University of Chicago, Benjamin S. Bloom, wrote or collaborated on 18 different publications from 1948-1993, but his most renowned and
regarded work is known as Bloom’s Taxonomy (Forehand, 2005). This work, published by Bloom and his mentor Ralph W. Tyler in 1958, was officially titled *Taxonomy of Educational Objectives, Handbook I, The Cognitive Domain*. The original six categories included knowledge, comprehension, application, analysis, synthesis, and evaluation (Krathwohl, 2002). The taxonomy laid out six gradually more complex levels based on the theory that in order for a student to be able to move on to the next level, they would need to be able to achieve at the prior level (Eisner, 2000).

Bloom’s goal was not simply to give instructors tools for measuring student success, but was to create common ground for learning objectives across all subject matters, grade levels, and students—a demystification of sorts (Krathwohl, 2002). According to Bloom’s former student Elliot W. Eisner, “It was clear that he was in love with the process of finding out and finding out is what I think he did best. One of Bloom’s great talents was having a nose for what is significant’ (2002, p.2). Bloom’s Taxonomy has remained relevant throughout the decades it has existed and therefore has been reinterpreted in numerous ways over the years (Forehand, 2005).

The official Revised Bloom’s Taxonomy, led by former Bloom student Lorin Anderson in the 1990s, updated the terms to include remembering, understanding, applying, analyzing, evaluating, and creating, as shown in Figure 1 (Anderson & Krathwohl, 2001, pp. 67–68). The original number of six categories was retained in the revised version but as stated above, three categories were renamed and the rest of the terms were updated from noun to verb forms (Krathwohl, 2002). Also, the order of the top two categories was interchanged (Krathwohl, 2002).
The categories of the revised taxonomy transcend subject matters just as the original did (Krathwohl, 2002). Anderson’s hope was to make the original Bloom’s Taxonomy more relevant to students and teachers in the 21st century (Forehand, 2005). This revised version was eventually published in 2001 (Anderson & Krathwohl, 2001).

After applying Bloom’s Taxonomy to my review findings, I found a high concentration of lower level examples and there is a gap in the literature requiring higher end taxonomy examples such as evaluating and creating in higher education. Typical uses of mobile devices in higher education classrooms tend to be on the lower end of the taxonomy structure and innovative uses tend to be on the higher end. The following are examples of classroom mobile device usage for learning matched with the multiple levels of Bloom’s revised taxonomy (see Table 1).
### Table 1

*Bloom’s Revised Taxonomy and Examples of Classroom Mobile Device Applications*

<table>
<thead>
<tr>
<th>Bloom’s Revised Taxonomy Levels</th>
<th>Classroom Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1: Remember</td>
<td>Example 1: Voelkel and Bennett (2014)</td>
</tr>
<tr>
<td>Level 4: Analyze</td>
<td>Example 4: Welsh et al. (2015)</td>
</tr>
<tr>
<td>Level 5: Evaluate</td>
<td>Example 5: Gap in literature related to lack of studies focusing on innovative examples in higher education</td>
</tr>
<tr>
<td>Level 6: Create</td>
<td>Example 6: Gap in literature related to lack of studies focusing on innovative examples in higher education</td>
</tr>
</tbody>
</table>

**Revised Bloom’s Taxonomy Level 1: Remember**

Voelkel and Bennett (2014) introduced and tracked the use of the *Poll Everywhere* audience response system. The introduction of these mobile polling systems resulted in positive student responses and increased both student attendance and exam performance (Voelkel & Bennett, 2014). The recalling of information through the use of these mobile response systems was an example of the revised first level of Bloom’s Taxonomy—Remembering.

**Revised Bloom’s Taxonomy Level 2: Understand**

A common theme in the study conducted by Holschuh et al. (2014) is the ability for students to use mobile device applications for understanding content. Specific application examples include *Explain Everything, iAnnotate, and Mind Canvas*. The
demonstration of understanding through comparing and contrasting information through mobile applications was an example of the revised second level of Bloom’s Taxonomy—Understanding.

**Revised Bloom’s Taxonomy Level 3: Apply**

Sevillano-Garcia and Váquez-Cano (2015) studied the use of tablets and smartphones in relation to environmental sensors such as weather stations, accelerometers, and magnetic field sensing where students showed competency in their ability to solve problems and act in new environments. The ability to apply classroom knowledge gained toward a new situation in the field using mobile devices was an example of the revised third level of Bloom’s Taxonomy—Applying.

**Revised Bloom’s Taxonomy Level 4: Analyze**

Welsh et al. (2015) conducted a study regarding iPad use by students in the field for recording, collecting, and analyzing data. These specific examples included mobile applications such as Dropbox and Bamboo Paper. Analyzing and examining information through such use of iPad applications was an example of the revised fourth level of Bloom’s Taxonomy—Analyzing.

**Revised Bloom’s Taxonomy Levels 5 and 6: Evaluate and Create**

Once again, the reviewed literature showed that there was a gap in relation to higher-end examples of taxonomy levels 5 and 6 related to higher education. For example, Burden et al. (2019) investigated innovative mobile learning pedagogies for K-12 learners and focused significantly on disruption and low-level outcomes. Rosenthal and Elaison (2015) discussed incorporating mobile technology into higher education classrooms but only focused on iPads and physical education courses. Chee et al. (2017)
found that there were a high number of studies focused on mobile learning but focused heavily on student perceptions rather than innovative examples.

An example of such use for evaluating was through using mobile devices in the classroom for blogging and forum responses in order to present one’s own opinion. Furthermore, an example of mobile device usage for creating in the classroom was having students collaborating on compiling information in shared documents using cloud-based services. While studies such as Welsh, et al. (2015) showed students using web applications such as Google or Dropbox for analyzing data, the studies reviewed in the literature rarely if ever explained students getting into the evaluation and creation levels of Bloom’s revised taxonomy.

As stated in reference to Vygotsky’s theory of social constructivism, my review of literature also established the need for studies related to innovative instructors using mobile device technology to help students overcome classroom objectives, which directly reinforced the need for Bloom’s Taxonomy to measure student achievement. For this reason, I sought out innovative instructors for this research.

**Summary**

The review of literature and theoretical review allowed me to address both past and current literature as well as theoretical lenses related to my research question. I addressed two gaps in the literature regarding the need for interviewing innovative instructors in the field and addressing mobile devices as tools of classroom engagement rather than distractions. I implemented two theories as potential lenses for my research—Vygotsky’s theory of social constructivism (Noddings, 2012; Powell & Kalina, 2009; Vygotsky, 1978, 1981) and the revised version of Bloom’s Taxonomy (Anderson &
Krathwohl, 2001; Forehand, 2005). I also gave examples applying Bloom’s Taxonomy to my review findings, finding a higher concentration of lower level examples and a gap in higher end taxonomy examples. Based on my question, review findings, and theoretical lenses, I selected the case study approach within qualitative research as my methodology.
CHAPTER THREE: METHODOLOGY

I adopted qualitative research methods to conduct my study for the sake of learning how higher education instructors use mobile devices for learning. In this chapter, I describe my reasoning for why I chose a case study approach within qualitative research. Qualitative researchers focus on how individuals understand their experiences and what meaning they give to those experiences (Merriam & Tisdell, 2016). I chose a constructivist paradigm (often referred to as social constructivism) because social constructivists “believe that individuals seek understanding of the world in which they live and work” (Creswell & Creswell, 2018, p. 8).

Research Methods

Qualitative research methods support this approach because this type of methodology allows for in-depth research regarding mobile devices in higher education—an issue without clearly defined sides. In other words, there are many gray areas surrounding this issue, as many instructors are unaware of how to deal with these emerging technologies. Merriam and Tisdell (2016) described the following characteristics as key to understanding qualitative research: process, understanding, and meaning.

By analyzing what people tell you and what they do, qualitative methods concentrate on this evidence to understand the meaning behind what is going on (Gillham, 2000). I selected case study research within qualitative research because the interview process is necessary for establishing a narrative amongst higher education instructors. Creswell and Creswell (2018) defined case study research as:
a qualitative design in which the researcher explores in depth a program, event, activity, process, or one or more individuals. The case(s) are bounded by time and activity, and researchers collect detailed information using a variety of data collection procedures over a sustained period of time. (p. 247)

This section offers a blueprint of the methodology I used to study how higher education instructors innovatively use mobile technology for learning.

**Institutional Review Board**

Participants in this study regarding how innovative higher education instructors used mobile devices for learning were human subjects and therefore I went through the Internal Review Board to ensure compliance with federal regulations concerning human subject studies. This study did not contain any vulnerable populations. I completed the Human Subjects Research Training for Educational Researchers provided through CITI Program as required by the University of St Thomas (see Appendix A for course certificate). I finished the University of St. Thomas IRB application process once my dissertation committee approved my research proposal.

**Role of the Researcher**

I believed that my role as researcher in this qualitative case study was vital to the value of the outcome. Bogdan and Biklen (2007) emphasized, “Qualitative researchers go off to study carrying the mental tools of their trade.” My work history included a variety of jobs in technological fields including journalism, photography, high school teaching, and now higher education in a technological field. Therefore, because of the benefits I experienced because of mobile technology, I certainly had my own bias and views that
mobile devices can be a great resource in a higher education classroom. However, I did not intend for this study to merely reinforce my own views.

I strived to research how other higher education instructors used and managed mobile devices in innovative ways in *their* classrooms. I certainly expected to find instructors who had negative experiences with mobile devices along the way and if discovered I wanted to bring those issues to light as well. I went into this study with an open mind and did not hope to obtain any research data other than the views and experiences of the participants. As Bogdan and Biklen (2007) stated regarding qualitative researchers, “Plans evolve as they learn about the setting, subjects, and other sources of data through direct examination.”

**Recruitment and Selection of Participants**

I obtained approval from the Institutional Review Board of the University of St. Thomas before progressing with any human subject research of those participating in my study. I selected participants with experience utilizing mobile devices in higher education classrooms in new and exciting ways. I wanted to study how instructors were using mobile technologies for learning in innovative ways. I identified and recruited participant candidates based on my personal knowledge of higher education instructors within my specific research institution, technology-related conferences I attend, and others around the Midwest. I also identified and recruited participant candidates with student-focused instructional methods related to learning with mobile technology (see Table 2).
## Table 2

*List of Participants*

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Affiliation</th>
<th>Teaching Areas</th>
</tr>
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<tbody>
<tr>
<td><strong>Dr. Arlys Peterson</strong></td>
<td>Dr. Arlys Peterson is an Associate Professor at the University of Sioux Falls in Sioux Falls, South Dakota in the Education Department. She teaches in both the Undergraduate and Graduate levels with classes in Technology and Education, K-8 Social Studies Methods, Telecommunications in Education, Applying Educational Technology, and Technology Planning and Implementation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Beth O’Toole, J.D.</strong></td>
<td>Beth O’Toole is a Professor at the University of Sioux Falls in Sioux Falls, South Dakota in the area of Social Science and Criminal Justice. She teaches courses in Juvenile Justice, American Federal Government, Social Problems, Capital Punishment, and Science and Law of Evidence.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Jason Whiting</strong></td>
<td>Jason Whiting is a part-time faculty member at Augustana University in Sioux Falls, South Dakota in the Education Department. He teaches in the Augustana Master’s program and is the lead professor for Technology in Education.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sharon Gray</strong></td>
<td>Sharon Gray is the Director of Instructional Technology at Augustana University in Sioux Falls, South Dakota. She teaches courses in both the Computer Science and Journalism departments in Website Development and Design and Ethical Issues in Technology.</td>
<td></td>
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<tr>
<td><strong>Nancy Sutton</strong></td>
<td>Nancy Sutton is an Assistant Professor of Media Studies at the University of Sioux Falls in Sioux Falls, South Dakota in the Media and Visual Arts department. She teaches courses in Web Design, Media Writing, Television Production, Print Production, Media Law and Social Media Management.</td>
<td></td>
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</tr>
</tbody>
</table>
Dr. Katie McCoullough
Dr. Katie McCoullough is an Assistant Professor of Communication Studies at Augustana University in Sioux Falls, South Dakota in the Communication Studies department. She teaches courses in Media Studies, Media Aesthetics and Production, Interpersonal Communication, and Introduction to New Media.

Dr. Timothy Meyer
Dr. Timothy Meyer is an Associate Professor of Practice of Agricultural Economics at the University of Nebraska-Lincoln in Lincoln, Nebraska. He teaches courses in Farm and Ranch Management, Introduction to Agricultural Economics, Introduction to Excel, as well as the entire Undergraduate Economics curriculum.

Rick Warkenthien
Rick Warkenthien is an Instructor of Media Design at Southeast Technical Institute in Sioux Falls South Dakota in the Media Communications program. He teaches courses in Web Design, Digital Photography, Media Writing, and the Adobe Creative Suite.

Romy Klessen
Romy Klessen is an Instructor of Media Layout at Southeast Technical Institute in Sioux Falls, South Dakota in the Media Communications program. She teaches courses in Page Layout, Grids and Layout, and the Adobe Creative Suite; primarily Adobe InDesign and Adobe Acrobat.

Dr. Matthew Pehl
Dr. Matthew Pehl is an Associate Professor of History at Augustana University in Sioux Falls, South Dakota in the History department. He teaches a wide variety of courses including Introduction to Western Civilization, Introduction to American History, and upper-level courses such as The History of Race and Labor, and American History Since World War II.
<table>
<thead>
<tr>
<th>Gail Weinhold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gail Weinhold is Director of the School of Education and faculty member at North Central University in Minneapolis, Minnesota in the School of Education. She teaches courses related to Educational Psychology, Classroom Management, Content Area Literacy, and several literature courses.</td>
</tr>
</tbody>
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<th>Ilah Raleigh</th>
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<td>Ilah Raleigh is an adjunct professor of music at the Dougherty Family College at the University of St. Thomas in St. Paul, Minnesota. She is currently teaching a course called Understanding Music and Culture.</td>
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<th>Dr. Janet Davison</th>
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<td>Dr. Janet Davison is a Lecturer in Media and Journalism at the University of South Dakota in Vermillion, South Dakota. She teaches courses such as News Writing, Graphic Communication, Audio Production, Gender and Media, and Intro to Mass Communications.</td>
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<th>Brian Anderson</th>
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<td>Brian Anderson is the Broadcasting Instructor at Northeast Community College in Norfolk, Nebraska. He teaches courses such as TV Production, Radio Production, Commercial Scriptwriting, Digital Storytelling, and Drone Operations.</td>
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I requested participation via email correspondence, phone discussions, and face-to-face inquiries. For email correspondences, I introduced myself as a researcher concerning mobile device technology in the field of higher education, explained the nature and significance of the study, and invited individuals to participate (see Appendix B). To those responding in agreement, I followed up with a more thorough explanation of the study along with the necessary consent paperwork (see Appendix D). I also followed up with those that do not respond to my first email correspondence.
The sample size of 10 to 15 participants was decided based upon similar interview-based dissertation proposals. Those whom I had discussions with and those whose dissertation proposals I had read typically started with 10 interviews. If more data was required to gain a good grasp on the trends and themes, I would simply add another interview participant until I have enough data. The preliminary group of participants included 10 interviews, but I expanded the sample to learn more by interviewing an additional four professors, for a total of 14 interviews. Although I could keep interviewing, the idea of how professors used the applications and what they used them for became clear. I reached data saturation.

**Data Collection**

I primarily used interviews as the data for my dissertation. The data collection mostly took place in what I typically call instructors’ “natural habitats.” Creswell and Creswell (2018) said that one of the benefits of conducting research in this manner is to observe participants while potentially engaged or located in relevant situations. As a media studies professor, I am constantly telling my journalism students to interview their story subjects in their natural setting because it is relevant to the story they are trying to tell. Both sights and sounds added details to the story that may have been lost if they pulled the interviewee into a contrived, futile room.

The idea of interviewing higher education instructors in their natural settings was precisely why I selected qualitative research. Creswell (2007) said, “This up-close information gathered by actually talking directly to people and seeing them behave and act within their context is a major characteristic of qualitative research” (p. 37). Qualitative research was ideal for this study because I wanted to hear specific instructor
stories and examples of how they were using mobile device technology in their classrooms.

I initially interviewed 10 higher education instructors from across the Midwestern region of the United States. I contacted instructors based on my existing knowledge of the field and searched the websites of Midwestern higher education institutions for contact information. I requested and set-up interviews via email (see Appendix B for recruitment e-mail script). I believed that 10 interviews would provide enough data for me to see clear trends throughout the instructors’ experiences. However, as stated previously, I expanded the sample size by an additional four professors to learn more until I reached data saturation. This was the ideal approach for my study because I was able to continue to ask participants question upon question until I got to the core of their experiences with mobile devices in their classrooms. Each answer provided leads to a new question I had never considered (see Appendix C for sample questions).

I conducted face-to-face interviews, Zoom (or other video chat technology such as WebEx, Skype, etc.) interviews in long-distance cases, and recorded the interviews with a Macbook Pro. Nine of the interviews were face-to-face and five were recorded via Zoom video conferences. I recorded audio of these interviews via mobile devices to further display their capabilities. I intend to eventually edit this audio footage using mobile devices into a short audio documentary or podcast. The benefits of recording audio with mobile devices into Audacity audio software included the ability to monitor levels and waveforms throughout the recording process, and ease of file formatting and management.
As I did in initial correspondences asking for participation, I provided information regarding the importance of the study and reminded them that their answers were being audio recorded. I transcribed these recordings following each interview and saved the text documents as Microsoft Word files on a hard drive designated specifically for my dissertation-related files. I set up a Microsoft Word table for the coding process. I scanned each transcribed Word document for themes. I believe that transcribing the interviews myself made the coding process easier because I was much more familiar with the material.

Cresswell (2007) stated, “The data collection in case study research is typically extensive, drawing on multiple sources of information, such as observations, interviews, documents, and audiovisual materials” (p.75). Because I conducted multiple interviews and gathered audio materials, this was a perfect example of why I chose a collective case study approach within qualitative research. As researcher, I also viewed myself as a key instrument in the qualitative process. Creswell (2007) discussed the nature of researchers as key instruments by saying, “The qualitative researchers collect data themselves through examining documents, observing behavior, and interviewing participants” (p. 38).

Instructor interviews were my primary source of data. However, if I found that I simply did not have rich enough data after conducting my interview, I asked subjects for supplemental materials such as rubrics or lesson plans regarding specific mobile applications discussed. This other source of data was documents and digital files related to interview discussions. I requested these documents from participants following the interview process as a way to reinforce the content discussed.
The term document refers to “materials such as photographs, videos, films, memos, letters, diaries, clinical case records, and memorabilia of all sorts that can be used as supplemental information as part of a case study whose main data source is participant observation or interviewing” (Bogdan & Biklen, 2007, p. 64). These acted as evidence and examples for the narrative presented through the interview process. Gillham (2000) said, “The basic way of presenting a case study report is a narrative following the logic and chronology of your investigation and reasoning” (p. 22) I also used the snowballing technique following each interview to inquire if they knew of other higher education instructors, at their institution as well as others, who might consider being interviewed for this study. This proved successful in gaining multiple additional interview subjects.

Data Analysis

Antaki et al. (2003) described data analysis as involving, “a close engagement with one’s [data], and the illumination of their meaning and significance through insightful and technically sophisticated work” (p. 30). In my study, I researched how higher education instructors used mobile devices for learning within their classrooms. I chose the case study approach for my research because it acknowledged and allowed the need for one or more—in my case, multiple—issues to be explored within a common setting (Creswell, 2007, p. 73).

Also, this study required a case study approach because of the need for multiple sources of information in order to exemplify both the overall themes and specific examples of my topic (Creswell, 2007). There are various types of case studies, but the collective case study approach allowed me to hear multiple stories as well as compare and contrast these different cases in order to illustrate my topic (Creswell, 2007, p. 74).
This methodology offered both a comprehensive, yet very specific view of how higher education instructors used mobile device technology for learning in their classrooms. As Bazeley (2013) suggested, and throughout the analysis process, I read and reflected, explored and played, coded and connected, reviewed and refined my way through the data (p. 15). After collecting data from interviews in the form of audio recordings and documents, I transcribed the interviews. As stated in the previous section, I believe that transcribing the interviews myself made for an easier coding process because of my familiarity with the material. When reviewing the transcriptions from the initial 10 interviews, I listened to the original audio and followed along with the text to ensure accuracy. I began to analyze the data for overall themes and began coding. However, after reviewing the data I expanded the sample size to 14 in order to gain more examples. Due to COVID-19 social distancing and quarantine restrictions at the time of the additional interviews, I updated my consent form to reflect virtual interview guidelines (see Appendix E). Although I could continue conducting interviews, the idea of how higher education instructors used mobile applications and what they used them for became clear. I reached data saturation after 14 interviews.

After I completed all interviews, I revisited all transcripts again and finished coding to note the significant themes. Eventually, I began to see a narrative pattern. I focused first on overall themes and narratives stemming from the interview process before applying a theoretical lens to the material. Bazeley (2013) said, “A narrative helps you to preserve the flow of the story as a whole” (p. 115). Once I established a narrative by pulling together the interview information from the multiple higher education instructors, I began to form coding categories for the data based on the frequency of such
themes. I categorized specific examples of mobile application use into two categories. The first category was knowledge acquisition in interdisciplinary fields and the second was preparing students for professional roles in advanced fields.

This process of data analysis guided me through the steps of providing a clear description of how higher education instructors used mobile devices for learning in their classrooms in innovative ways. While Bloom’s Revised Taxonomy was beneficial for analyzing the literature review findings, I added two new theories that focused on learning design to analyze the findings of my study in addition to Vygotsky’s (1978) theory of social constructivism. These two frameworks were technological pedagogical content knowledge (TPACK; Mishra & Koehler, 2006) and universal design for learning (UDL; Meyer et al., 2014).

Although I had my own biases as researcher, my methods for interpreting themes within the data of this qualitative study were credible, reliable, and valid. Creswell (2007) said, “Ethical validation means that all research agendas must question their underlying moral assumptions, their political and ethical implications, and the equitable treatment of diverse voices” (p. 205). I fully followed this example shown by previous qualitative researchers.

**Ethical Considerations**

Bogdan and Biklen (2007) stated, “Two issues dominate traditional official guidelines of ethics in research with ‘human subjects’: informed consent and the protection of informants from harm” (p. 48). I followed all necessary steps for ensuring such an ethical, integrity-driven study. After obtaining voluntary higher education instructor participants for the study, I obtained IRB consent forms from the instructors.
All instructor participants were over the age of 18. My study related to higher education instructors using mobile devices for learning in innovative ways and therefore did not involve questioning regarding subject matters of a sensitive nature. Because of this lack of sensitivity, there was no risk to the participants.

I protected all interview data on a hard drive designated specifically for my dissertation documents. This included audio recordings of interviews and transcribed text documents. Since I was the individual transcribing the interview data, I was able to ensure that I maintained an accurate voice of the individuals. I highly respected these instructors and treated their interview responses, my observations, and collected documents with extreme confidentiality. Because all interview subjects signed consent forms stating as such, original recordings and data collected will be not destroyed following completion and defense of my dissertation, and may be used as an audio podcast in the future regarding mobile devices use in higher education (See Appendix D).
CHAPTER FOUR: INNOVATIVE USES OF MOBILE DEVICES FOR LEARNING

To answer my questions regarding how higher education instructors use mobile devices for learning in their classrooms, I interviewed 14 higher education instructors across a variety of content areas. However, there were more instructors with focus on professional preparation and fewer focusing on disciplinary content. In this chapter, I introduce each of the instructors interviewed and discuss how they used mobile technology in innovative ways for student learning. I describe specific instructor examples of mobile device use. In order to provide context, I sometimes refer back to a participant’s specific school, department and/or courses taught.

In my analysis of the data, I found more examples of mobile technology and application use in higher education classrooms for the purpose of preparing students in technical fields for professional development. Subsequently, I found fewer examples of using mobile technology for acquiring knowledge for content-area learning. I have separated interview examples into these two categories: (1) knowledge acquisition in interdisciplinary fields and (2) preparing students for professional roles in advanced fields. I introduce mobile and web applications and share participants’ examples of mobile technology use in their own classrooms. I provide a variety of examples from participants in both sections.

Knowledge Acquisition in Interdisciplinary Fields

As previously stated, I interviewed fewer professors in the category of disciplinary applications. But although there are fewer examples, all professors interviewed gave examples of mobile technology use for the same purposes—real-time
feedback, formative assessment, and continuous engagement. Some used quizzing applications to get students engaged with content while some used polling applications for real-time feedback. Other professors used mobile technology to assess student learning.

The examples in this section focus primarily on input—acquiring knowledge of the disciplinary field and getting to a higher level of knowledge related to each discipline. These higher education instructors leveraged these applications and each participant gave examples of specific use in their classrooms.

**Kahoot™**

Kahoot™ is a web-based quiz application where instructors write questions in quizzes and games, also known as “Kahoots,” to which their students respond. Kahoots can be accessed via any web browser or the Kahoot™ app (see Figure 2 for description of Kahoot™ applications).
Kahoot™: Kahoot™ allows instructors to create interesting learning activities and quizzes by either choosing from existing games or creating their own. Kahoot™ quizzes can help engage students through collaboration and promotes accessing prior knowledge and reviewing content. Kahoot™ works for both face-to-face and distance learning. Polls can also be added to Kahoot™ quizzes to gauge student opinions or to check student understanding.

Kahoot™ allows for a social learning experience where multiple students may collaborate on a quiz game using the same screen, monitor, or projector. Professor Sharon Gray teaches using Kahoot™ at Augustana University. Although she teaches undergraduate courses in web development and technology, she said she understands the usefulness of this app which has become a favorite for K-12 educators. She said, “[Kahoot™] kind of has a K-12 patina on it but I find that it’s extremely useful, and it’s fun, and students really enjoy it.”

Gray incorporates Kahoot™ into her web design course by suggesting her students take Kahoot™ quizzes over each chapter before taking the actual course quiz. She said, “I’ve designed it so that whenever we’re going to have a quiz, there’s always a Kahoot™ quiz scheduled right before it.” She does not attach any points to the Kahoot™ quiz and the students are not required to take it but the incentive is that some of the
questions return on the real quiz. She described it as a “mini review” of sorts for her students. These allow her students to become familiar with the content and the questions in an entertaining way, which she believes promotes increased content retention.

She described her students as smiling, laughing, and competing while trying to be on top of the winner board. She said, “The [students] enjoy Kahoot™. Like I say, they’re engaged. They’re laughing and it’s just a really fun way to help them master the material.” She said using Kahoot™ puts her mind at eased as she sees this as promoting engagement and student success. Gray said she creates Kahoot™ chapter quizzes for all 12 chapters in the course and believes mobile devices are welcome in her classroom as long as they are being used for something productive such as a Kahoot™ quiz. Even if students do not bring their own mobile device, Gray said one of the benefits of Kahoot™ is that those students can log in using a desktop in the computer lab.

Gray explained there are other options in the market when it comes to quiz apps, such as Socrative™, but that Kahoot™ is still the favorite in classrooms. She said, “[Socrative] is another one that’s similar. It’s a little bit more—it’s not as fun and flashy but it gives you more opportunities, I think, for lengthy answers.” Additionally, there are polling applications such as Poll Everywhere™ that allow checking in on student understanding and for real-time feedback.

**Using Polling Application to Monitor Student Learning**

Professors Beth O’Toole, Sharon Gray, and Matthew Pehl use the online response system Poll Everywhere™ in their undergraduate courses using multiple strategies and for various reasons but each said they found the technology to be fast and beneficial.
Poll Everywhere™

Poll Everywhere™ is an online audience response polling system where users can create a live poll during a presentation to be sent out to their audience for instant results (see Figure 3 for description of Poll Everywhere™ applications).

Figure 3

Create Web-Based Audience Response Polls to Interact with your Audience via Mobile Devices

http://polleverywhere.com

Poll Everywhere™: Poll Everywhere™ is an online audience response system that allows users to create interactive polls for their presentations and their audience responds on mobile devices via the web page or through text messaging. Users create their own questions and can customize how their audience responds. Results show up in real time and can be shared and analyzed later. Poll Everywhere™ is free for up to groups of 25 and has paid plans for groups up to 700 or more. The free option also allows for unlimited questions.

Professor Beth O’Toole uses Poll Everywhere™ in her American Federal Government classes at the University of Sioux Falls when she wants to get a sense of what her student population feels about a certain issue.

I usually have big classes, so I have about 45 students and I want to get a sense of what the mood of the room is but [students] want to remain anonymous so you can use something like Poll Everywhere.
While O’Toole understands there are other classroom polling methods such as the Pollster™ app, she said Poll Everywhere™ is fast and simple for her classes. The benefit becomes, whenever she has an idea for a poll, it can easily be projected to the class. After she has created a poll for her students, Poll Everywhere™ generates either a number for students to text their answer to or a custom URL for them to enter into their browser from any mobile device. As students reply on their mobile device of choice, the entire class can see real-time results of how the students feel about the topic. O’Toole says that is a fun moment.

She explained sometimes the results may be predictable and sometimes they are very surprising but they always prompt discussion. Certain students may want to defend their viewpoint which also prompts positive conversation. O’Toole expressed Poll Everywhere™ can be used for any kind of a lesson where students can offer simple opinions; not to get into really deeply held views. As with her discussions during Twitter™ assignments, O’Toole sometimes asks, “How do you feel about the President using Twitter as a means of communicating policy? Is that a good idea or a bad idea?” Her students will generally fall on both sides of the issue and that will spark a conversation. Students realize there are people in the same classroom with varying viewpoints and O’Toole said it is interesting to see where the discussions take the class.

Professor Sharon Gray uses Poll Everywhere™ in her Computer Science and Journalism classes at Augustana University. Gray said she likes using the free version of Poll Everywhere™ because it allows for plenty of capabilities for classes her size. After she creates a poll for her class, the students can reply with their answers via their mobile devices. One thing specifically that Gray appreciates about Poll Everywhere™ is that she
can choose for her students to respond with their own write-in answers, rather than being limited to choosing A, B, C, or D. At the end of the semester, Gray said her polls can be saved, modified, or reused for future semesters.

Professor Dr. Matthew Pehl uses Poll Everywhere™ while teaching in the History department at Augustana University; specifically, in his Western Civilization and United States History courses. Pehl said the reason he uses Poll Everywhere™ is because he does not believe his classes are that large as they typically have about 35 people. Poll Everywhere™ allows for Pehl to incorporate discussion questions that would not work with a group that size without such technology.

Pehl said he began using Poll Everywhere™ as he was thinking of ways to not have to lecture constantly and to incorporate breaks into class sessions in order to reset attention. He began to think of a few polls that could be directed at students’ thoughts about something each student could respond to. He described the use of Poll Everywhere™ in this instance as a “mental reset” and to facilitate future discussion.

Pehl uses Poll Everywhere™ in his Western Civilization course lessons on Antigone because the story includes a “big moral conundrum” where his students are asked to consider whether individual morality should trump law. More specifically, he asks students, “If you believe in something to be right, are you justified in breaking the law to do it?” He said he believes that even students who did not read the Antigone reading assignment still learn something by having to respond to that poll question using Poll Everywhere™ and that leads to discussion as well. Pehl said he allows students to let their minds wander a bit as they give their opinion because that is where the “Aha!” moments happen.
Pehl described his most interesting use of Poll Everywhere™; when in a Post-Civil War United States History course, students were learning and discussing the impact of the Vietnam War, the Pentagon Papers, and Watergate. He began class by giving his students a list of institutions and asked them to name the ones they trust the most versus the ones they trust the least. This activity became very revealing to students as they began to realize their own innate sense of reality and lack of trust, which then led to a positive discussion regarding where that comes from. He tells his students that if he had shown them a similar opinion poll in 1960 their answers would likely have been drastically different.

Pehl suggested instructors should simply start with a few polls added to class discussions using Poll Everywhere™ because that is exactly how he began incorporating mobile devices into his own classroom.

I think one of the biggest problems is having students feel personally invested in the topic and you know having to put an opinion out there--even if it’s on the phone--especially for students where the phone is like an extension of their soul. If you’ve done something on that it’s like, “Okay, you’re kind of invested in it now.”

Flipgrid™ is another application higher education instructors use in their classrooms for student feedback and collaboration.

**Flipgrid™**

Professor Whiting uses Flipgrid™ in his online Technology in Education courses at the Augustana University to have his students record video responses to course content rather than traditional written replies in something like an online forum. Flipgrid™ is a website
where students respond to given topics and collaborate through video recordings (see Figure 4 for description of Flipgrid™ applications).

**Figure 4**

*Record and Share Quick Videos for Classes, Schools and Communities*  

Flipgrid™: Flipgrid™ is a free online tool for video-based discussions and meetings. Educators can create grids where students meet virtually and add their own video responses to a given topic. Students are able to discuss and reflect upon these topics from anywhere and at any time using their mobile devices. Flip codes are created by educators and shared with students. Students in turn record their own videos as a response to prompts and can add their own photos, text, and effects.

Professor Whiting described Flipgrid™ as a free digital video forum that can be accessed via mobile devices with either an online or app version. He said he has started incorporating Flipgrid™ into any online subject and lesson where students would normally do a written response. Whiting begins by creating a new grid on Flipgrid™ which is an individual page where students and instructors can record videos regarding a given topic.

He then records his own introductory video explaining the subject and talking points to the students for them to record their own replies. He said he can set a threshold to limit how long the student responses should be and typically chooses between two and five minutes. This forces his students to condense their information to get their points
across. It also makes it faster for students to watch each other’s responses and do their own video responses back and forth among their classmates.

Whiting said he appreciates Flipgrid™ for his online classes because it gives students more “quote/unquote face-to-face interaction with each other rather than just sitting in a regular, traditional forum where you’re reading through somebody’s post.” It changes the student experience by encouraging them to add more depth to their responses. Another reason Whiting said he and his students love Flipgrid™ is because you can record them from anywhere using mobile devices. His examples included standing in a grocery line and sitting at a car wash. Whiting said being able to see student facial expressions brings his class discussions to a new level of ownership and requires students to create much more focused material. Another application to help students interact and collaborate is Google Docs.

**Google Technology for Collaboration and Real-Time Discussion**

Professors Timothy Meyer and Beth O’Toole use Google Docs™ in their undergraduate courses to foster collaboration, communication, and content creation.

**Google Docs™**

Google Docs™ is a text editing application that is part of the overall set of Google-owned and created applications. Google Docs™ allows users to collaborate on a single project from multiple devices in real-time (see Figure 5 for description of Google Docs™ applications).
Google Docs™: Google Docs™ (Documents) is a free text document editor allowing users to format text, fonts, and images. Users can create, edit, and access documents through any web browser or via the Google Docs™ app on mobile devices. Documents are saved in real-time through internet connections and can be downloaded and accessed offline when connections are unavailable. There are many templates and presets for users to choose from, or documents can be created from scratch. Multiple users can edit the same document at the same time from multiple devices. Google Docs™ can also be saved as Microsoft Word™ files for compatibility with other platforms.

Professor Dr. Timothy Meyer uses Google Docs™ in his economics and agriculture courses at the University of Nebraska-Lincoln to facilitate student discussion and inquiries. Meyer first used Google Docs™ in his classroom so students could ask questions during his lectures. If Meyer was teaching a lesson with a large group of students, rather than take time for questions and answers aloud with the group, he created a Google Doc™ for students to anonymously enter questions into as he lectured.

Meyer said Google Docs™ are beneficial because students no longer have to worry about other students knowing if they are the ones asking questions or having trouble with a specific topic.
I previously had them simply write down questions. Google Docs™ works much better. They are simply more likely to type a question on their tiny iPhone keyboard or their computer than they are to write down the same question and pass it forward.

Meyer said he has also noticed his students are very much participation-driven. Although both he and his students do not like multiple choice questions, he appreciates that students like to feel their viewpoints are being addressed through this type of questioning. One of the ways Meyer accomplishes this is by using Google Docs™ to allow students to write their own exam questions throughout the semester. Meyer said he and students both interact on the Google Doc™ throughout the semester. He uses what he considers to be the “good” questions on the final exam and said that is an incentive for students to ask good questions throughout the semester and become engaged. Meyer said this exercise ultimately improves student scores on the actual exams.

Another way Meyer uses Google Docs™ in his classroom is to do informal competitions during his lectures. If Meyer feels student engagement and excitement waning, he creates 10 to 20 question quizzes on Google Docs™ that have roughly half to three-fourths of the content from the entire course while also including things like trivia—Nebraska and agricultural trivia specifically—in order to get students excited and more engaged about course content again. Meyer said sometimes he may also have students open up class Google Docs™ in order to review content he may have sent out to the group online.

Professor Beth O’Toole uses Google Docs™ in her Criminal Justice and Social Science courses at the University of Sioux Falls to help students collaborate and take
notes during class lectures. O’Toole said note-taking via Google Docs™ allows students to have a comprehensive set of notes where multiple students can share their document with their study group, and add and edit as the instructor lectures. All students can edit the same document in real-time. Another method for accessing files from anywhere is with the cloud-based storage platform Dropbox™.

**Dropbox™**

Director Gail Weinhold of the School of Education at North Central University uses Dropbox™ with her education students to save and share digital files. Dropbox™ is a cloud-storage service available on iPhone, Android, and web-connected devices. (see Figure 6 for description of Dropbox™ applications).

**Figure 6**

*Cloud-based storage and sharing with Dropbox™*

[https://www.dropbox.com/](https://www.dropbox.com/)

**Dropbox™**: Dropbox™ is a cloud-based file hosting service available on iPhone, Android, and web-connected devices. Dropbox™ allows users to upload, manage, and save files from any device connected to the Internet. Users get two gigabytes of file space for free with Dropbox Basic™ and up to two terabytes of storage space with Dropbox Plus™. The upgraded paid service costs $9.99 per month when billed yearly.

Weinhold said she generally uses Dropbox™ as her main web-based file storage resource. She said she appreciates how she can access and share files from any web-
based device. Even though her University has a file storage system, she said she still finds herself going to Dropbox™ for ease of access to her saved files.

If I want to share a folder with a student or if I want a student to share something with me, if they’ve got a Dropbox account they can simply give me access to that Dropbox folder and so that’s been a way that I’ve been able to share content with other professors and with students.

Weinhold said she also supervises numerous student teachers and wanted the ability to be able to access all of her files from wherever she is. She said she did not want to be forced to be connected to a specific school server because Dropbox™ allowed her to access her files from anywhere with an Internet connection. She said she found herself mainly using the basic capabilities of Dropbox™ for storage and said she did not view herself as accessing the more advanced features of the tool with her students. However, she said many students were not familiar with the technology when entering higher education because many K-12 schools use Google™ tools.

Weinhold said although she uses Dropbox™ as a storage tool and does not utilize the more advanced features, it is still a powerful sharing tool in her classroom. Pedagogically, she said she looks to Dropbox™ as a way to connect and share with students digitally rather than keeping physical files or needing to be in the same room. She and students are able to save and submit their work in ways they have not been able to do before. This includes access to files from off-campus and anywhere in the world. Pedagogically, she said this offers her and her students ease and access which they did not have with traditional files for activities like handing in assignments and sharing
documents for feedback. She said she also leverages the TurboScan™ application for converting and sharing digital files.

**TurboScan™**

Professor Ilah Raleigh uses TurboScan™ with her music students at the University of St. Thomas for creating and sharing digital copies of physical documents. TurboScan™ allows users to take photos of documents with their mobile device and convert them into PDFs or JPEGs. (see Figure 7 for description of TurboScan™ applications).

**Figure 7**

*Transforms Ideas Into Stunning Visual Stories with TurboScan™*

![TurboScan™](https://turboscanapp.com/)

**TurboScan™:** TurboScan™ allows users to take photos of items such as documents or photos and converts them into PDF or JPEG files. TurboScan™ automatically detects the edge of your document for appropriate cropping. Users may name, store, and search for files within the app. Documents may be emailed, saved locally, or uploaded to cloud-based storage such as Dropbox™ or Google Drive™. The free version allows up to three document conversions. The paid option allows for unlimited conversions for $4.99. TurboScan™ is available on iPhone and Android devices.
As a music educator, Raleigh said she appreciates the ability to quickly take photos of documents with her smartphone and convert them into PDFs using TurboScan™. When introducing students to the application, Raleigh said she first has them download it to their own devices. She shows her students examples of documents she has converted using her own device. She explains how to convert multiple-page printed documents into multiple-page PDF documents.

For students who may have difficulties using the application, Raleigh said she will do additional activities with them such as having them take a photo in the application and walk them through the steps until they understand the process. She said an example of how students practice using TurboScan™ is by having her students take a photo of their music notes while they work on writing a song. She said she walks back through the steps of naming the file and sending the PDF to her email.

Once they are comfortable using the application, they routinely use it for various purposes throughout the semester. Raleigh said students often use TurboScan™ when needing to get a printed document to someone quickly that requires a signature. They open the application, take a photo of the document, convert it to digital format, and email it to the designated receiver. She said her students also routinely use TurboScan™ to hand in songwriting assignments.

[TurboScan™] is a way for my students to share their work with me very quickly that they have written out; handwritten music. They might write a chart for me, take a picture of that, and send it in as their homework.

TurboScan™ also helps Raleigh and her students save on paper and printing costs. She says the PDF files are much easier for her when grading assignments and keeping up with
student homework because she can see the emailed documents on her smartphone as they are handed in. It is also helpful for students who do not have access to a scanner at home. They are still able to hand in assignments that would have traditionally been printed, scanned, and emailed. Raleigh said TurboScan™ speeds up that process and makes it a lot more accessible.

She encourages instructors in other disciplines to try it with their students for handing in homework, permission forms, or any other document that needs to be sent quickly. In relation to pedagogy, she said TurboScan™ allows her and her students to hand in assignments and share files which would have traditionally been printed. The application speeds up the process and makes the act much more accessible. Another application for making resources more accessible to students is Pro Metronome™

**Pro Metronome™**

Professor Raleigh uses Pro Metronome™ with her music students to help them practice various time signatures. Pro Metronome™ helps users customize ways to keep time while practicing their music. (see Figure 8 for description of Pro Metronome™ applications).
Pro Metronome™: Pro Metronome™ is a digital app-based alternative to a traditional mechanical metronome. The application allows users to customize time signatures by changing sounds and volume levels. Users may also increase or decrease the speed of time signatures as they perform. The free version offers visual pendulum and color modes which add visuals in addition to audio. Upgrade to the Pro version for additional modes such as vibration and flash mode for different types of learners which costs $3.00. Pro Metronome™ is available on iPhone and Android devices.

Raleigh said she introduces Pro Metronome™ to students as they are still learning the basics of music. She said the application lets them see things represented visually. For example, if beginning students are having difficulty understanding a concept such as time signatures, the application shows specific types of notes such as quarter notes and the visual element elevates capabilities beyond those of a traditional mechanical metronome.

When students use the application, they choose a time signature and can use the dial within Pro Metronome™ to increase or decrease the number of beats per minute. Raleigh said Pro Metronome™ works really well when explaining to students how constant tempos and downbeats work. Students are able to push play on a given piece and...
hear how a fast tempo sounds and then can use the dial to slow down the pace. Students are able to view visuals and hear these tempo changes.

Raleigh said Pro Metronome™ is beneficial for different types of learners. She said she is able to approach assignments by accommodating different types of learners at the same time; those who prefer audible cues and visual learners as well. She finds herself using Pro Metronome™ much more than the traditional mechanical metronome that would sit on her piano due to the additional visual features and because it can be accessed everywhere via her mobile device.

Raleigh encourages her students to practice using Pro Metronome™ routinely when preparing for a piano or voice lesson. She explains how to map out a goal tempo they can comfortably play or sing at without any mistakes. They choose about a page worth of music and begin by playing or singing at a slow tempo. Once they master the music at a slower pace, she encourages them to gradually increase the pace each time they practice. She said, “I find that with voice you can do harm if you try to go too fast too soon and so it’s better they go slower in smaller increments.”

Raleigh said she also uses Pro Metronome™ to explain the difference between how musicians feel the pulse of a time signature when it is 4/4 versus how they feel the pulse when it is 2/2. For example, when introducing specific styles of music such as a march which she said feels like 4/4, she demonstrates the feel of the time signature using Pro Metronome™ and then contrasts that against a merengue style of music which she said feels more like 2/2. She said the added capability of seeing it visually makes a huge difference with student progress.
It’s like the difference between somebody who tried to understand music theory in their head and then they have their first music theory class taught with a piano in the room and all of a sudden they’re like, “I see everything in front of me. This makes so much sense.”

She said Pro Metronome™ has been helpful with making things visual for those types of learners and they have progressed much faster using the application. By adding Pro Metronome™ into her classes, she has leveraged a traditional mechanical metronome and used mobile technology to enhance that aspect of student learning in her music classes.

**From Interdisciplinary Scholars to Professional Development**

All applications and web resources explained previously relate to consumers and producers of knowledge. Although there were fewer higher education professors interviewed who focused on leveraging mobile technology for knowledge acquisition and real-time feedback, they all consistently described how to get students engaged in disciplinary content and actually learn it. These professors are not teaching students how to use the application, they simply use them for learning and formative assessment.

There is a shift in pedagogy toward getting more student feedback in real time and to continue student engagement. By leveraging mobile device technology in their classrooms, the aforementioned higher education instructors are able to keep students engaged, gain real-time feedback, and foster student knowledge acquisition. For example, keeping students engaged with applications like Goose Chase™ and Kahoot™, students are continuously engaged in course content, but the applications may also be used as a type of formative assessment. However, at a certain point, students will need to be able to show evidence of their learning through some sort of output. This may be through
projects or portfolio pieces but the use of classroom mobile technology changes as students transition toward focusing on professional preparation.

**Preparing Students for Professional Roles in Advanced Fields**

Participants in this section are focused on motivating their students to learn dispositions in a given field through project-based learning. These participants use mobile technology and applications to give students technical opportunities to learn and acquire knowledge beyond facts and use these tools for learning and producing. Their students are learning how to become professionals.

Early on in their courses, students are practicing with a given technology and then these higher education instructors have their students focus on how to produce their own content using such technology. Next, students output their projects by being given a project and/or problem to complete. Such outputs include webpages, videos, or social media accounts. For example, in a video-production course, students are learning the technical skill of editing video files for the sake of digital storytelling and create their own video files using mobile technology. These higher education instructors teach using these applications because they are industry-standard technologies in their fields, and each participant gave examples of specific use in their classrooms.

**Adobe Applications for Content Creation and Delivery**

Professor Rick Warkenthien uses Adobe resources to help his students gain mastery over Media Communications course goals at Southeast Technical Institute in Sioux Falls, South Dakota, including Adobe Spark™, Adobe XD™, and Adobe Capture™. Warkenthien recognized students need to be well-versed in social media applications because when they enter the industry and work-force, they will likely have
some part of social media management in their job description. He said he does not force students to use mobile devices but rather encourages them to use them productively.

**Adobe Spark: Spark Page, Post, and Video**

Adobe Spark™ is a free mobile application that simply requires the user to create a free Adobe ID so that all projects may be stored within the user’s login for further editing at any time. Adobe Spark™ helps students and instructors create graphics for social media, web pages, and short videos within a matter of minutes. Adobe Spark™ is composed of three sub-applications including, Spark Page, Post, and Video—each with their own specific capabilities. Warkenthien’s students use the Adobe Spark™ capabilities to put together class presentations, web pages, and videos. Although he typically encourages students to create original designs, he explained sometimes he wants students to present something without getting hung up on the interface of the tool.

As a media professional, I know how to edit video. I know how to build websites and our students learn that too. But sometimes I want the students to present something in a video format or a webpage without getting hung up on the interface of the tool they’re using.

Adobe Spark™ allows for exactly that. Students put together video presentations, social media posts, and web pages without considering the coding or back-end process.

Warkenthien appreciated the advantage of Adobe Spark™ mobile capabilities. For example, students put together presentations for general education courses without relying on traditional desktop-based computers and software. Adobe Spark™ allows both students and instructors to communicate without the requirement of learning a complicated interface.
Adobe Spark™ proved useful as an assessment tool for student learning. Warkenthien requires students taking internship credits to create Adobe Spark™ presentations with interactive links to photos, videos, and PDF files, rather than traditional two-page written summaries. These presentations and pages are then shared on departmental social media pages as a way to raise student interest in doing internships.

If you are going to use… [Adobe Spark™] for learning assessment, you are able to quickly throw together text and images, video clips, links, to HTML documents so you can remember the experience. So, perhaps a student does an industry visit - a tour. While they’re at the industry visit, they can be capturing photos, video clips, sound bites, and add text so it’s going to help the student to remember what they learned and better understand the [learning] process.

Warkenthien explained the use of Adobe Spark™ is more than just gathering images, text and video clips. The user is actually creating a professional presentation (see Figure 9 for a description of Adobe Spark applications).
Adobe Spark™: Part of the Adobe Creative Cloud set of mobile applications, Adobe Spark™ helps students and instructors create graphics for social media, web pages, and short videos within a matter of minutes. Adobe Spark™ is composed of three sub-applications including, Spark Page, Spark Post, and Spark Video - each with their own specific capabilities. Spark Page users input text and graphics to create quick, easy web page presentations with corresponding URLs. Spark Post allows users to choose their own graphics and text and apply preset design filters to create fast social media ready posts. Spark Video helps users edit quick videos using graphics, video, and audio with available copyright-free soundtracks. All three Adobe Spark™ features help users create content and share their ideas quickly using various platforms.

Warkenthien encourages instructors in all content areas to be open to Adobe Spark™ capabilities. In addition to using Adobe Spark™ in his lessons and projects, he also trains fellow Southeast Technical Institute faculty members on how to incorporate the use of Adobe Spark™ into their own classrooms. Another Adobe product, Adobe XD™, also helps users create prototype websites for various platforms.

Adobe XD™

Adobe XD™ is a User Interface and User Experience (UI/UX) design and collaboration application. Like all other Adobe applications, a free Adobe ID is required, allowing users to store projects within a login for further editing at any time. Adobe XD™ does offer two paid monthly plans for users looking to increase cloud storage and
access exclusive business features for team collaboration (see Figure 10 for description of Adobe XD™ applications).

Figure 10

Create Designs for Websites, Mobile Applications, Voice Interfaces, and Games

http://xd.adobe.com

Adobe XD™: Part of the Adobe Creative Cloud set of applications, Adobe XD™ helps users create designs for web and mobile applications as well as other interfaces. Adobe Spark™ and XD™ helps users design prototype websites and mobile interfaces without having to worry about having to learn coding and/or programming. It is vector-based rather than pixel-based, which means user designs may be scaled for any digital device without the worry of altering the quality of graphics.

Warkenthien’s students use Adobe XD™ to develop concepts and prototypes for websites and mobile applications without having to focus on the programming and developing aspects. Focusing on work-force development and “real world skills,” Warkenthien requires students to assess a potential client or public need and address that need with a mobile application. Students create “wireframes” for the navigation of a website or applications. The wireframes are simply a flowchart for which pages and links direct the user to the next page/link.

Students evaluate the effectiveness of their creations based on functionality, organization, design, and usability. They create UX/UI designs to emulate what finished products will look like without focusing on deploying it to the market for viewing and
downloading. The concepts and prototypes may be viewed inside the Adobe XD™ interface to show what the designs would look like across various platform sizes, including smartphones, tablets, and desktop screens.

Examples of Warkenthien’s student projects included using Adobe XD™ to develop a concept for shopping and e-commerce, public transportation, new and expecting parents, and food. Students identify a public need or problem within their category and then outline wireframe flowcharts to arrange where content goes within their concepts. Students choose all of the design aspects as well, including color schemes, font choices, buttons, and textures.

After developing a prototype, students conduct research to see what other applications are currently out in the market that may already be solving that need. The goal is to improve upon or invent a new concept for solving such a problem. Because Adobe XD™ can emulate the interface of multiple platforms, all students may view how their prototypes will look on each device. This gives all students the same opportunity to complete the lesson no matter what mobile technology they use. Students share a link to their prototypes so that Warkenthien may access their work and evaluate it. Adobe Capture™ is also an Adobe application and allows the user to use mobile devices to create vector assets for use in other Adobe applications such as Adobe XD™.

Adobe Capture™

Adobe Capture™ is a mobile application that allows students to use their mobile device to gather color schemes, fonts, textures, etc. to use in projects using other Adobe applications. Students can log in and use Adobe Capture™ for free with their Adobe ID (see Figure 11 for description of Adobe Capture™ applications).
Figure 11

Create Vector Designs from Images Using Your Mobile Device

Adobe Capture™: Part of the Adobe set of applications, Adobe Capture™ allows the user to use their mobile device to convert photos into vector assets for use in other Adobe applications such as Photoshop™, Illustrator™ and XD™. Use preset filters to transform your Adobe Capture™ assets to create unique designs. Adobe Capture™ technology can recognize fonts in photos and suggest similar fonts to use in your own design. Adobe Capture™ can also create color swatches and palettes from colors in a photograph to apply to other Adobe application projects.

Warkenthien’s students use Adobe Capture™ to integrate things they see in their everyday lives into projects created in other Adobe applications. For example, Warkenthien has students capture typography and fonts that they see using their smartphone cameras to use in projects such as menu designs. If students are unsure of fonts used in other projects, Adobe Capture™ is able to recognize fonts and/or offer similar fonts to be used in other projects.

In addition to fonts and typography, Warkenthien’s students photograph shapes, patterns, and textures in the app. Colors captured in photographs using Adobe Capture™ can be turned into color swatches, and those swatches can be used in other applications as well. Students may add all of these assets to their Adobe library, and when working in
other Adobe applications and software such as Adobe Illustrator™, Photoshop™, and InDesign™, these assets may be imported and applied to those projects.

Warkenthien said Adobe Capture™ helps his students develop assets for future projects and assists with things like remembering colors and fonts in things they have seen elsewhere. He said Adobe Capture™ is highly effective for students gathering inspiration for their projects. He went on to say, “[With] some of the Adobe projects, we’re actually creating a product. This is more just creating content that’s gonna reach your audience and get them to interact with you.”

Warkenthien said one of his favorite teaching moments was an instance where he had previously shown one of his students how to use Adobe Capture™. This student, while working on an internship in a subsequent semester, was using Adobe Capture™ for a real-world client’s work and returned to campus with excitement to show Warkenthien how he had actually used these tools to produce work for a client. Warkenthien explained how this brought him a sense of fulfillment.

That was a pretty satisfying moment where, you know, a lot of them use [Adobe Capture™] just for stuff in the classroom. But that was the first time I saw somebody actually use it in a real-world setting and talk about how valuable it was to him; that while he was meeting with his client, was able to put together fonts and color schemes, and it actually got integrated into the work that he created for that client.

Warkenthien’s innovative strategies using mobile applications such as Adobe Spark™, Adobe XD™, and Adobe Capture™ assist students with learning design and web development skills and the incorporation of such mobile technologies
helps accomplish their learning goals. DJI GO 4 is another industry-standard application that assists students with producing course content.

**DJI GO 4™**

Broadcasting Instructor Brian Anderson uses DJI GO 4™ with his Drone Operations students at Northeast Community College to have his students control and manage drone flights. DJI GO 4™ is a mobile application for viewing and controlling drone footage live using both iPhone and Android devices (see Figure 12 for description of DJI GO 4™ applications).

**Figure 12**

*Control Drones via Mobile Devices and View HD Footage Live with DJI GO 4™*

https://www.dji.com/downloads/djiapp/dji-go-4

**DJI GO 4™**: The DJI GO 4™ application is used to view live video, and control flying and landing of various DJI drone devices including the Mavic Series, Phantom 4, and others. DJI GO 4™ has built-in video tutorials and user manuals for training purposes. The application offers near real-time image transmission. Photos and videos captured with the drone can be edited and shared within the application.

Anderson said he uses the DJI GO 4™ app in his Drone Operations courses along with school-owned and operated iPads and the DJI Mavic 2 Zoom drone. When incorporating this application into a lesson, Anderson said he begins by opening the
application and walking students through the interface step-by-step. Anderson said he teaches how to use DJI GO 4™ for drone flights through hands-on demonstrations.

The application has built-in simulators, similar to a traditional flight simulator for airplanes and helicopters, where the application mimics the look and feel of a regular flight without physically lifting the drone off the ground. This allows a safe, digital way for students to practice and get experience before flying a real drone. Then, after practicing with the simulator, students practice lifting a drone off the ground using different flight maneuvers and techniques.

These practices are done indoors in a controlled space prior to students taking the devices outside.

We do practice indoors before we go outdoors. Obviously, we don’t want a student just lifting off and putting [the drone] up at 300 feet in the air right away. You want them just to practice in more of a controlled environment. So, we’ll use that in the gym where maybe [students] just lift off 10 feet, 15 feet and get the basic maneuvers down first before they go out.

Once students have had time to practice with simulations and indoor flights, Anderson said he gives them checklists of various requirements they must meet routinely such as industry-type maneuvers. He said he collaborates with other departments on campus to give students additional hands-on, real world experience with their projects.

We have students that build houses on our campus in the construction department. And so as they build houses we go over and do a real estate shoot. Once the houses are done, we go take pictures of those houses with the drones and then we
submit them to the college marketing department, which then uses those pictures to put on the sale bill for when they sell the student-built houses.

Anderson said he attempts to create as many real-world experiences for his students as possible. Examples include taking students to a railroad track near campus to record and portray a train derailment as if students were documenting a spot news piece, or similarly having students record footage of a campus building as if it was on fire and they were documenting footage of the situation with the drones. Aside from the routine uses of DJI GO 4™, Anderson said advanced projects may include more cinematic, news-based, or portfolio-building pieces. Students going into particular industries focus their advanced drone projects on completing projects geared more toward that field. For example, if a student was going into journalism, they would focus on more news footage, and if they are going into the field of cinema, they work on capturing more aesthetically-pleasing videos.

Anderson said students from various departments take his Drone Operations course and work with DJI GO 4™ because the skills learned throughout the projects translate to a wide variety of fields. He said students from the Agriculture department appreciate working with DJI GO 4™ and drones because they want to get footage of fields from above. He caters class projects to include footage related to the fields they intend to enter post-graduation.

Anderson said there are rules and regulations required by the Federal Aviation Administration (FAA) regarding drone pilot licensing that needs to be taught to students alongside using DJI GO 4™ to control drones and complete class projects. Because the FAA only controls the airspace outside of buildings, practice and routine use inside for
students is not subject to FAA oversight. Whereas Anderson uses DJI GO 4™ application because it is industry-standard in his field of study, Professor Dr. Arlys Peterson uses Goose Chase™ and Kahoot™ quizzes because her students need to use them in their professions.

**Web Applications for Creating Unique Learning Activities**

Professor Dr. Arlys Peterson teaches her educational technology students at the University of Sioux Falls how to use the Goose Chase™ web application to assist with teaching their own students about various content areas. Peterson understood her students need to be up-to-date with emerging educational technologies like Goose Chase™ to help their own students learn content in innovative ways.

**Goose Chase™**

Goose Chase™ is a web-based program for educators where instructors can create virtual missions for their students to complete in order to earn points. Missions may include things like taking photos or videos of something related to one’s content area, or checking in at a particular location. Games can be created by the user with entirely original content or by using a template in the Goose Chase™ Game Library (see Figure 13 for description of Goose Chase™ applications).
GooseChase™: GooseChase™ helps students interact with others by completing scavenger hunts and games through missions created and scored by their instructors. Scavenger hunts are built for free on the GooseChase™ website and can include whatever content, descriptions, photos and videos necessary for each course. Create your own mission or create one from scratch.

Goose Chase™ is free for educators with unlimited games and classes, and one live game at a time. For educators, schools, and districts looking to add additional live games and participants, there are paid options as well. Professor Peterson demonstrates the capabilities of Goose Chase™ in her Technology in Education classes. In order to teach her students the program, she has students use their mobile device of choice, including iPads and smartphones or anything with a built-in camera, to complete Goose Chase™ missions related to their content areas. For example, she said she creates missions regarding the Civil War where students are tasked with going to the University of Sioux Falls library in order to find two books related to the Civil War.

Once her students find the two books, they take photos of themselves with the book covers. Additional tasks may include interviewing an expert with information about
the Civil War. Students can record video within the Goose Chase™ application to document their interviews. Peterson said she believes Goose Chase™ missions like these allow for educators to keep track of their students and document where they are with a given assignment.

While Peterson said she believes mobile devices to be a positive addition to her classroom, she realizes that not every student will have a mobile device such as a smartphone and may only have something like a flip phone that does not have access to internet data or camera technologies.

I can’t assume that I can do an assignment where everyone has a [mobile device] but I can do an assignment like Goose Chase™ and they can work in groups. And then if one person has an iphone, then they can do the activity. And with Goose Chase™, they can go all over campus or all over the building and I’m just showing them how Goose Chase™ can be used in classrooms. Peterson said no matter what devices they bring to class, whether smartphones or tablets, they are a great resource for classroom use. She said she shows her students ways to use them because when her students become educators in elementary, middle, and high schools, their students will likely have these devices as well.

Kahoot™ is another learning tool Professor Peterson uses for reinforcing course content. Kahoot™ is the one application that falls into both categories found in the data—Knowledge Acquisition in Interdisciplinary Fields and Preparing Students for Professional Roles in Advanced Fields. In this section, Professors Arlys Peterson and Jason Whiting explain how they incorporate Kahoot™ into their technology in education courses.
Kahoot™

Peterson teaches her educational technology students at the University of Sioux Falls how to use the Kahoot™ web application to reinforce course content. As with Goose Chase™, Peterson understood there are emerging educational technologies her students should be familiar with in order to engage their own students and she said Kahoot™ is a great example of using mobile technologies to create fun learning activities.

Professor Peterson said she demonstrates the capabilities of Kahoot™ with her students by creating a Kahoot™ quiz for an individual student to complete. As her student completes the quiz, the results show up in front of the class on the smartboard. It displays in real-time how many they get correct or incorrect. Peterson said when multiple students contribute to the same Kahoot™ in front of the class, she always gives her students a tip not to write their real name so that the rest of the class does not know who gets questions correct or incorrect.

Professor Jason Whiting uses Kahoot™ in his Technology in Education courses at Augustana University to teach his students how to help students review information in their own K-12 courses. He said he appreciates Kahoot™ because it allows students to work with their mobile devices but also realizes that Kahoot™ is not the only option when it comes to quiz apps. He said, “I mean, every year there’s a new one coming out. One dies and another one comes out so they are all free.” Whiting said another suggestion for popular, game-based quiz apps is Quizlet; although Kahoot™ is still preferred in classrooms.
Whiting said the reason why Kahoot™ is the current favorite when it comes to quiz apps is because it is stable and reliable. He said, “There are websites out there that will bomb.” Kahoot™ is a common app that students mention positively when Whiting gets his course feedback at the end of the semester. He attributed this to students having epiphany moments where they realize the immense capabilities of smart phones. Another option for introducing collaboration into the classroom is with Nearpod™.

**Nearpod™**

Director Gail Weinhold of the School of Education at North Central University uses Nearpod™ with her education students for demonstrating how to create collaborative activities with their future students. Nearpod™ is an interactive and instructional lesson platform for iPhone, Android, and web. (see Figure 14 for description of Nearpod™ applications).

**Figure 14**

*Create Collaborative Learning Activities with Nearpod™*

Nearpod™ is an application and software that allows educators to create interactive lessons and engage students. Nearpod™ is free for group sizes up to 40 and there are paid options beyond that threshold. Users may choose to create their own activities or choose from over 7,000 pre-made lessons. Nearpod™ can be integrated into school learning management systems such as Google Classroom™ and Canvas™. Users may create collaborative activities such as game-based quizzes, virtual reality, and polls.
Weinhold said when educators log in to begin using Nearpod™, they have the options to create new lessons or can access the built-in library of lessons. When creating their own, users may choose to import existing artifacts such as PDFs, Powerpoint™ presentations, images, and even Google Slides™. Instructors can then create codes within the application for their students to be directed toward a specific Nearpod™ lesson. When students sign into their Nearpod™ account, they are given the same options but are also prompted to enter a code if they wish.

Weinhold said when teaching her education students how to use the app she walks them through how to create a lesson because they are future K-12 educators. Once they understand the Nearpod™ interface, they create their own student-based lessons and presentations, and then turn them in for feedback. These lessons pertain to the content these students will be teaching in the future. For example, she said future English education students might create Nearpod™ lessons regarding Shakespeare’s plays.

Weinhold said her ultimate teaching goal when using Nearpod™ is to show students how to present content digitally that might normally be presented in a traditional classroom format.

If you’re a high school math teacher, you would create your lesson for that day on Nearpod™, send the code out to all of your students and then for their digital learning for that day they would have to complete their Nearpod™ lesson. Weinhold said her students are consistently surprised about the capabilities of Nearpod™. She said, “It’s so much more interactive and engaging for students than showing a PowerPoint™.” Students are able to respond to questions via the application,
take polls, or complete quizzes. Art educators can even require their students to complete drawings within the application.

Weinhold said it gives students a way to interact with the content but does not necessarily require the instructor to be with the student at the time. They are able to complete it on their own time. Once students have completed activities, instructors can create reports based upon student activity and see how they performed on entire quizzes or individual questions. Instructors can also reply to student work and offer feedback directly through the application.

Weinhold said she believes the reason Nearpod™ is still only widely used in the K-12 educational environment because many higher education instructors are unaware of the platform. Additionally, many Nearpod™ lessons are directly aligned with K-12 teaching standards. She said pedagogically she incorporates Nearpod™ into her higher education classrooms because full immersion into the application helps her achieve course content goals while also preparing her students for their professional careers.

Using Social Media to Facilitate Discussion and Research

Professors Beth O’Toole, Jason Whiting, and Katie McCoullough use Twitter™ in their undergraduate courses and lessons in a variety of ways but each said benefits include the ability to instantly access such a vast network. They also agreed that most educators do not primarily view Twitter™ as an academic resource.

Twitter™

Twitter™ is a social media website and application used by hundreds of millions of users around the world. In an instant, users can access global and regional trends and
discussions by viewing the posts of other users (see Figure 15 for description of Twitter™ applications).

**Figure 15**

*Become Part of the Global Conversation by Posting and Following Social Media Posts*

http://twitter.com

**Twitter™**: Twitter™ is a social media and microblogging platform focused on what is currently happening in the world. Individual users post about any and every topic through messages called “tweets”, allowing all users to become part of the global conversation. Users can post, like, and retweet other users’ posts through the web version (www.twitter.com) or through the mobile Twitter™ app.

Professor Beth O’Toole teaches her American Federal Government students at the University of Sioux Falls how to use Twitter™ to instantly see what trending topics are in the United States. She jokingly but also seriously stated, “Things happen on the Twitter™.” As current events happen with the American government, she asks her students to take out their mobile devices and watch the feedback for those stories on Twitter™.

The ability to see real-time results and discussions is what O’Toole said is so important and beneficial for her students. Because of the constantly changing landscape in social media discussions, O’Toole said she addresses that quickly in her classroom.
It’s super handy in a world where we have a President who tweets. It’s super handy to walk into a class in the morning. He starts tweeting about the same time my Government class starts. So, it’s handy to say, “Alright, pull [mobile devices] out. Let’s see what’s going on!”

O’Toole said because the United States President uses Twitter™ regularly, the question becomes, “Should we treat those tweets as policy?” and as students look through his Twitter™ feed, they are asked to consider if what they read is appropriate activity for the Commander-in-Chief.

O’Toole and her students continue to scour headlines and compare various social media platforms to stay up-to-date on current topics. These types of activities promote relevant discussions in her classrooms. To further facilitate discussion, she asks her students, “How do you feel about the President using Twitter™ as a means of communicating policy. Is that a good idea or a bad idea?” Her students are asked to debate the pros and cons as a means for beginning conversation regarding course content.

O’Toole stated she did not necessarily remember when she decided to start incorporating social media and mobile technology into her classes but that one example came to mind. When Barack Obama became President, he had created social media pages and she realized they were fun for students to check out in class. She would both pull them up on her projector and ask students to look up posts on their own mobile devices. Twitter™ became commonplace in her classroom because she believes it is something students are accustomed to using on a daily basis. For students unfamiliar with using Twitter™, O’Toole recommends they download the Twitter™ app on their mobile
devices. She said she also appreciates learning new things on a daily basis through using Twitter™ with her students.

Professor Jason Whiting uses Twitter™ in his Technology in Education courses at Augustana University for student research and professional development. He said his main purpose for using Twitter™ is to show students about professional learning networks as that is his go-to for personal use. He personally curates 15 Twitter™ accounts, including accounts for specific courses, professional development, as well as personal.

An example Whiting gave of a specific Twitter™ assignment is having students find one tweet per day for an entire week. In the beginning, Whiting said only about half of his students have Twitter™ accounts so this is the first time some of them have ever used it. While some are resistant due to lack of familiarity or what Whiting described as, “every excuse in the book,” this is not an optional assignment. He then gives them a list of other users to follow, including his own professional page, various companies, and other “tech gurus.” If there is a class content being taught, Whiting said there are pages for that. For example, if he is teaching a future physical education teacher how to incorporate technology into their classroom, he suggests a group of physical educational technology teachers to follow on Twitter™. He said, “I give everybody people within their group to follow and then they have to go out and use, and research on Twitter™, and find some type of instructional technology.” His students then retweet posts they find.

His students also post using a group-designated hashtag so that the rest of the class can see what each other is finding. Both current students and past students can
follow along with the findings. A majority of the feedback he gets from students on this project is that they did not realize that Twitter™ was so full of educational resources; especially when it comes to the professional learning aspect.

“I had access to so much stuff through Twitter!” I mean, that is one of the most common comments I get. “Thank you for showing that to me. You gave me something to save time that I was spending elsewhere.” I’m now able to use it to benefit what they do and it’s an enjoyable way because they get to filter whatever they want.

By applying the concept of professional development to a social media resource like Twitter™, Whiting said it shows students there are unlimited resources if they are willing to look.

Professor Dr. Katie McCoullough uses Twitter™ in classes related to social media at Augustana University such as Introduction to New Media. She often creates a Twitter™ page for classes and has them create their own tweets. She also assigns students to “like” a certain number of tweets regarding a given topic. Despite the wide range of content on Twitter™, McCoullough found student interaction with this assignment to be very surface level as students were not as engaged with the class page as she wanted them to. However, McCoullough found that discussions surrounding the use of such social media platforms have opened opportunities for ethical discussions surrounding the projection of an online identity.

For example, one of McCoullough’s favorite teaching moments was when a student chose to research the daughter of a reality television personality; a Real Housewives cast member. The student’s point was, this young four-year-old girl already
has a Twitter™ account. She felt that clearly this meant someone else had created this online identity for her already. This helped foster a healthy class discussion surrounding the ethical issue of how users project their own identity among various social media platforms including Twitter™, Facebook™, and LinkedIn™. Healthy class discussion also occurs through student use of the web resource ISideWith™.

**Using Web Application to Synthesize Viewpoints**

Professor Beth O’Toole uses ISideWith™ in her Social Science and Criminal Justice courses at the University of Sioux Falls to help students synthesize their viewpoints regarding a variety of topics into a cohesive political stand.

**ISideWith™**

ISideWith™ is a web-based resource where users input their views concerning certain issues and ISideWith™ processes that information to offer the user a clearer view regarding where their views align (see Figure 16 for description of ISideWith™ applications).
ISideWith™: ISideWith™ is a quiz and polling website where users answer questions regarding a given topic in order to find out where their views may align on issues. Popular issues include current political elections, LGBT rights, abortion and gun control. Users fill in their own answers to lengthy questionnaires on any web-connected device via their browser, assign their level of importance around those issues, and the ISideWith™ algorithm processes answers related to the given quiz.

Professor O’Toole uses ISideWith™ in her American Federal Government course to help her students understand the positions among various political candidates. She described the process where students open the ISideWith™ quiz and/or poll and fill out their opinion on different topics. She explained the process as helping students transition from a meta-level of understanding of various issues all the way to an extremely detailed understanding of the issues.

For example, if the class discussion concerned political candidate views regarding environment or social security, she assigns students to complete ISideWith™ quizzes related to those issues, and the ISideWith™ algorithm generates the candidate whom they most closely align. ISideWith™ breaks down each issue into categories and questions, and O’Toole said she has students do “deep dives” into specific issues. For example, if someone is passionate about gun control, you can pinpoint that issue within ISideWith™ and answer an additional 20 questions about that issue.
It’s a great way to say generally, “I think I could align with this person but specifically this person thinks a lot like I do” and that’s important to me. So, it’s a great tool, I think, to force students to think about how they stand on the issues.

When students have finished completing a given quiz, ISideWith™ generates a percentage for each candidate with whom they agree and align with that percentage of the time to help students make informed decisions. While O’Toole does not have students tell which specific candidate they aligned with, she asks them to tell her if they were surprised and whether or not they will be voting for that person. O’Toole said she assigns this as an out-of-class activity because students are generally quite surprised with what candidate rises to the top. She often gets student feedback such as, “That’s not the one I wanted!” She replies by saying, “Do you want a candidate or do you want somebody who actually reflects your viewpoint?”

O’Toole said she sees the value in using ISideWith™ for instructors teaching any courses related to political science because she feels it gives her students a safe place to consider how they feel about certain issues and to get a clearer picture of what political candidates have actually said about every issue. If a candidate has not addressed one of the issues discussed, O’Toole sees that as something students should be aware of. Her goal is to get students to care and vote about their principles. It gets her students to consider things they may have never thought of.

Even though she uses Twitter™ for other purposes and discussions in her class, O’Toole said she does not necessarily view it as the safest place to do political research and sees ISideWith™ as a safer, more reliable resource for specific candidate alignment.
Another application used to get students invested in working through course content is the video editing application, iMovie™.

**Video Editing for Content Creation and Digital Storytelling**

Professors Nancy Sutton, Beth O’Toole, Romy Klessen, and Brian Anderson use video editing applications such as iMovie™ and Adobe Premiere Rush™ in their undergraduate courses to tell digital stories.

**iMovie™**

iMovie™ is a video editing application that allows users to put multiple video clips together into one cohesive digital story. The user records or imports multiple videos into the application and makes whatever edits are necessary, and then exports and saves the video for various platforms (see *Figure 17* for description of iMovie™ applications).

**Figure 17**

*Edit and share videos using Apple Inc. mobile devices and desktops*

http://apple.com/imovie

**iMovie™**

iMovie™ is a free consumer-grade application that allows users to edit videos. Editing capabilities include adding titles, audio/music, and various effects such as green screening. iMovie™ now supports up to 4K quality footage. iMovie™ works seamlessly between mobile and desktop apps—allowing users to begin projects on one device and send projects to another device for further editing. Finished videos can be exported to local device storage or can instantly be published to social media sites including YouTube™ and Instagram™.
Professor Nancy Sutton uses iMovie™ to teach digital storytelling techniques in her online Media and Visual Arts classes at the University of Sioux Falls. Sutton said she is always looking for resources for her online students to be able to edit videos.

To teach online with video was probably the hardest thing that I have ever done; knowing that I’m not sitting there with them week after week [and] knowing that they’re not going to understand how difficult video is going to be.

Creating and editing quality projects can be frustrating for her students so finding alternative options like iMovie™ using mobile devices has proven to be successful. In the beginning, Sutton attempted to get all of her online students into chat rooms at the same time in order to lecture and demonstrate iMovie™ techniques, but she said that defeated the purpose of an online class where everyone had different schedules. It also did not work for her when she attempted to create forum posts for questions on a learning management system.

Instead, she has since created online video projects where she gives step-by-step instructions with all technical information about how to edit their video projects using mobile devices. Sutton has her students identify the mobile device they are able to use for a given course and she provides them with options for completing video projects using that device. Typically, those options include iMovie™, Adobe Clip™ (no longer available for download and updated to Adobe Premiere Rush), or Camtasia™. A majority of her students regularly have access to iMovie™ on their own iPads, smart phones and laptops so that has become her initial teaching tool for video.

Sutton said she has found, throughout her years of teaching video editing, that when it comes to online video students, iMovie™ functions much better for those
students on iPads rather than laptops. But in addition to simply learning to use iMovie™ for class projects, Sutton said the experience of teaching yourself how to find a way to do the work no matter what device or software or application you have, is an extremely relevant skill for video students who will soon become media professionals.

An example of how Sutton has her students use iMovie™ for class is through 45-second video assignments. Sutton described it as a “learn quick” project. Students are tasked with recording 45-second videos using the built-in camera on whatever mobile device they are using. She gives them a prompt of some sort for what to discuss on camera so they are recording both video and audio of themselves for 45 seconds. Students then import that video footage into iMovie and edit their voice audio to remove unnecessary sounds and fade the beginning and end.

They are also asked to import photos relevant to the topic and show those as the video progresses. Sutton stated these projects can be recorded, edited, and finalized within about an hour and a half. She said for students who have never edited video with any kind of software, this project maintains student interest. One of the most difficult challenges becomes, “Where did the video export to within your device once it is saved?” Sutton sees this as another teaching moment for students to be able to navigate through file management structures within various devices. She said it is different for each device and software, so always being willing to search and challenge yourself to transfer skills you have learned from one device to another is extremely beneficial. In the end of the video project, Sutton has her students upload their final videos directly to YouTube™ for class premieres and critiques.
Professor Beth O’Toole teaches using iMovie™ in her Crime in Film class at the University of Sioux Falls. For her students’ final project, she has students produce their own movie trailer after watching numerous crime films. More specifically, the students watch films related to serial killers and are then tasked with taking these concepts and stories and turning them into movie trailers. Students write scripts, record video using mobile devices, and use iMovie™ to edit the footage together. O’Toole said iMovie™ gives all students the possibility to create their own movies.

Because O’Toole is not directly teaching students how to edit video, she said she sees iMovie as an easy-to-learn tool for students.

iMovie™ gives everybody the possibility of becoming a director and so there are varying qualities. And the goal isn’t to necessarily have the most professionally produced iMovie™ at the end. I’m looking for the concepts that they took from the course but the students get so into it. There’s about a one-week period on our campus where there are a lot of ‘murders’ occurring. There are ‘serial killers’ everywhere because they’re all out filming with their little iMovie™ apps.

O’Toole said students are producing what they consider to be Oscar-worthy movie trailers and in the end, they are able to use the iMovie™ app to successfully produce the class project. Alongside their own student-produced movie trailers, the students watch trailers from Oscar-winning movies within that genre such as films by the Coen Brothers. O’Toole said this project helps to facilitate healthy discussion surrounding class systems in America and how accurately the public view is surrounding the criminal justice system and that portrayal in film.
Professor Romy Klessen has her students at Southeast Technical Institute produce videos with cameras, video equipment and applications such as iMovie™, even though she said video production is not her content area. Rather than create personal content such as “selfies,” Klessen said she has students producing short videos of themselves and classmates explaining things regarding coursework. Klessen assigns students to record videos of themselves explaining what they did on a specific assignment and how they did what they did. They are assigned to use their own mobile devices and software to record and edit these videos as necessary.

Klessen said such videos can be transferred electronically to an iPad, and the iPad can be passed around an entire class of students for them to watch in order to show what other students are working on and to compare positives and negatives regarding specific assignments and content. Klessen said she views this as an engagement activity for students. As Sutton mentioned above, another video editing option using mobile devices is Adobe Premiere Rush™.

Adobe Premiere Rush™

Broadcasting Instructor Brian Anderson uses Adobe Premiere Rush™ with his Applied Television students at Northeast Community College to have his students record video news projects. Adobe Premiere Rush™ is a mobile or desktop-based application for editing video on various platforms (see Figure 18 for description of Adobe Premiere Rush™ applications).
Adobe Premiere Rush™: Part of the Adobe Creative Cloud set of mobile applications, Adobe Premiere Rush™ allows users to edit videos on iPhone, iPad, Android, and desktop platforms. The free starter plan allows users to edit and export up to 3 videos, whereas the $9.99/month or $119.88/year paid option allows for unlimited exports. Users can add text and graphics, and make adjustments to color and audio. Videos and projects automatically sync with cloud storage so projects can be accessed from anywhere.

Anderson said he introduces Adobe Premiere Rush™ to his Applied Television students because they have more advanced video training and are already familiar with the professional-grade, desktop-based Adobe Premiere Pro™ video editing software. He said the Adobe Premiere Rush™ application is very similar. Because these students are already familiar with working with video cameras and editing video, he said he started looking for ways to get his students to think about non-traditional methods for capturing and editing footage.

When introducing students to Adobe Premiere Rush™, Anderson said he has students download the application to their own smartphones. Once they open the application, they instantly realize it looks very familiar to the software they are already used to. However, he said he still explains each capability of the interface and tools, so they fully understand how to edit using the application before beginning a project.
Anderson’s students then begin to practice by recording three or four different videos of a given subject on their smartphone and importing them into Adobe Premiere Rush™. They edit those videos together in the timeline of the application and export them as one cohesive video file. Videos can be exported directly to social media platforms such as Facebook™, YouTube™, or email. Anderson said he continues to have students use Adobe Premiere Rush™ routinely throughout the semester for other projects to show them that the skills they learned regarding how to record and edit video translates easily to other equipment and platforms using mobile technology.

They specifically have to use [Adobe Premiere Rush™] in order to cover stories so they can experience top-to-bottom, you know, from doing an interview with somebody, to getting b-roll, to recording their narration, to putting it all together. We use that a couple of different times over the course of the year.

Anderson said even though his students have access to professional-grade video production facilities, they are still able to use their own smartphones to complete projects because they offer both convenience and high-quality video. Once his students understand the basics of recording and editing videos for class, advanced students begin to add music and graphics to their projects in Adobe Premiere Rush™. Another application used to help students master industry-standard course content is Code Combat™.

Using Web-Based Tools for Quick Learning Activities

Professor Jason Whiting uses Code Combat™ in his Technology in Education courses at the Augustana University to help his students learn programming through
coding games and assignments. He also uses Flipgrid™ as a digital video forum to facilitate class discussion.

**Code Combat™**

Code Combat™ is a website where students learn computer science and coding languages through entertaining games (see Figure 19 for description of Code Combat™ applications).

**Figure 19**

*Learn How to Code Through Project-Based Game Development*

![Code Combat](http://codecombat.com)

**Code Combat™**: Code Combat™ is a game-based educational tool for teaching students software programming languages such as JavaScript, Python, and HTML. With built-in computer science, web development, and game development curriculum, Code Combat™ promotes problem-solving and creativity as students type code and see characters within the game react in real time. The Introduction to Computer Science course is free to students and teachers, while advanced courses and resources require paid subscriptions. Paid subscriptions are customized on an individual basis with schools and districts based on classes and needs.

Professor Whiting has his students work on laptops or Chromebooks in order to complete Code Combat™ assignments. Whiting’s education students include future K-12 teachers going into a variety of content areas including physical education, early childhood development, English, and art. The reason he chooses to incorporate Code Combat™ into lessons for these students is because he believes aside from simply
teaching coding languages such as HTML, JavaScript, and Python, students also learn valuable critical thinking and problem-solving skills.

Whiting’s students create a free Code Combat™ account and complete the free Introduction to Computer Science activity. As his students collaborate with one another through these activities, they set up chat rooms and help one another solve problems within various levels of Code Combat™. Whiting said such collaborative work opens up entirely new possibilities for classrooms.

Code Combat™ is a great site because that’s game based so people who are scared of the word coding, are scared of the word programming, can have zero experience whatsoever and be able to use that site. And then they can go back and use it with their students.

Code Combat™ is a launch pad for Whiting’s students to be able to learn basic web coding languages in general and then take that knowledge to create their own content using other simple free platforms in the programming world. Another example of professors leveraging mobile applications to help students produce content is with Rev Call Recorder™.

**Rev Call Recorder™**

Lecturer Janet Davison uses Rev Call Recorder™ with her Audio Production students at the University of South Dakota to have her students record remote audio-based discussions and interviews from off-campus. Rev Call Recorder™ is a call recording application for iPhone devices (see Figure 20 for description of Rev Call Recorder™ applications).
Rev Call Recorder™: Part of the Rev brand set of mobile applications, Rev Call Recorder™ allows users to record both outgoing and incoming calls on their smartphone. This simple, user-friendly app is free for all call recordings and includes human transcription options for $1.25 per minute. Recordings are stored within the app and can easily be shared directly to email, Dropbox, and other platforms.

Professor Davison described Rev Call Recorder™ as a free application designed to assist users with recording phone conversations on iPhone devices. She said there are multiple applications that have similar capabilities, but that her main criterion was that the app was free. Davison began looking for an application with such capabilities due to Covid-19 social distancing and quarantine restrictions during the Spring 2020 school term. She needed a way for her radio students to continue producing their shows for KAOR-FM student radio for the University of South Dakota.

When introducing Rev Call Recorder™ to her students, Davison said she did not initially have to teach students how to use the application. She described the Rev Call Recorder™ interface as intuitive and lacking unnecessary “bells and whistles.” She simply sent out an email explaining what the application was, why and how they should use it, and that it would facilitate the recording of a discussion among multiple people via
mobile devices. She explained that the application would allow her students to record their phone conversations with multiple hosts and then these recordings could be used in the campus radio station instead of live, in-person discussions.

Her students then downloaded the application to their smartphones. Many of them were previously familiar with using built-in voice memo capabilities on their phone to create their own audio recordings but that did not include the capability to record calls with other people. When Davison’s students begin working with Rev Call Recorder™, they are instructed to plan and record a conversation.

In the application, students begin by choosing a name for the conversation they are about to record and then make their call directly through the app. All calls initiated in the app are then saved within the app. Once the call is complete, students can export the audio file to multiple platforms including email, cloud services, or simply downloaded directly to your mobile device.

Davison said her students are primarily using Rev Call Recorder™ as a way to solve a technical challenge pedagogically. Students record and produce recordings in lieu of their weekly, in-person radio shows due to Covid-19 social distancing guidelines and her school’s transition to online learning for the Spring 2020 semester. Students are routinely recording phone conversations among three students on average and then Davison instructs them to download the recorded audio file to their home computers. Students then conduct further editing in audio software such as Adobe Audition™. Once the audio file is ready for submission, students email the audio file to the web staff member for KAOR student radio at the University of South Dakota. This person then uploads the file to the radio station web page for listeners to play.
Davison said Rev Call Recorder™ fulfilled a need for her students to be able to continue their learning and production in times of quarantine due to Covid-19.

I was trying to figure out how to make it possible for [students] to continue. We can’t let them into the studio and the production units because the campus is shut down, so how do I make it possible for them to have some semblance of normalcy here and record their shows so that the two or three hosts are actually interacting the way they might be if they were on the air?

Davison continued to say that beyond the Covid-19 online learning situation her students can also use Rev Call Recorder™ to conduct interviews in other broadcasting or multi-platform writing courses. She said the audio quality from mobile devices is high enough for classroom use and for posting on various online school platforms. Advanced uses for Rev Call Recorder™ in Davison’s classes include producing remote news spot pieces where students record audio interviews regarding a specific news story and then edit the interviews together with other audio files to be incorporated into a multi-platform or broadcast news format. She says her ultimate goal is for students to see the use of tools such as Rev Call Recorder™ as second nature and harness the capabilities of smart phone audio. Facebook Live™ is another technology that helps students produce multimedia content from anywhere.

**Facebook Live™**

Broadcasting Instructor Brian Anderson uses Facebook Live™ with his broadcasting students at Northeast Community College to have his students livestream campus events and shows. Facebook Live™ is a way for Facebook™ social media users
to broadcast video live from their mobile devices to other users. (see Figure 21 for description of Facebook Live™ applications).

**Figure 21**

*Broadcast live audio and video from anywhere using Facebook Live™*


**Facebook Live™:** Facebook Live™ is a resource within the Facebook™ social media platform and is available on Apple, Android, and web platforms. Facebook Live™ allows users the ability to livestream video directly to their Facebook™ page, group, event and/or news feed. Facebook™ users need a digital video camera or webcam and microphone, or may use built-in audio/video capabilities on Apple or Android mobile devices. A Facebook Live™ stream can be previously scheduled or spontaneous. Viewer comments may be moderated or public.

Anderson said his students are required to use the Facebook™ social media platform as a student media organization to maintain contact with viewers and listeners. These traditional uses include posting photos, articles, and news stories. He said he also has started requiring his students to use Facebook Live™ technology for covering campus events, shows, and to conduct radio shows.

When his institution instituted social-distancing guidelines due to Covid-19 during the Spring 2020 semester, Anderson said he needed to find a way to allow students to maintain production of some of their shows. He found Facebook Live™ to be the simplest method to continue these student broadcasts. These shows would have
typically been produced and broadcast from the campus of Northeast Community College.

Anderson said Facebook Live™ is very easy to implement into his classes because students are already familiar with how the Facebook™ platform works. He said he gives his students a little guidance the first time they try a Facebook Live™ broadcast because they need to understand where the video input comes from. For example, if students are going to broadcast from a desktop computer, they will need to either plug in a webcam or use the built-in camera if available. Conversely, if students are using a smartphone or tablet, they will be able to use the built-in camera on that device as the video input.

Anderson discussed how to walk students through broadcasting through Facebook Live™. First, students log into their own Facebook™ account or perhaps that of a different organization. Next, they navigate to the area where they would normally write something to post. Just above that area students are instructed to click on the button that says “Live.” Facebook™ connects to the designated camera and students are prompted to give the broadcast a name and description. Then they click on the button that says “Go Live” to begin broadcasting to their followers.

Anderson said the only way for students to practice using Facebook Live™ is to actually go live. He said he gives his students administrative rights to a department page such as the campus radio station and they can practice by doing a simple radio newscast. He said, “[It] doesn’t have to be a long one to three-hour show. It can be something short. They would do it just to get into the habit and understand how it works.” One of the
benefits of Facebook Live™ is the ability for students to use the technology from wherever they are.

He said he also watches all live broadcasts and makes sure students notify him prior to using Facebook Live™ due to potential privacy concerns.

Whether I’m in the other room or I’m in the same room with them, if they tell me they’re gonna go to the other side of campus because there’s a big event going on and they’re gonna do a [Facebook Live™] from there, I say, “Go do it.” But then I’m also gonna pull up Facebook™ and I’m gonna watch them do the [Facebook Live™] just to double check the content that’s coming out.

Anderson said social-distancing restrictions due to Covid-19 prompted him to think of innovative ways to use technology such as Facebook Live™ for continuing student projects when teaching online. He said his students were feeling unsure about how they were going to continue their schoolwork because their projects seemingly required school-owned broadcasting equipment. This prompted him to think that his radio students could broadcast their radio shows on Facebook Live™.

Anderson said he implemented a way for students to broadcast on Facebook Live™ and he would act as board operator for them in the studio. He used laptops in the studio on the campus of Northeast Community College and connected their stream into a channel on the audio board. Students were still able to perform their discussions from their individual locations and Anderson took the audio output and broadcast it live on their radio station. He was even able to take commercial breaks for them from the studio. He said, “It’s a pretty unique situation that we really haven’t used before but it was an outside-of-the-box way of getting radio programs on the air.” He said he envisions being
able to keep utilizing this technology when traditional instruction resumes after Covid-19 restrictions are lifted.

**Summary**

In both areas discussed, knowledge acquisition in interdisciplinary fields and preparing students for professional roles in advanced fields, somehow higher education instructors have to get their students familiar with the mobile technology applications themselves and then they transition to getting students to a certain level with course content to accomplish learning goals. Most professors introduced the application through demonstration and practice and eventually moved on to show more routine and advanced uses.

At first glance, the use of each mobile technology looked like a way to digitally manage classroom tasks which were typically accomplished using traditional methods. However, a deeper look showed the level of critical thinking and analysis gained by students through the use of mobile apps. In some cases, this was done by taking a traditional method and introducing a mobile application as an alternative with more capabilities. For example, Professor Ilah Raleigh used Pro Metronome™ as the digital equivalent of a traditional mechanical metronome because of the additional capabilities, such as added visuals for different types of learners. Raleigh helped ensure her students were able to master course objectives and offered additional methods for alternative learners.

In other cases, professors used mobile applications as a way to maintain student engagement. For example, Professor Beth O’Toole used iSideWith™ to keep students
engaged and take sides related to various issues. This allowed her students to achieve higher levels of critical thinking to consider the multiple perspectives.

Some professors applications introduced applications as a way to accomplish course goals from alternative locations. For example, Professor Brian Anderson used Facebook Live™ with his students as a way to continue radio station work when COVID-19 social distancing regulations were in place by allowing students to broadcast from their homes. Professor Janet Davison introduced her students to Rev Call Recorder™ to help them continue similar audio work from home. While some of these examples were once considered to be innovative, they are now becoming routine in many higher education classes.

Furthermore, no matter the purpose of adding these mobile technologies to their classrooms, all higher education instructors interviewed got their students to higher levels in terms of course content by incorporating these examples of mobile device use than they would have using traditional methods. Professors and students became familiar with the technology and then many times through project-based learning and a shift in pedagogy, these professors immersed students into mobile applications to help them to learn and achieve course goals and content in unique and innovative ways.

In conclusion, the themes emerging from data analysis suggest these higher education instructors leveraged mobile technology to enrich student learning. In the next chapter I analyze the data using three learning theories—Vygotsky’s (1978) theory of social constructivism, Mishra and Koehler’s (2006) Technological Pedagogical Content Knowledge, and the universal design for learning (Meyer et al., 2014). I apply these theories to the examples described by higher education instructors.
CHAPTER FIVE: MOBILE APPLICATIONS, PHILOSOPHY AND PEDAGOGY

My research question involved how pioneering higher education professors in a variety of fields use mobile devices to engage students in seamless learning in and outside of the classroom. I interviewed 14 higher education professors to identify innovative and effective uses of mobile applications to facilitate student learning. In this chapter, I analyze the selection and use of mobile applications using Vygotsky’s (1978) theory of social constructivism as well as two frameworks widely adopted in the field of education: technological pedagogical content knowledge (TPACK; Mishra & Koehler, 2006) and universal design for learning (UDL; Meyer et al., 2014). I adopted Vygotsky’s theory of social constructivism, including the focus on the zone of proximal development, as well as the importance of student engagement and collaboration with others. Vygotsky believed collaboration with others allowed students to reach a higher level of content difficulty (Powell & Kalina, 2009). Vygotsky’s theory of social constructivism applies due to the collaborative nature of mobile technologies in classroom settings.

Technological pedagogical content knowledge breaks down the process of curriculum planning and delivery by identifying the uses, stages, and integration of technology for learning (Mishra & Koehler, 2006). In relation to my study, TPACK addresses how and why higher education instructors integrate mobile technology to enhance their classrooms. Misha and Koehler (2006) described TPACK as a “framework [that] allows us to make sense of the complex web of relationships that exist when teachers attempt to apply technology to the teaching of subject matter” (p. 1044).
Finally, I adopted UDL to analyze the types of pedagogical goals and purposes achieved with the selection and use of mobile apps. The pedagogical uses include: (1) engagement, (2) representation, and (3) action and expression (Meyer et al., 2014). All three areas of emphasis help students learn. I analyze the mobile apps to illustrate UDL may be achieved with the effective and strategic use of mobile applications to enhance student learning.

**Theory of Social Constructivism**

I begin with Vygotsky’s educational theory to show how this learning theory accounts for the success and use of mobile applications by higher education professors (see Table 3).
Table 3
Vygotsky’s Theory of Learning and Mobile Apps

<table>
<thead>
<tr>
<th>Vygotsky’s Theory of Learning</th>
<th>Social Learning Facilitates Cognitive Development</th>
<th>Zone of Proximal Development</th>
<th>Student Engagement</th>
<th>Teacher &amp; Student Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goose Chase™</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>A Scavenger Hunt with Destinations Tasks, and Goals</td>
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<tr>
<td>Adobe Spark™</td>
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<tr>
<td>Create graphics and videos to tell visual stories</td>
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<tr>
<td>Code Combat™</td>
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<td>X</td>
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<tr>
<td>Learn how to code through project-based game development</td>
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<td>Flipgrid™</td>
<td>X</td>
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<tr>
<td>Record and share quick videos for video-based discussions</td>
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<tr>
<td>Google Docs™</td>
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<tr>
<td>Create, edit, and collaborate on documents</td>
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<tr>
<td>Nearpod™</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Create collaborative learning activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rev Call Recorder™</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Record and transcribe iPhone calls</td>
<td></td>
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</tbody>
</table>

Professors interviewed used a combination of educational philosophies, however a strong contender for analysis involves Vygotsky’s view of social constructivism. This included four primary principles: (1) the most effective learning occurs when students
learn together—the social interactions facilitates cognitive development; (2) the zone of proximal development refers to any goal or task which is challenging and achievable with support the “more knowledgeable other;” (3) eliciting student interest and engagement makes learning possible; and (4) the traditional role of “teacher” changes—the actions between student and teacher involves collaboration, not teacher-dominated presentations and talk (Vygotsky, 1978).

Professors using mobile applications described how their learning environment changed with the use of mobile applications. Students learned together. For example, Professor Dr. Arlys Peterson used Goose Chase™ to facilitate teamwork and introduce new ideas by engaging them in a scavenger hunt. Students used their mobile devices of choice to complete Goose Chase™ missions that focused on their individual content areas. For example, students used mobile devices to take photos and conduct interviews at the University of Sioux Falls library regarding the Civil War. Students also learned together using Code Combat™ with Professor Jason Whiting. Whiting used Code Combat™ to teach students critical thinking and problem-solving skills. Students set up chat rooms to help one another solve game-based problems within different levels of Code Combat™.

Professors also described how they used mobile applications to challenge and support students in achieving deeper levels of learning. Vygotsky’s (1978) Zone of Proximal Development in this case does not pertain to a teacher or peer, but rather to mobile technology. For example, Professor Rick Warkenthien introduced his students to Adobe Spark™ so they could present videos without “getting hung up on the interface of the tool.” Adobe Spark™ helped students to produce multimedia content without having
to focus on much of the back-end process and therefore achieving a higher achievement level.

Professor Jason Whiting used Flipgrid™ as a digital video forum to facilitate class discussion. Both Whiting and his students leveraged Flipgrid™ to facilitate online class discussions that would normally have been written responses. Flipgrid™ supported students and faculty to achieve virtual face-to-face interactions and therefore added more depth to their responses.

Professors also described how mobile applications help increase student interest and foster student engagement with course content. Professor Rick Warkenthien uses Adobe Spark™ to have students gather images, text, audio, and video clips to put together professional presentations. By creating their own interactive presentations and content, students are engaging and better understanding their own learning process.

Professor Gail Weinhold introduced her students to Nearpod™ for showing them how to present content digitally and in unique, interactive ways. Course content that may have traditionally been presented using slideshows such as PowerPoint™ may be presented using polls, quizzes, games, and virtual reality using Nearpod™. Students engage with collaborative activities to respond, interact with, and achieve course content goals.

Professors described how the traditional role of the educator changed when incorporating mobile technology into their lessons. Students and their professors collaborated instead of engaging in teacher-dominated instruction. Professor Timothy Meyer used Google Docs™ to facilitate student discussion and inquiries. His students used Google Docs™ to ask anonymous questions throughout lessons to participate in an
ongoing discussion. Meyer and his students both interact on a Google Doc™ throughout the semester to write exam questions. Google Docs™ allowed Meyer and his students to collaborate with course content that may have been fully lecture-based in the past.

Professor Janet Davison used Rev Call Recorder™ with her students to record audio-based discussions and produce audio files to be played on the KAOR student radio website at the University of South Dakota. She collaborated with her students to use Rev Call Recorder™ to record and produce radio interviews remotely when social distancing guidelines were in place due to Covid-19.

Vygotsky’s (1978) theory of social constructivism helps explain how students are successful through introduction to mobile technology by their higher education professors. Professors discussed how mobile integration helped meet Vygotsky’s four primary principles—social learning facilitating cognitive development, the zone of proximal development, student engagement, and collaboration between teachers and students. Next, I discuss how technological pedagogical content knowledge (TPACK) addresses how and why higher education instructors integrate mobile technology to enhance their classrooms.

**Technological Pedagogical Content Knowledge: Upgrades to Learning and Teaching**

Mishra and Koehler (2006) developed TPACK as a way to explain how instructors effectively integrate technology into their classrooms. They break down the process into three primary forms of knowledge (see Figure 22)—content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK).
“Though separating the three concepts and their relationships may be difficult in practice, the [TPACK] approach helps us identify important components of teacher knowledge that are relevant to the thoughtful integration of technology in education.”
Mishra and Koehler (2006) also focused on where these three primary forms of knowledge intersect including pedagogical content knowledge (PCK), technological content knowledge (TCK), and technological pedagogical knowledge (TPK). Where TPACK culminates, the center of Figure 22 where all three circles intersect, is when considering more strategically how instructors teach their students a subject, teach effectively, and incorporate technology. Similar to Vygotsky’s (1978) Zone of Proximal Development, the TPACK framework identifies how instructors teach effectively with the support of technology; “the more knowledgeable other.” Multiple professors described such use of TPACK principles through selection, introduction, practice, and leveraging of mobile applications toward increasingly challenging work.

Higher education instructor Brian Anderson described his use of the DJI GO 4™ application to have his students control and manage drone flights. He introduced his students to the application by describing the interface and through hands-on demonstrations. His students practiced by using built-in simulators and indoor drone flights in order to meet industry-standard requirements. Anderson also described advanced uses such as news-based and portfolio-focused videos where students applied each form of knowledge.

Professor Arlys Peterson introduced her students to Kahoot™ to reinforce course content through interactive learning activities. She introduced her students to the application as an emerging technology involving content-based quizzes and games. Her students practice and demonstrate using Kahoot™ by creating their own Kahoot™ quizzes. She described advanced uses such as students contributing to the same Kahoot™
quiz in front of the class where they are using technology to master content and collaborating in order to learn more effectively.

Professor Ilah Raleigh described her use of the Pro Metronome™ application to assist students with practicing various time signatures. She introduced her students to Pro Metronome™ as they were learning the basics of music theory. Her students practiced by choosing time signatures and using the application to increase or decrease the amount of beats per minute. She said this process allowed students to understand further how tempos and downbeats work. She described how adding the Pro Metronome™ application enhanced how students engaged with course content in her music classes.

Higher education instructor Rick Warkenthien introduced his students to Adobe Capture™ to help them create unique designs based on things they see in their everyday lives. For example, his students could take photos of typography and fonts using their smartphones and Adobe Capture™ to help identify fonts to be used in other projects. He said the application helped his students to create assets for future multimedia projects. With Adobe Capture™, Warkenthien’s students are creating their own products and incorporating their own designs into real-world work for professional clients.

Professors Anderson, Peterson, Raleigh, and Warkenthien each described how they selected, introduced, practiced, and eventually leveraged these applications for increasingly more challenging work. In each example, and similar to Vygotsky’s (1978) Zone of Proximal Development, these higher education instructors used the TPACK framework to teach their own subjects effectively with the support of technology. Next I discuss how the universal design for learning (UDL) addresses how to analyze the types
of pedagogical goals and purposes achieved with the selection and use of mobile apps in higher education classrooms.

**Universal Design for Learning: A Planning Framework**

The Universal Design for Learning (UDL) includes three primary learning guidelines: (1) providing multiple means of engagement, (2) providing multiple means of representation, and (3) providing multiple means of action and expression (Meyer et al., 2014). These three guidelines help students learn course content.

The digital environment, with its connectivity, multimedia, just-in-time communications, distributed authoring, wisdom of the crowd, and many other qualities, has opened the door to a broad palette of communication skills and options, most critically perhaps, the opportunity for learners to act on materials—to understand them by changing them and making them their own. (Meyer et al., 2014, p. 50)

I describe how professors used the mobile applications to illustrate enhanced student learning through the implementation of UDL guidelines to create learners who are purposeful and motivated, resourceful and knowledgeable, and strategic and goal-directed (see Appendix E, Table E1).

Professor Beth O’Toole used ISideWith™ to help her students synthesize viewpoints regarding topics such as politics and government. Students began to engage by responding to quiz questions and inputting their own viewpoints. Next, they were asked a variety of questions in multiple different ways in order to offer flexibility related to how they connect with concepts. O’Toole’s students accessed existing knowledge and viewpoints in order to complete various quiz questions. Finally, through the use of
ISideWith™, students were able to synthesize, articulate, and express their own viewpoints related to course content.

Professor Arlys Peterson used Goose Chase™ to teach her education students how to help their own future students how to learn content in innovative ways. Peterson’s students used their own mobile devices to complete Goose Chase™ game-based missions related to their content areas. Her students learned by collaborating through gamification. Peterson introduced her students to content knowledge and skills using multimedia resources within Goose Chase™. The various quiz questions assisted with breaking down course concepts to make them more accessible to her students. Eventually, Peterson’s students created their own Goose Chase™ activities in order to challenge other students.

Professor Jason Whiting used Code Combat™ to help his students learn programming coding skills such as HTML, JavaScript, and Python through project-based game development. Whiting’s students collaborated with one another to solve problems within different levels of Code Combat™. His students were introduced to various levels of content knowledge using the multimedia resources within the application. Finally, Whiting’s students used tools within the application to create their own content using other platforms in the programming world.

Professors Nancy Sutton, Beth O’Toole, and Romy Klessen used video editing applications such as iMovie™ to help their students edit and share videos. They described how they used iMovie™ to help their students make creative choices while learning digital storytelling techniques. Their students were introduced to content-area knowledge and skills using multimedia resources within the application. With iMovie™,
their students had options when combining audio, video, and graphics to complete assignments. They expressed their learning in flexible ways.

Professors O’Toole, Peterson, Whiting, Sutton, and Klessen each described how they leveraged these applications to promote student engagement, comprehension, and expression. With each example, these higher education instructors used the UDL guidelines to ensure their students had access to relevant, challenging learning opportunities.
CHAPTER SIX: SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

In this chapter I provide a summary of the research, implications of the findings, and recommendations based on those findings.

Research Summary

This qualitative study explored how pioneering higher education instructors in a variety of fields use mobile devices to engage students in seamless learning in and outside of the classroom. The 14 higher education instructors interviewed identified innovative and effective uses of mobile applications to facilitate student learning. Examples were separated into two categories: (1) knowledge acquisition in interdisciplinary fields, and (2) preparing students for professional roles in advanced fields. Data and themes regarding the selection and use of mobile applications were analyzed and interpreted using Vygotsky’s (1978) theory of social constructivism and two frameworks widely adopted in the field of education: technological pedagogical content knowledge (TPACK; Mishra & Koehler, 2006) and universal design for learning (UDL; Meyer et al. 2014).

Professors interviewed in the category of Knowledge Acquisition in Interdisciplinary Fields gave examples of mobile technology related to real-time feedback, formative assessment, and continuous engagement. Examples primarily focused on acquiring knowledge of the disciplinary field and getting students to a higher level of knowledge in their discipline. Specific applications discussed in this category include Kahoot™, Poll Everywhere™, Flipgrid™, Google Docs™, Dropbox™, Turboscan™, and Pro Metronome™.
All professors interviewed in this category described how they use various mobile applications for knowledge acquisition and student engagement. All participants gave examples of specific uses in their classrooms. Rather than teaching these students how to use the mobile applications, they simply used the application for learning.

Professors interviewed in the category of preparing students for professional roles in advanced fields gave examples of mobile technology that focused on project-based learning and learning dispositions in a given field. These instructors focused heavily on teaching technical skills and industry-standard content production. Specific applications discussed in this category include Adobe Spark™, Adobe XD™, Adobe Capture™, DJI GO 4™, Goose Chase™, Kahoot™, Nearpod™, Twitter™, ISideWith™, iMovie™, Adobe Premiere Rush™, Code Combat™, Rev Call Recorder™, and Facebook Live™.

Professors interviewed in this category described using mobile technology to help students produce their own content. All participants explained specific uses of mobile applications in their classrooms. Students learned to use professional-level applications through practice, routine use, and eventually for advanced purposes such as content creation.

In both categories described in the findings, knowledge acquisition in interdisciplinary fields and preparing students for professional roles in advanced fields, higher education instructors introduced their students to mobile technology applications and transitioned toward accomplishing content-related learning goals with the applications. Many professors interviewed discussed the process of introduction, practice, routine use, and eventually advanced uses. Students gained critical thinking and analysis skills by using the mobile applications.
Some professors described this process through taking traditional education methods and using mobile applications as an alternative with more capabilities. Other professors used the mobile applications to maintain student engagement or accomplish content-specific course goals. However, all higher education instructors interviewed described how they got their students to higher levels of learning by using mobile technology than they would have using traditional methods. All instructors leveraged mobile technology to enhance student learning.

I applied three learning theories to analyze the data including Vygotsky’s (1978) theory of social constructivism, Mishra and Koehler’s (2006) Technological Pedagogical Content Knowledge (TPACK), and universal design for learning (UDL; Meyer et al. 2014). I began with Vygotsky’s (1978) theory of social constructivism and described how professors described their experiences in relation to his four primary principles: (1) social learning facilitates cognitive development, (2) zone of proximal development, (3) student engagement, and (4) teacher and student collaboration. Vygotsky’s (1978) theory helped to explain how students were successful through introduction to mobile technology.

Next, I analyzed how professors effectively integrated mobile technology into their classroom with Mishra and Koehler’s (2006) Technological Pedagogical Content Knowledge (TPACK). Similar to Vygotsky’s (1978) Zone of Proximal Development, the TPACK framework helped to identify how instructors teach effectively with the support of technology. Lastly, I described how professors used mobile applications to enhance student learning through the implementation of Universal Design for Learning (UDL; Meyer et al., 2014) guidelines. The three UDL primary learning guidelines include: (1) providing multiple means of engagement, (2) providing multiple means of representation,
and (3) providing multiple means of action and expression. I described specific ways professors used mobile applications to help their students become learners who are purposeful and motivated, resourceful and knowledgeable, and strategic and goal-directed. This research related to higher education instructors using mobile devices to engage students produced some implications.

**Implications, Recommendations, and Limitations**

The findings of this study have implications for higher education instructors using or looking to use mobile technology in their classrooms. It is not as simple as saying mobile technology is welcome in a higher education course. First, higher education instructors should learn from how the professors selected mobile applications for learning and how they leveraged the applications to increase student skills. Higher education instructors should develop new strategies to enhance use of mobile technology applications through their own instruction.

Second, these instructors should learn the value of interdisciplinary and innovative general-use applications to foster collaboration and project-based learning. Professors focusing more on technical skills and professional roles should search out industry-standard applications in their field. General education instructors should find useful mobile applications to foster student engagement and gain real-time feedback.

Third, higher education instructors should realize they do not need to try to incorporate all mobile technology and applications into their classrooms, but rather choose the mobile technology relevant to their own content and leverage those for student learning.

Higher education institutions should introduce faculty development programs to address skills and information necessary to allow faculty to effectively use mobile
technology in their courses. Program options might include hands-on tutorials and project-based modeling. Institutional technology designers and implementation specialists should assist higher education instructors with syllabus development and assist with demonstrating digital literacy skills. Trainings should include hands-on mobile technology demonstrations with innovative and cutting-edge applications. Institutions will need to provide the necessary infrastructure to support the integration of mobile learning such as creating resources such as a center for mobile learning at their schools, modeled much like they currently have with institutional technology departments but with a clear focus on mobile technology.

Professors need support from their institutions in terms of technology, technical support, and consistent policies in order to successfully use mobile devices in their classrooms for learning. Professors engaged in preparing students for roles in professional fields need to use industry-standard mobile applications in their classrooms. Likewise, general education professors need to incorporate mobile applications to foster student engagement, receive real-time feedback, as well as teach students skills such as critical thinking. General education professors should also be thinking of ways to teach their students content using mobile technology as if those students were going to work in that field professionally. This means they should give emphasis to project-based approaches in their classroom while implementing industry-standard applications to increase student learning. Technology continues to change at a dramatic pace and higher education instructors need to make robust changes in order to stay up-to-date. Instructors and institutions need to be building a culture of innovation and creativity with regard to mobile technology, including more collaboration among faculty.
The limitations of this study are related to participant selection and content area. This study was limited to interviewing higher education instructors from around the Midwest United States; specifically, South Dakota, Nebraska, and Minnesota. The sample size was 14 participants, with nine women and five men participants. More instructor content areas were focused on professional preparation and fewer focused on general disciplinary content. However, the 14 interviews provided comprehensive, deep, and useful insights for higher education instructors.

Future research may investigate in different locations to provide a contrast to the experiences discussed. Ongoing studies are necessary in the future to understand how mobile technology use is impacting student learning as the technology continues to change. Recommendations for further research also include focusing on mobile technology use in higher education classrooms in different fields and in different institutions. Furthermore, future investigators should interview students regarding their perceptions to explore this topic through the lens of the student. These recommendations are intended to help future higher education instructors understand how to incorporate mobile device use into their classrooms for student learning.

**Final Thoughts**

This study provided specific examples from higher education instructors regarding how they incorporated mobile technology into their classrooms for student learning. I was introduced to many current professionals in the field who are using mobile technology in innovative ways. I am thankful they chose to participate in this study to discuss how they use mobile devices for learning and greatly respect them for being trailblazers in their fields. I encourage all current and future higher education
instructors to think creatively when it comes to incorporating mobile technology into their classrooms. The technology will continue to change but the basics of quality teaching will remain the same.
REFERENCES


Cassidy, E. D., Britsch, J., Griffin, G., Manolovitz, T., Shen, L., & Turney, L. (2011). Higher education and emerging technologies: Student usage, preferences, and


http://udlguidelines.cast.org


doi:10.3109/0142159X.2013.849800


APPENDIX A: CITI PROGRAM COURSE CERTIFICATE

This is to certify that:

**Nicolas Poppins**

Has completed the following CITI Program course:

- **Human Subjects Research (HSR)**
- **Human Subjects Research Training: Social-Behavioral-Educational Researchers**
- **1 - Basic Course**

Under requirements set by:

**University of St. Thomas - Minnesota**

Verify at [www.citiprogram.org/verify?w0f73243b-25c0-4e7f-8691-9241c4b1e5e9-28478061](http://www.citiprogram.org/verify?w0f73243b-25c0-4e7f-8691-9241c4b1e5e9-28478061)
APPENDIX B: RECRUITMENT EMAIL SCRIPT

Dear [name],

My name is Nick Poppens and I am a doctoral student at the University of St. Thomas in St. Paul, MN. I am conducting research for my dissertation and am writing to you because I would like to interview you in order to gather data for use in my study. The purpose of my study is to investigate how higher education instructors use mobile devices in their classrooms for learning in innovative ways. I have identified you as a potential candidate for this study based on your expertise and experience in this field.

The interview data will be audio-recorded using mobile devices and may be used in a short audio documentary or podcast as a way to audibly present my findings. My study is the next natural step in a wide-ranging group of previous studies regarding mobile technology and classrooms. You will not receive any form of payment for your participation in the interview. However, I will provide you with a copy of the completed written dissertation.

Please contact me by email at popp1980@stthomas.edu or by phone at 605.360.2560 and I would be happy to answer any questions.

Thank you,

Nick Poppens
APPENDIX C: SAMPLE INTERVIEW QUESTIONS

Interview Questions

For this study, mobile device will be defined as a laptop, tablet, or smartphone.

These are wireless mobile devices that are able to access the Internet.

Please state your full name and title.
Please list your institution, department in which you teach, and list courses taught.

1. Why and how did you get involved in using mobile technology for teaching and learning?
2. What do you do to find teaching ideas and stay up to date with emerging technology?
3. How do you view mobile devices in your classroom?
4. How do you design lessons or projects for college students that incorporate mobile devices?
5. How do you measure the success of your students’ work when using mobile devices in class?
6. What teaching changes do you make when attempting to incorporate mobile devices? How does student learning change?
7. What are some specific, innovative ways that you have used mobile devices in your classroom for learning?
   a. Do you have any examples of class projects involving mobile technology?
   b. How have students learned by using mobile devices in your classroom?
8. What have been your favorite teaching moments with regards to mobile devices and your students within your classroom?
9. If you were to offer advice to another higher education instructor looking to incorporate mobile device technology into their classrooms for learning, what would you tell him/her?
10. Do you have any supplemental materials (digital documents, screenshots, etc) related to any of our discussions?
Consent Form


You are invited to participate in a research study about how innovative higher education instructors use mobile devices for learning. You were selected as a possible participant because of your experience using mobile devices in innovative ways in higher education classrooms. You are eligible to participate in this study because you are also located at a Midwestern United States higher education institution. The following information is provided in order to help you make an informed decision whether or not you would like to participate. Please read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by primary investigator Nicolas Poppens and research advisor Dr. Sarah Noonan with the department of Educational Leadership at the University of St. Thomas, MN. This study was approved by the Institutional Review Board at the University of St. Thomas.

Background Information

The purpose of this study is to investigate how innovative professors and undergraduate college students use mobile devices in various disciplines for learning. I hope to feature the best and most innovative uses of technology in undergraduate education. I hope to add to current knowledge concerning mobile technology and higher education by studying the specific ways professors are using mobile devices in higher education classrooms.

Procedures

If you agree to participate in this study, I will ask you to do the following things:

- Participate in a one-on-one audio-recorded interview for up to 2 hours at your educational institution or location of your choice. There will be about 10 interview participants total
- Subsequent classroom observations and audio recordings may be necessary depending on the success of the initial interview
- Participants may be asked to provide documents and digital files related to interview discussions

Risks and Benefits of Being in the Study

The study has no known risks. There are no direct benefits for participating in this study.
Privacy and Confidentiality

Due to the nature of the study procedures, privacy cannot be guaranteed while you participate in this study.

**The records of this study will not be kept confidential. In any sort of report I publish, I may include information that will make it possible to identify you.** The types of records I will create include audio recordings, transcripts, master lists of information, and computer records. These records will be stored on a password-protected laptop and/or other password-protected mobile device and only the investigator and advisor listed above will have access. If collecting data while traveling, these items will remain in the possession of the investigator on password-protected devices. There is no intent to destroy these items in the future. All signed consent forms will be kept for a minimum of three years upon completion of the study. Institutional Review Board officials at the University of St. Thomas reserve the right to inspect all research records to ensure compliance.

Collected data containing personal identifiers include audio recordings of interviews, subsequent transcripts of the interviews, and an edited audio documentary to be included with the written dissertation. The initial audience will be a small group of University of St. Thomas faculty on the dissertation committee. Future audiences may include technology in education professors or a broader audience interested in educational technology incorporation. Such personal identifiers include name, current institution of employment, and courses taught.

We will keep information about you for future research about higher education and mobile devices. We will only use aggregate information and will not use any identifiers in future research. There is no limit to the length of time we will store de-identified information, but if you choose to withdraw from the study your information will not be stored for future use.

_______________________________________________________________
Signature of Study Participant for Consent to Use Identity in Research Findings

_______________________________________________________________
Signature of Study Participant for Consent to Use Audio Recording of Interview in Research Findings

Voluntary Nature of the Study

Your participation in this study is entirely voluntary. Your decision whether or not to participate will not affect your current or future relations with primary investigator Nicolas Poppens, research advisor Dr. Sarah Noonan, or with the University of St. Thomas, MN, or the University of Sioux Falls, SD. There are no penalties or consequences if you choose not to participate. If you decide to participate, you are free to withdraw at any time without penalty or loss of any benefits to which you are otherwise entitled. Should you decide to withdraw, data collected about you will not be used nor will it be stored for future use. You can withdraw by contacting Nicolas Poppens at 605-360-2560 or popp1980@stthomas.edu by the estimated dissertation completion date of April 2019. You are also free to skip any questions I may ask.
Contacts and Questions

My name is Nicolas Poppens. You may ask any questions you have now and any time during or after the research procedures. If you have questions later, you may contact me at 605-360-2560 or popp1980@stthomas.edu, or advisor Dr. Sarah Noonan at 651.962.4897 or sjnoonan@stthomas.edu. You may also contact the University of St. Thomas Institutional Review Board at 651-962-6035 or muen0526@stthomas.edu with any questions or concerns.

Statement of Consent

I have had a conversation with the researcher about this study and have read the above information. My questions have been answered to my satisfaction. I consent to participate in the study. I am at least 18 years of age. I give permission to be audio recorded during this study.

You will be given a copy of this form to keep for your records.

_______________________________________________________________   ________________
Signature of Study Participant      Date

_______________________________________________________________
Print Name of Study Participant

_______________________________________________________________   ________________
Signature of Researcher       Date
### Table E1

**Universal Design for Learning with Mobile Applications in Higher Education**

<table>
<thead>
<tr>
<th>Universal Design for Learning</th>
<th>Engagement</th>
<th>Representation</th>
<th>Action &amp; Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goose Chase™</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>A Scavenger Hunt with Destinations, Tasks, and Goals</td>
<td>Invites students to learn using gamification (8.2)</td>
<td>Introduces content knowledge and skills using multimedia resources (2.5)</td>
<td>Students perform a task correctly to earn points (5.1)</td>
</tr>
<tr>
<td></td>
<td>Encourages collaboration and teamwork (8.3)</td>
<td>Breaks down large concepts or processes in steps or stages to make them accessible (3.4)</td>
<td>Students create a Goose Chase™ to challenge other students (6.4)</td>
</tr>
<tr>
<td>Adobe Spark™</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Create graphics and videos to tell visual stories</td>
<td>Students choose their own designs and graphics (7.1)</td>
<td>Introduces content knowledge and skills using multimedia resources (2.5)</td>
<td>Students use Adobe Spark™ to tell digital stories (5.1)</td>
</tr>
<tr>
<td></td>
<td>Students use Adobe Spark™ to solve media-based projects in creative ways (7.2)</td>
<td>Students customize their own information formatting on Adobe Spark™ presentations (1.1)</td>
<td>Students have options when combining audio, video, and graphics (5.3)</td>
</tr>
<tr>
<td>Adobe XD™</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Create designs for web, mobile, and game platforms</td>
<td>Students choose their own designs and graphics (7.1)</td>
<td>Introduces content knowledge and skills using multimedia resources (2.5)</td>
<td>Students use Adobe XD™ to display digital information (5.1)</td>
</tr>
<tr>
<td></td>
<td>Students use Adobe XD™ to solve media-based projects in creative ways (7.2)</td>
<td>Students customize their own information formatting on Adobe XD™ designs (1.1)</td>
<td>Students have freedom to create unique designs (5.3)</td>
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<td>Application</td>
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<td>Adobe Capture™</td>
<td>Create vector designs from images using mobile devices</td>
<td>Students participate in the design process (7.1)</td>
<td>Introduces content knowledge and skills using multimedia resources (2.5)</td>
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<td></td>
</tr>
<tr>
<td>Kahoot™</td>
<td>Create interactive learning games and quizzes</td>
<td>Invites students to learn using gamification (8.2)</td>
<td>Introduces content knowledge and skills using multimedia resources (2.5)</td>
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<td>X</td>
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<tr>
<td>Twitter™</td>
<td>Social media platform allowing users to post, like, and retweet to become part of a global conversation</td>
<td>Encourages collaboration (8.3)</td>
<td>View trending topics and hashtags (1.1)</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>ISideWith™</td>
<td>A website to help determine political and social views through quizzes</td>
<td>Students offer personal responses, evaluate and self-reflect outcomes (7.2)</td>
<td>Students access existing knowledge and viewpoints to complete quizzes (3.2)</td>
</tr>
<tr>
<td>X</td>
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</tr>
</tbody>
</table>

Students choose their own designs and graphics (7.1)
Convert images from one format to another (1.3)
Breaks down large concepts or processes in steps or stages to make them accessible (3.4)
Students access and contribute to the online Twitter™ community (8.3)
Students input information and ISideWith™ helps assess viewpoints (9.3)
Helps students process information (3.3)
Students organize multiple viewpoints into one cohesive understanding of issues (6.3)
<table>
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<th>Tool</th>
<th>X</th>
<th>X</th>
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</thead>
<tbody>
<tr>
<td><strong>Poll Everywhere™</strong></td>
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<tr>
<td>Web-based audience response for interacting with groups via mobile devices</td>
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<tr>
<td>Encourages collaboration (8.3)</td>
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<tr>
<td>Allows students to answer questions and give feedback anonymously (7.3)</td>
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<tr>
<td>Students respond to polls and information can instantly be accessed and displayed (2.5)</td>
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<tr>
<td>Students use interactive web tools to answer questions and give feedback (5.1)</td>
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<tr>
<td><strong>iMovie™</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Edit and share videos using Apple devices</td>
<td></td>
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<tr>
<td>Students make creative choices when editing video (7.1)</td>
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<tr>
<td>Introduces content knowledge and skills using multimedia resources (2.5)</td>
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<tr>
<td>Students use iMovie™ to tell digital stories (5.1)</td>
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<tr>
<td>Students have options when combining audio, video, and graphics (5.3)</td>
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<tr>
<td><strong>Code Combat™</strong></td>
<td>X</td>
<td>X</td>
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<tr>
<td>Learn how to code through project-based game development</td>
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<tr>
<td>Invites students to learn using gamification (8.2)</td>
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<tr>
<td>Encourages collaboration and Teamwork (8.3)</td>
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<tr>
<td>Introduces content knowledge and skills using multimedia resources (2.5)</td>
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<tr>
<td>Breaks down large concepts or processes in steps or stages to make them accessible (3.4)</td>
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<tr>
<td>Students use Code Combat™ web tools to learn how to create their own content (5.1)</td>
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<tr>
<td>Students collaborate to solve problems (6.4)</td>
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<tr>
<td><strong>Flipgrid™</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Record and share quick videos for video-based discussions</td>
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<tr>
<td>Encourages collaboration, discussion, and virtual peer interactions (8.3)</td>
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<tr>
<td>Students create an online community and contribute content (8.3)</td>
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<tr>
<td>Course concepts are discussed using multimedia resources (2.5)</td>
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<tr>
<td>Students use interactive web video tools for discussion and expression (5.1)</td>
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<tr>
<td>Application</td>
<td>Feature 1</td>
<td>Feature 2</td>
<td>Feature 3</td>
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<tr>
<td><strong>Google Docs™</strong></td>
<td>Create, edit, and collaborate on documents</td>
<td>Encourages collaboration and teamwork (8.3)</td>
<td>Course concepts are discussed using multimedia resources (2.5)</td>
</tr>
<tr>
<td></td>
<td>Students can create, edit, and collaborate on documents at any time and from anywhere (7.2)</td>
<td>Students respond to questions and information can instantly be accessed and displayed (2.5)</td>
<td>Students use interactive Google Docs™ to facilitate discussion and ask questions anonymously (5.1)</td>
</tr>
<tr>
<td><strong>Nearpod™</strong></td>
<td>Interactive lessons for students such as game-based quizzes and polls</td>
<td>Invites students to learn using gamification (8.2)</td>
<td>Introduces content knowledge and skills using multimedia resources (2.5)</td>
</tr>
<tr>
<td></td>
<td>Students respond to questions and information can instantly be accessed and displayed (2.5)</td>
<td>Breaks down large concepts or processes in steps or stages to make them accessible (3.4)</td>
<td>Students play Nearpod™ games and answer quiz questions correctly to earn points (5.1)</td>
</tr>
<tr>
<td><strong>Rev Call Recorder™</strong></td>
<td>Record and transcribe iPhone calls</td>
<td>Encourages collaboration and teamwork (8.3)</td>
<td>Introduces content knowledge and skills using multimedia resources (2.5)</td>
</tr>
<tr>
<td></td>
<td>Students use Rev Call Recorder™ to create audio recordings (5.2)</td>
<td></td>
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<tr>
<td><strong>Dropbox™</strong></td>
<td>Cloud-based storage and file sharing</td>
<td>Encourages collaboration and file sharing (8.3)</td>
<td>Class files are shared using multimedia resources (2.5)</td>
</tr>
<tr>
<td></td>
<td>Students use Dropbox™ on multiple devices to share media to various web platforms (5.1)</td>
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<tr>
<td><strong>TurboScan™</strong></td>
<td>Take photos of items such as documents or photos and convert them into PDF or JPEG format</td>
<td>Convert files to PDF without having to find a scanner (7.3)</td>
<td>Create digital copies of printed documents and information (1.3)</td>
</tr>
<tr>
<td></td>
<td>Students use TurboScan™ to convert photos to a PDF and JPEG format (5.1, 5.2)</td>
<td>Share class files using multimedia resources (2.5)</td>
<td></td>
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<tr>
<td>Tool</td>
<td>X</td>
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<tr>
<td>Pro Metronome™</td>
<td>Hear and see musical time signatures from mobile devices</td>
<td>Learn time signatures at your own pace; start slow and gradually increase speed (8.2)</td>
<td>Introduces content knowledge and skills using multimedia resources (2.5)</td>
</tr>
<tr>
<td>DJI GO 4™</td>
<td>Control drones and view live video footage on mobile devices</td>
<td>Students use DJI GO 4™ to participate in drone controls and experiment with capabilities (7.2)</td>
<td>Practice using flight simulator prior to taking flight with drones (7.3)</td>
</tr>
<tr>
<td>Adobe Premiere Rush™</td>
<td>Edit audio and video on mobile devices</td>
<td>Students make creative choices when editing video (7.1)</td>
<td>Introduces content knowledge and skills using multimedia resources (2.5)</td>
</tr>
<tr>
<td>Facebook Live™</td>
<td>Broadcast live audio and video to Facebook™ pages, groups and events.</td>
<td>Students choose to broadcast events from anywhere at anytime (7.1)</td>
<td>Introduces content knowledge and skills using multimedia resources (2.5)</td>
</tr>
</tbody>
</table>
APPENDIX F: REVISED CONSENT FORM

Consent Form


You are invited to participate in a research study about how innovative higher education instructors use mobile devices for learning. You were selected as a possible participant because of your experience using mobile devices in innovative ways in higher education classrooms. You are eligible to participate in this study because you are also located at a Midwestern United States higher education institution. The following information is provided in order to help you make an informed decision whether or not you would like to participate. Please read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by primary investigator Nicolas Poppens and research advisor Dr. Sarah Noonan with the department of Educational Leadership at the University of St. Thomas, MN. This study was approved by the Institutional Review Board at the University of St. Thomas.

Background Information

The purpose of this study is to investigate how innovative professors and undergraduate college students use mobile devices in various disciplines for learning. I hope to feature the best and most innovative uses of technology in undergraduate education. I hope to add to current knowledge concerning mobile technology and higher education by studying the specific ways professors are using mobile devices in higher education classrooms.

Procedures

If you agree to participate in this study, I will ask you to do the following things:

- Participate in a one-on-one audio-recorded interview for up to 2 hours via online video-conferencing such as WebEx or Zoom. There will be about 15 interview participants total
- Subsequent audio recordings may be necessary depending on the success of the initial interview
- Participants may be asked to provide documents and digital files related to interview discussions

Risks and Benefits of Being in the Study

The study has no known risks. There are no direct benefits for participating in this study.

Privacy and Confidentiality
Due to the nature of the study procedures, privacy cannot be guaranteed while you participate in this study.

The records of this study will not be kept confidential. In any sort of report I publish, I may include information that will make it possible to identify you. The types of records I will create include audio recordings, transcripts, master lists of information, and computer records. These records will be stored on a password-protected laptop and/or other password-protected mobile device and only the investigator and advisor listed above will have access. If collecting data while traveling, these items will remain in the possession of the investigator on password-protected devices. There is no intent to destroy these items in the future. All signed consent forms will be kept for a minimum of three years upon completion of the study. Institutional Review Board officials at the University of St. Thomas reserve the right to inspect all research records to ensure compliance.

Collected data containing personal identifiers include audio recordings of interviews, subsequent transcripts of the interviews, and an edited audio documentary to be included with the written dissertation. The initial audience will be a small group of University of St. Thomas faculty on the dissertation committee. Future audiences may include technology in education professors or a broader audience interested in educational technology incorporation. Such personal identifiers include name, current institution of employment, and courses taught.

We will keep information about you for future research about higher education and mobile devices. We will only use aggregate information and will not use any identifiers in future research. There is no limit to the length of time we will store de-identified information, but if you choose to withdraw from the study your information will not be stored for future use.

Signature of Study Participant for Consent to Use Identity in Research Findings

______________________________

Signature of Study Participant for Consent to Use Audio Recording of Interview in Research Findings

Voluntary Nature of the Study

Your participation in this study is entirely voluntary. Your decision whether or not to participate will not affect your current or future relations with primary investigator Nicolas Poppens, research advisor Dr. Sarah Noonan, or with the University of St. Thomas, MN, or the University of Sioux Falls, SD. There are no penalties or consequences if you choose not to participate. If you decide to participate, you are free to withdraw at any time without penalty or loss of any benefits to which you are otherwise entitled. Should you decide to withdraw, data collected about you will not be used nor will it be stored for future use. You can withdraw by contacting Nicolas Poppens at 605-360-2560 or popp1980@stthomas.edu by the estimated dissertation completion date of April 2019. You are also free to skip any questions I may ask.
Contacts and Questions

My name is Nicolas Poppens. You may ask any questions you have now and any time during or after the research procedures. If you have questions later, you may contact me at 605-360-2560 or popp1980@stthomas.edu, or advisor Dr. Sarah Noonan at 651.962.4897 or sjnoonan@stthomas.edu. You may also contact the University of St. Thomas Institutional Review Board at 651-962-6035 or muen0526@stthomas.edu with any questions or concerns.

Statement of Consent

I have had a conversation with the researcher about this study and have read the above information. My questions have been answered to my satisfaction. I consent to participate in the study. I am at least 18 years of age. I give permission to be audio recorded during this study.

You will be given a copy of this form to keep for your records.

_______________________________________________________________   ________________
Signature of Study Participant      Date

_______________________________________________________________
Print Name of Study Participant

_______________________________________________________________   ________________
Signature of Researcher       Date