FACULTY PERCEPTIONS OF SMARTPHONES AND SMARTPHONE INTEGRATION IN FACULTY DEVELOPMENT AND THE CLASSROOM: A CASE STUDY

by

Jeanna R. Cronk

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The following individuals read and discussed the dissertation submitted by student Jeanna Renee Cronk, and they evaluated the student's presentation and response to questions during the final oral examination. They found that the student passed the final oral examination.

Ross Perkins, Ph.D.	Chair, Supervisory Committee
Patrick R. Lowenthal, Ph.D.	Member, Supervisory Committee
Lida J. Uribe-Flórez, Ph.D.	Member, Supervisory Committee

The final reading approval of the dissertation was granted by Ross A. Perkins, Ph.D., Chair of the Supervisory Committee. The dissertation was approved by the Graduate College.

DEDICATION

To my parents, Rick and Donna, whose love and guidance are with me in whatever I pursue.

To my grandmother, Florence, who would have been in the front row during my graduation.

To my loving and supportive husband, Jim, who is also the most helpful and most generous friend that I will ever have.

To my wonderful children, Nolan and Carter, who provide unending inspiration and have threatened to teach me to play video games now that I have free time.

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ABSTRACT

This research examined the perceptions of university faculty on the integration of smartphones in faculty development programs. The literature on higher education smartphone integrations has focused almost exclusively on individual courses or mobile learning implementations limited to pre-service teacher education departments. Current practice indicates that faculty are electing to use smartphones for their own professional learning. This study advances our understanding of faculty perceptions, outside of education departments, to provide insight for faculty developers designing programs that incorporate smartphones by addressing the following research questions: (1) What are faculty perceptions of smartphones? (2) How are faculty using smartphone technologies for professional learning as a part of faculty development sessions? (3) What are faculty perceptions of the use of smartphones during faculty development sessions? (4) How are faculty integrating smartphone technologies in their teaching? The fourth research question was added during data collection.

Using a sample of full-time and part-time undergraduate college professors, this case study collected data from two sources. Survey and participant interviews were used to identify themes and determine how perceptions and faculty development experiences translated into smartphone technology classroom integrations by the participants. This study relied on Rogers' diffusion of innovation theory (2003) to reflect upon the acceptance of classroom smartphone technology and Koole's FRAME model (2009) for specific smartphone integration considerations.

The findings from this research were clear regarding the faculty level of comfort and self-efficacy with their smartphone devices. The majority of respondents used a mobile phone at least on an hourly basis, and an average of 92% of respondents indicated a high level of self-efficacy with smartphones. Faculty were confident and willing to take risks with their own smartphone. The results also indicated that smartphones were a helpful and convenient tool that faculty have become dependent on in their everyday lives; however, for content production or composition, laptops were preferred. In addition, faculty were using smartphones for professional learning in a variety of informal (e.g., accessing online documents) and formal (e.g., connecting to conference apps) ways. If the purpose of a faculty development session was well served by integrating smartphones, faculty were open to the idea. The case study results also indicated that faculty have noticed that nearly all of their students brought a smartphone to class; as such, faculty were integrating smartphones in the classroom when it was appropriate for the lesson and situation, even when there was a no cell phone policy included in the syllabus. Based on the research data, it is recommended that faculty developers need to make clear their intentions for using a smartphone-based tool during each faculty development program and provide guidance for those instructors who wish to mimic the same tool in the classroom.

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LIST OF ABBREVIATIONS

BSU	Boise State University
CPA	Certified Public Accountant
CRK	Cognitive Reconstruction of Knowledge
FRAME	Framework for the Rational Analysis of Mobile Education
IRB	Institutional Review Board
LMS	Learning Management System
MBA	Master of Business Administration
PDA	Personal Digital Assistant
QR	Quick Response Code
WCS	Web Conferencing System

CHAPTER ONE: INTRODUCTION

College students are constantly connected to their mobile devices (Rosen, Carrier, Miller, Rokkum, & Ruiz, 2016), carrying them in their pockets or bags to every activity or appointment, including their college classes. With mobile devices—like smartphones—that have a "notable capability to support intense and ubiquitous cooperative learning, social interaction, and sharing" (Kukulska-Hulme, 2012, p. 249), students expect to use these tools in the classroom (Kearney & Maher, 2013). Faculty may not recognize the pedagogical affordances of smartphones if they have not experienced mobile learning from a student perspective (Matzen & Edmunds, 2007). Higher education faculty development programs that incorporate mobile technology can help to bridge the divide between reluctant faculty and expectant students (Kearney & Maher, 2013).

Background of the Study

Researchers define mobile learning differently. In fact, mobile learning has been described as noisy and problematic to define (Traxler, 2007). In some definitions, mobile learning is focused on the integration of mobile technology regarding a learner's problem solving (Lefoe, Olney, Wright, & Herrington, 2009); others target the convergence of the mobility of technology, learning, and learners (El-Hussein & Cronje, 2010). Still, some define mobile learning as learners using mobile devices to engage in educational activities (Wu et al., 2012) or learning that is "both formal and informal, [as well as] context-aware and authentic for the learner" (Gikas & Grant, 2013, p. 19). In this study,

mobile learning was defined as learner engagement or assessment related to content that is accessed easily via a mobile device (with an emphasis on smartphones), both inside and outside of a designated location and stated times.

The proliferation of mobile technology is creating a sense of urgency to implement it into education (Ally, Grimus, & Ebner, 2014). However, integrating mobile technology is a relatively recent phenomenon in higher education (Bennett, Bishop, Dalgarno, Waycott, & Kennedy, 2012). As such, most higher education faculty have little to no experience using mobile learning for teaching or learning (Burden & Kearney, 2017; Khaddage et al., 2015).

Traditionally new technologies at the university level are promoted, supported, and accompanied by some type of training before wide-spread implementation (Walsh et al., 2013). The ever-present nature of smartphones in higher education classrooms is creating a unique student-driven demand for integration that is leading to classroom integrations without fully developed lesson planning (Gikas & Grant, 2013). As such, faculty developers are working to help faculty adjust and prepare for mobile technology classroom implementations (Matzen & Edmunds, 2007) out of the belief that the success of these integrations is based on the instructor's pedagogical planning (Ekanayake & Wishart, 2014).

Kukulska-Hulme (2012) examined how utilizing mobile technology during a higher education institution’s faculty development program can impact the faculty’s adoption of mobile devices in the classroom. She argued that “faculty engagement should go beyond technology adoption in their teaching to adoption in their own professional learning” (2012, p. 248). Since the ultimate goal of faculty development is to enhance

classroom practices and improve student achievement (Camblin & Steger, 2000), faculty development programs should exhibit mobile learning pedagogies that faculty can later imitate in their courses (Reeves & Li, 2012). This study examined faculty perceptions of smartphone technology during faculty development sessions to provide insight for faculty developers designing programs that incorporate smartphones. This case study used a survey and participant interviews to identify themes in faculty perceptions and determine how those perceptions translated into smartphone technology classroom integration.

The majority of research on higher education smartphone integration has reported on mobile technology within individual courses, like micro-blogging via Twitter© (Ebner, Lienhardt, Rohs, & Meyer, 2010) or using social media (Gikas & Grant, 2013), or on mobile technology within pre-service teacher education departments (e.g., Kearney & Maher, 2013; Power & Thomas, 2007). The results of mobile implementation studies indicated that mobile learning "has the potential to take higher education aggressively in a flexible, student-centered direction" (Hargis, Cavanaugh, Kamali, & Soto, 2014, p. 46). A research gap exists among higher education faculty development programs integrated with mobile devices (Kukulska-Hulme, 2012). Faculty will need pedagogical training and guidance when leveraging ubiquitous mobile devices, such as smartphones, in their college classrooms. This study assists in understanding faculty perceptions for designing future smartphone-integrated faculty development programs.

Context of the Study

The selected location for this case study was a private, non-profit Midwestern business-focused university with programs for residential students, adult learners, and graduate students in online, hybrid, and face-to-face modalities. The full residential

campus serves traditional 18-22-year-old college students in a mainly 16-week, face-to-face modality. The university adult program targets non-traditional working adults with 3-week or 8-week evening, hybrid courses and 8-week or 12-week online courses. The graduate program offers 8-week face-to-face daytime or evening courses, in addition to online. Table 1.1 provides a summary of the university's 2016 faculty and student enrollments.

Table 1.1 2016 University Operating Unit Information

Operating Unit	Full-time Faculty	Part-time Faculty	Student Enrollment
Residential Campus	44	77	1,442
Adult Programs	5	290	1,596
Graduate School	6	14	495

The offered programs of study are concentrated on the ideas of free enterprise, personal responsibility, and a competitive advantage in the global marketplace. The university degrees include the Bachelor of Business Administration (BBA), Bachelor of Science (BS), Master of Business Administration (MBA), and Master of Science (MS). The university primarily focuses on specialized programs, such as automobile dealership, fashion merchandising, or entrepreneurship, with the majority of faculty coming directly from their respective industry. At the time of this research, the undergraduate residential program employed 48 full-time and 74 adjunct undergraduate faculty.

In 2007 a dedicated office was established on the residential campus for the university and tasked with coordinating faculty development efforts with the two satellite residential campuses and the non-traditional adult learner program. This organization was led by two full-time faculty who held degrees in education and were given half-time

course teaching loads to enable them to focus on the faculty development programs for the university. Representatives from the other two campuses also were included in regular conference calls and planning sessions. The group used a learning management system course shell to provide information for faculty and as a means of communication with all campus locations. The two group leaders offered workshops and one-on-one consultations with instructors from across the university.

As the university's landscape evolved, the two satellite residential campuses were dissolved or sold, and the previously structured trimester course schedule maintained by the university transitioned into a semester format. The faculty development office was then eliminated at the recommendation of the two faculty leads, due to both instructors wishing to return to the classroom full-time. In the summer of 2010, a faculty development committee was established to continue the work of the past organization, but with the one residential campus as the primary focus. The newly established committee met throughout the academic year to organize and facilitate two faculty development day-long workshops, one in the fall semester and one in the spring semester. These faculty development days loosely would follow a conference format with administrative, informational sessions, breakout instructor or expert-led sessions, and a keynote-style presentation.

In addition to these annual development days, the university instructional technologist (the researcher for this case study) facilitated technology-focused development opportunities for all faculty. All in-house faculty development programs were facilitated by one full-time instructional designer, employed within the university's adult degree program, and one full-time instructional technologist, who supported all

operating units. The adult program's instructional designer presented a variety of faculty development for instructors teaching in that university operating unit. Beginning in 2013, the instructional technologist and the instructional designer began to offer faculty development support in a collaborative effort. Each development session was optional for university faculty, except for the two faculty development days that were mandatory for full-time undergraduate faculty. Topics selected were based on a variety of factors, including end-of-course evaluations, academic dean/division chair input, faculty survey results, future/new university resources, and available session leaders. The university had not previously focused on, initiated, or directly promoted mobile learning with the faculty prior to this case study. Smartphone-based mobile learning had been included during ad-hoc faculty development sessions offered by the instructional designer and instructional technologist during the previous two academic years, but the university is in the beginning stages of considering mobile learning. Table 1.2 provides a summary of the faculty development offerings for the five academic years preceding this study.

Table 1.2 University Faculty Development 2013-2018 Events

Academic Year	Topics	Modalities
2013-2014	LMS features, transformational teaching, metacognition, social media, content management, web conferencing tools, video recording	Webinars, workshops, hybrid-course, whole day conference, open house style
2014-2015	LMS features, plagiarism, web conferencing tools, content management, social media,	Whole day workshops, webinars,
2015-2016	LMS features, Web 2.0 tools, social media, plagiarism, online teaching	Webinars, workshops
2016-2017	Grading, accessibility, copyright, principles of instruction, presentation software, LMS features, assessment, video production, curriculum mapping, online teaching	Webinars, workshops, whole day conference
2017-2018	Web conferencing tools, LMS features, accessibility, cloud computing, active learning, teaching satisfaction, assessment, course design	Webinars, workshops, whole day conference

Note. All faculty development events are optional, except for a mandatory attendance requirement at the whole day conferences for full-time, undergraduate faculty.

At the time of this research, the instructional technologist and instructional designer were working to establish a Center for Excellence in Instruction and Learning at the university.

Purpose of the Study

The purpose of this research was to describe smartphone integration within higher education faculty development experienced by faculty at one Midwestern private university. The general research problem explored by this case study was the advancement of faculty development programs that are incorporating smartphone technology to meet the needs of higher education faculty.

With the majority of past studies of smartphone integration in faculty development programs primarily focused on teacher education departments, the faculty

from this study provided a unique viewpoint. The study contributed to the field of mobile learning and faculty development by targeting faculty with no experience in pre-service teacher education departments. The study participants were from industry and were not formally trained by a teacher education program. In other words, the research participants earned degrees from their respective fields of study, not university education departments.

Research Questions

Given the context of the faculty development history at the university, a case study approach was selected to provide an in-depth understanding and to advance the practice of higher education faculty development by addressing the three research questions:

1. What are faculty perceptions of smartphones?
2. How are faculty using smartphone technologies for professional learning as a part of faculty development sessions?
3. What are faculty perceptions of the use of smartphones during faculty development sessions?
4. How are faculty integrating smartphone technologies in their teaching?

During the interview phase, each interviewee was asked whether they had already attempted to integrate any type of smartphone-based activity in their face-to-face classes. It became apparent that each of the interviewees was already incorporating smartphones in their courses and the corresponding participant experiences became a significant portion of the collected data. As such, the fourth research question was introduced during

the data collection phase. An important consideration in mobile technology integration, or lack thereof, is universal accessibility, this study did not address that.

To focus on the research questions, a case study utilizing survey, interviews, and emergent framework data analysis was used to frame the narrative surrounding the participants' perceptions of smartphone integration within faculty development. A case study was appropriate for this research because the location was bound by the research site and the shared experiences of faculty at one university (Creswell, 2013; Stake, 2000; Yin, 2003). A case study is ideal when "a how or why question is being asked about a contemporary set of events" (Yin, 2003, p. 9). This research followed an instrumental case study design (Creswell, 2013; Merriam, 2009; Stake, 2000) because it was intended to provide an in-depth examination of faculty perceptions of smartphone integration within faculty development programs.

This research held three assumptions: (a) that higher education faculty and students had their own smartphones, (b) that faculty had access to faculty development programs that incorporated smartphone technology, and (c) that faculty were incorporating smartphone technology in their teaching. This study assisted the instructional technologist and the instructional designer at the university in implementing research results from related studies and reflecting upon participants' perceptions of the faculty development programs they have experienced.

Definition of Terms

For the purpose of clarification, this section provides operational definitions of terms that are referenced in this study.

Faculty Development. Refers to guided, structured events organized by a faculty developer. In practice, all faculty development events at the research site are referred to as Professional Development due to the close relationship between the university and the business industry.

Professional Learning. Refers to informal, self-driven, or degree-seeking activities undertaken by the individual faculty members.

Smartphone Technology. Refers to any smartphone use, for example, applications, internet access, or social media tools. Used interchangeably with the term, smartphone.

Summary

The smartphone's ever-present connection and its potential for enhanced teaching and learning through a student-centered, constructivist approach could offer authentic learning and anywhere, anytime student engagement possibilities in higher education (Ally et al., 2014; Kearney, Schuck, Burden, & Aubusson, 2012). The utilization of smartphones for mobile personalized learning also could produce social and collaborative, new generation learning, with increased student engagement (Ally et al., 2014; Hargis et al., 2014). To attain these levels of mobile learning environments, university faculty will need to help prepare students for the seemingly endless amounts of information available via smartphone (Koole, 2009). While research suggests that mobile technology has the potential to enable learning that is "collaborative, contextualized, customized, and personalized" (Baran, 2014, p. 27), merely using smartphones does not guarantee success. Faculty need assistance with mobile integrations in the form of faculty development that can bring about positive changes in faculty behavior and student learning (Steinert et al., 2016). Such faculty development programs should include

ongoing mobile learning opportunities for faculty that include modeling, collaboration, and reflection before classroom implementations to help promote adoption and ease the uncertainty (Rogers, 2003) of mobile learning.

Current research highlights a lack of focus on higher education faculty development initiatives with mobile technology (Kukulska-Hulme, 2012) because the majority of mobile learning research has focused on individual courses or integrations that are limited to teacher education departments (e.g., Ebner et al., 2010; Gikas & Grant, 2013; Kearney & Maher, 2013; Power & Thomas, 2007). Current practice indicates that university faculty are using smartphones for their professional learning, but there is little research in the area of faculty development programs integrating smartphones (Kukulska-Hulme, 2012). The next chapter provides a review of the literature relating to mobile learning, including the affordances and barriers of smartphones and the personalized, authentic, and collaborative learning (Kearney et al., 2012) that can emerge through mobile learning. Also discussed in Chapter Two are specific instances of mobile learning within higher education courses and faculty development programs.

This research described smartphone integration within higher education faculty development as experienced by faculty at one Midwestern private university. Given the context of the faculty development history at the university, a case study approach was selected to provide an in-depth understanding and to advance the practice of higher education faculty development by addressing the following research questions: (1) What are faculty perceptions of smartphones? (2) How are faculty using smartphone technologies for professional learning as a part of faculty development sessions? (3) What are faculty perceptions of the use of smartphones during faculty development

sessions? (4) How are faculty integrating smartphone technologies in their teaching? These research questions were addressed through participant survey, interviews, and emergent framework data analysis to frame the narrative surrounding the participants' perceptions of smartphones and their integration in faculty development. Chapter Three provides a detailed description of the research methodologies, participants, data sources, data collection, and data analysis procedures of the study. The data analysis results are reported in Chapter Four; Chapter Five discusses the themes among the research results and offers recommendations for future research and practice.

CHAPTER TWO: REVIEW OF LITERATURE

Introduction

College students are entering higher education classrooms having experienced a different relationship with mobile technology than that of their professors (Baran, 2014; Sharples, Taylor, & Vavoula, 2007), and coming of age in a time with instant access to resources and peers (Rosen et al., 2016). Such mobile devices as the ubiquitous smartphone are not only social tools for college students but also ones that can be leveraged to enhance learning (Kukulska-Hulme, 2012). Professors who are seeking to incorporate mobile technologies can look to faculty development sessions to experience successful and authentic mobile learning because "most educators have had limited opportunities to observe and experience mobile pedagogies" (Burden & Kearney, 2017, p. 113). There are a multitude of studies surrounding mobile learning implementation plans with student perspectives (Wu et al., 2012), but to a much smaller extent, research has focused on mobile learning within faculty development (Baran, 2014). This chapter provides a review of the literature related to mobile learning theories, affordances and barriers for smartphones, higher education mobile learning implementations, and the ways in which faculty development currently incorporates mobile technology in higher education.

Learning Theories and Mobile Learning

When considering the process of learning, constructivism advocates an active practice where new ideas and information are built upon the learners' past knowledge and experiences. This assimilation of the new and the old information translates into reaching a higher level of real understanding (Ali, 2005). The epistemological origins of constructivism cross between rationalists and empiricists by focusing on the mind of the learner, yet also on the experiences of the learner: "like with the rationalists of Plato's time, the mind is believed to be the source of all meaning, yet like the empiricists, individual, direct experiences with the environment are considered critical" (Ertmer & Newby, 1993, p. 16).

The constructivist theory of learning places an instructor into the role of mentor or guide, instead of as the sole source of information, to encourage inductive learning based on discovery and interpretation of a learner's experience (Ng'ambi & Lombe, 2012; Rieber, 1992). While serving as a learning guide, instructors can apply the following five principles from the constructivist theory of learning:

> (1) An emphasis on the identification of the context in which the skills will be learned and subsequently applied;
> (2) An emphasis on learner control and the capability of the learner to manipulate information;
> (3) The need for information to be presented in a variety of different ways;
> (4) Supporting the use of problem-solving skills that allow learners to go beyond the information given;
> (5) Assessments focused on transfer of knowledge and skills. (Ertmer & Newby, 1993, p. 19)

In a four-year mobile learning study, university instructors combined constructivist principles with smartphone capabilities to facilitate the following activities: real-time data capture and collaboration, data sharing, asynchronous communication, scaffolding support, reflective journaling, peer critique, situated learning, and formative

feedback (Cochrane & Bateman, 2010). The implementation of these constructivist mobile activities "illustrated the potential to transform traditional teaching approaches and introduce context bridging teaching and learning scenarios" (Cochrane & Bateman, 2010, p. 8). This shift in teaching approaches was facilitated by offering support stages and three scaffolded faculty development opportunities that included theory-based preparation, integration, and reflection.

As the learning environment and the needs of learners are changing (Isiyaku, Ayub, & AbdulKadir, 2018; Khaddage et al., 2015; Watty, McKay, & Ngo, 2016), so, too, are the discussions surrounding learning theories. By considering the various approaches of conceptual change theory, Jonassen and Easter (2014) explored the ways in which a learner's knowledge itself changes. The authors described evolutionary conceptual change as a gradual change where the learner, following a constructivist process, builds new ideas in context and utilizes the new knowledge. Constructivists posit that learning must be active, include critical concepts, and be within the appropriate context in order to be successful, meaningful, and lasting (Ertmer & Newby, 1993). Jonassen and Easter (2014) explained another approach known as radical conceptual change whereby the learner's knowledge is adjusted more abruptly and radically, oftentimes by a major new concept or idea. Both of these approaches require the learner to analyze the new information critically for conceptual change to occur; research on these change theories has not accounted for learner motivation. Placing the process of conceptual change on a *hot* to *cold* scale, Jonassen and Easter argued that theories only focused on the cognitive rather than emotional influences of conceptual change would be

described as cold, and the inclusion of motivation and emotions in current research is creating a warming trend.

Jonassen and Easter (2014) also described the Cognitive Reconstruction of Knowledge (CRK) Model. The CRK model claims learners will be motivated to undergo a conceptual change process if (a) they are dissatisfied with their current knowledge, (b) the new concept is personally relevant, (c) the context is persuasive, and (d) their need for cognition is heightened. The following educational activities have been successful in bringing about conceptual change in learners: (a) simulations; (b) model building (which is deemed most effective when built by the learner); and (c) constructing arguments related to the content, including peer collaboration (Jonassen & Easter, 2014).

Some of the aforementioned smartphone activities, such as reflective journaling, real-time data capture, and data sharing in Cochrane and Bateman's (2010) study, emerged in a large cross-institutional study conducted by Bennett et al. (2012) that was designed to explore the implementations of Web 2.0 technologies at the university level. Of the six implementations included in the research, the authors concluded that the faculty who closely aligned pedagogy with the technology and included student creation and sharing experiences were the most successful at affecting student learning (Bennett et al., 2012). These mobile learning pedagogical considerations include personalized learning, authenticity, collaboration (Kearney et al., 2012), and mobile strategies that incorporate "collaborative learning, game-based learning, inquiry-based learning, simulation, information-rich content delivery, and tutoring for context-aware ubiquitous learning" (Hsu, Ching, & Snelson, 2014, p. 7).

Frameworks for Mobile Learning

When considering the theories behind effective mobile learning, it is also essential for faculty to go further and utilize a "framework based on analysis of empirical evidence" (Hsu & Ching, 2015, p. 2) to guide mobile learning integration. A "dynamic, theoretical set of criteria or a framework" (Khaddage et al., 2015, p. 632) can support educators in their mobile learning endeavors. By combining instructionism, social learning, constructionism, and collaborative learning, Laurillard (2009) created the conversational framework as a way to guide and examine the implementations of computer-supported collaborative learning. The conversational framework is not focused solely on mobile learning; instead it covers all aspects of teaching and learning, including "conventional and digital, mobile and classroom-based, formal and informal" (Laurillard, 2009, p. 7) considerations.

Koole's Framework for the Rational Analysis of Mobile Education (FRAME) model "describes a mode of learning in which learners may move within different physical and virtual locations and thereby participate and interact with other people, information, or systems—anywhere, anytime" (2009, p. 26). This mobile-focused model considers the convergence of device aspects, learner aspects, and social aspects whereby portable, powerful, and intuitive devices and a learner's motivation and prior knowledge combine with collaboration and communication to create "a deeper contextualization of learning" (Koole, 2009, p. 38).

Planning or analyzing a mobile learning implementation involves reflection on each aspect of the FRAME model, illustrated in Figure 2.1. First, considerations when selecting appropriate mobile devices include comfortable physical characteristics, user

control of input and output settings, device processing speeds, and user guides for file storage and retrieval methods. An ideal mobile device will enable the learner to focus on the tasks at hand, rather than on the device. Next, concerns of the mobile learning activities themselves include assessing the current knowledge of learners, instructional design techniques, varying multimedia and stimuli, providing authentic contexts, the transfer of concepts to differing contexts, and the personalization of experiences. When these elements are included, mobile learning can allow convenient access to multiple formats of content from authentic situations. The third area of the FRAME model, social aspects, requires the contemplation of shared vocabulary, cultural etiquette, and communication expectations or guidelines. Essentially, the learner's consumption and creation of knowledge need to be culturally relevant.

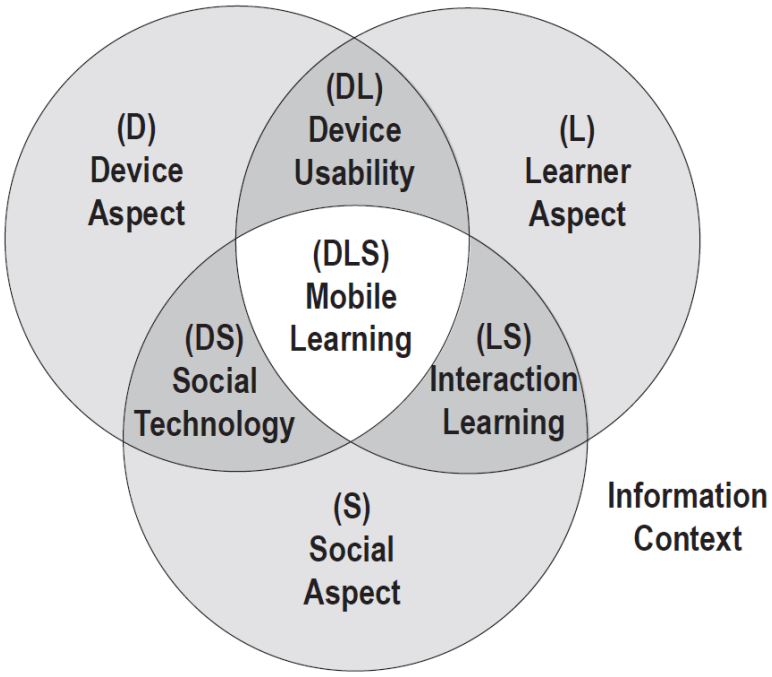


Figure 2.1. The FRAME Model presented as a Venn diagram. From "A Model for Framing Mobile Learning," by M. L. Koole, 2009, in M. Ally (Ed.), Mobile Learning: Transforming the Delivery of Education and Training, p. 27. Copyright 2009 by AU Press. Used with author's permission.

When the three areas of device, learner, and social aspects overlap, each part needs to be considered in relation to the others. For example, when the device and learner zones combine, the device usability considerations will include durability and connect-ability, ease of use, and learner control of aesthetics. The device-social intersection results in social technology considerations that include setting a minimum wireless network expectation and the necessary collaboration platform. The social-learner combination contemplates the relationships, social interactions, and preferences of learners, as well as the mobile spaces needed to facilitate learning with mentors or experts. When all three aspects of Koole's FRAME model combine, the resulting mobile learning system will impact interactions, information processing, life-long learner skill sets, and the roles of teachers and learners.

As mobile technology continues to advance, sometimes becoming out-of-date while research is still in progress (e.g., Lefoe et al., 2009), future researchers will need to focus on and examine the possibilities of newly emerging mobile affordances. Utilizing Koole's (2009) FRAME model, higher education faculty can take into account all aspects of devices, learners, and social learning to design a mobile learning environment that can adapt with future changes in mobile learning and technology.

Affordances of Smartphones

Smartphones are ubiquitous (Havel, Powell, Cabaniss, & Arbuckle, 2017; Kearney & Maher, 2013; Kukulska-Hulme, 2012); the number of worldwide smartphone users was expected to exceed 2.5 billion in 2018 (Smartphone, n.d.). In a 2012 meta-analysis conducted by Wu et al., mobile phones and PDAs accounted for over 75% of the mobile devices used in the 164 mobile learning instances included in the analysis. The

results also indicated that the type of mobile device selected could significantly impact learning based on the capabilities of the device (Wu et al., 2012). The smartphone is an ideal device for mobile learning because of its portability, computing capabilities, and real-time connections that enable ubiquitous, collaborative, and contextual learning (Hsu et al., 2014).

Ubiquitous Learning

Ubiquitous learning is a pervasive and seamless connection between "learning collaborators, learning contents, and learning services" (Yang, 2006, p. 188). Based on the ubiquitous nature of smartphones, Ng'ambi and Lombe (2012) conducted a case study of mobile podcasts used to scaffold learning and merge informal and formal learning. The results of the case study indicated that the participating students used the podcasts outside of the classroom setting for informal reflections on the course content. It has been noted that the ability to bridge formal and informal learning spaces is a distinct affordance of smartphones (Gikas & Grant, 2013). Similarly, the ability to offer ubiquitous learning opportunities such as collecting in-the-moment feedback (Havel et al., 2017), enhancing instructor-learner interactions (Isiyaku et al., 2018), and enabling learner reflections (Ng'ambi & Lombe, 2012) are all characteristics of smartphone-based mobile learning.

Social Collaborative Learning

In social collaborative learning environments, self-directed learners and collaborators accumulate, enrich, and manage their own knowledge (Yang, 2006). The sustained contact that is intrinsic in social media mobile tools (e.g., Twitter) also enables smartphones to be used for consistent engagement with course curriculum (Cochrane &

Narayan, 2012). While synthesizing experimental research regarding mobile computer-supported collaborative learning, Hsu and Ching (2013) noted consistent reports of increased engagement and participation among the data.

Similarly, Sha, Looi, Chen, and Zhang (2012) researched a two-year smartphone integration based on the nature of self-regulated learning that included three phases for each lesson that directed students to consider their prior knowledge, personal learning goals, and metacognitive reflection after the learning activities concluded. The results indicated that levels of extrinsic motivation impacted the success of self-regulated, self-directed learning. These types of social collaborative learning environments made possible by smartphones also were present in the data sharing and peer critique of Cochrane and Bateman's (2010) study and the creation and experience sharing of Bennett et al. (2012).

Contextual Learning

An additional affordance of smartphone-based mobile learning is contextual learning. Contextual learning refers to the current situation of the learner, whether physically or mentally (Yang, 2006). The following examples of mobile learning illustrate how smartphones can be leveraged to bring about contextual learning opportunities. First, the MOBIlearn^{TM} museum scenario utilized mobile technology to enable conversational learning spaces in the context of an Italian art gallery (Sharples et al., 2007). Museum visitors could use mobile devices to learn more about the artwork on display and to engage with other visitors or art experts while examining specific works of art. Similarly, Cochrane and Bateman (2010) noted instances of contextual mobile learning with QR codes (a smartphone readable barcode that points to online information)

and geotagging (online information, photos, or videos that appear when a smartphone is in a specific geographical location).

Another example of contextual learning was the use of iPads by pre-service teachers who documented real-life scenarios for classroom lessons, organized professional learning, accessed productivity apps, and evaluated, observed, recorded, and annotated reflections. The students' use of the mobile devices displayed both authentic learning and personalization of learning. These instances took place inside and outside of the classroom, in both formal and informal environments–all critical aspects of mobile learning (Kearney & Maher, 2013).

Additionally, in a study of a teacher-training mobile learning project, the student and faculty participants noted that it was *fun* to share and document contextual experiences via image messages with other program members. The student participants used their mobile devices for educational purposes during their "in-between" moments for example, while riding the bus to class. The most beneficial aspect of this mobile project, as indicated by the student participants, was the immediacy of the mobile devices. On the other hand, the university faculty included in the study indicated a favorable aspect was the devices allowing for more flexibility in their use of class time (Seppälä & Alamäki, 2003).

As noted earlier, the smartphone's ubiquitous nature and readily-available technology (Havel et al., 2017; Kearney & Maher, 2013; Kukulska-Hulme, 2012) make it ideal for allowing learners to focus on the task at hand, rather than on the device itself (Koole, 2009). When instructors use smartphones to diversify content and to promote innovation and participatory, collaborative, and contextual learning (Hsu et al., 2014;

Isiyaku et al., 2018), they can impact course interactions, information processing, life-long-learner skill sets, and the roles of teachers and learners (Koole, 2009).

Barriers to Smartphone Integration

This section introduces some potential barriers to the successful integration of mobile learning in higher education, including access to technology and faculty perceptions towards mobile technology. Some mobile learning barriers can be grouped into similar categories, such as access to technology, while others stand alone, like cell phone providers requiring extra fees for increased usage of internet data plans (Marinagi, Skourlas, & Belsis, 2013). Another example could be the rate of change with smartphone technology and faculty who are not familiar with quickly evolving Web 2.0 and mobile applications (apps) (Bennett et al., 2012; Isiyaku et al., 2018). Additionally, the disruptive and pervasive nature of smartphones raises concerns about classroom management and ethical considerations (Hsu et al., 2014; Peng, Su, Chou, & Tsai, 2009).

Technology Access

Various concerns of access have emerged as a barrier to mobile learning integration. For example, in Ng'ambi and Lombe's (2012) study, student interviews revealed that the large file sizes of the podcast downloads were a significant access barrier for learners with certain mobile devices or connection speeds. Due to this concern, most learners attempted to use a laptop or desktop computer to download the files.

Additional access barriers include connecting to a wireless network and concerns of an institution's broadband infrastructure (Isiyaku et al., 2018). Likewise, the limitations of a mobile device's screen size (Cochrane & Bateman, 2010; Gikas & Grant, 2013), battery life, or memory capacity (Power & Thomas, 2007) can be a barrier to

access. Further concerns include limited data wireless contracts and the costs associated with smartphones and unlimited data packages (Ally et al., 2014; Khaddage et al., 2015; Power & Thomas, 2007), as well as technical difficulties experienced by students (Gikas & Grant, 2013; Power & Thomas, 2007).

Perception of Mobile Learning

College faculty who do not understand the affordances of smartphones are hesitant to incorporate them in the classroom, perceiving too much time and effort required to master mobile integration (Kukulska-Hulme, 2012). Instructors value the opportunity to become comfortable with mobile technology before considering its impact on teaching and learning, and when given a chance to work directly with mentors or co-workers regarding mobile technology implementation, mobile device usage will increase (McFarlane, Roche, & Triggs, 2007). The most effective strategy is to begin with small instances of mobile technology integration that are fully planned out (McFarlane et al., 2007).

An important facet of overcoming a perception barrier to mobile learning is the amount of administrative support observed by higher education faculty. To this point, Isiyaku et al. (2018) found that "teachers expected more support from their school authorities" (p. 348) when they were tasked with increasing their classroom use of mobile Web 2.0 technologies. Mobile learning initiatives require time and training, whether integration is self-initiated or directed by an institution. Having an administrator serve as a "champion" for mobile technology can increase the success of mobile integration (Grant et al., 2015).

Another part of this barrier to consider is the possible misalignment of assessments and mobile learning. Secondary school teachers have raised concerns that mobile-enhanced classrooms will have an adverse effect on a school district's standardized test results because the modality of nationwide assessments is significantly different from the individualized and contextual experiences in a mobile learning environment (Hargis et al., 2014). Teachers are afraid that student achievements will not transition from a flexible mobile-learning format to an unyielding standardized assessment. Universities seeking accreditation may need to consider this implication because accrediting agencies often require program assessments in higher education as well (McFarlane et al., 2007).

Technological barriers may be easier to overcome than barriers of perception. For example, it has been noted that the technical difficulties experienced by learners could be reasonably bypassed with assistance from the instructor and increased familiarity with the device (Bennett et al., 2012). Additionally, institutions are also collaborating with in-house information technology groups to ensure classrooms have reliable wireless network connections (Havel et al., 2017). Of course, some faculty may naturally move beyond a perception barrier by personally witnessing the need for smartphone integration, as was evidenced in a reflective study by Halaweh (2017) at a university in the United Arab Emirates that strictly prohibited smartphone use during class time. In his observations, Halaweh noted that students often would demonstrate a need for mobile learning, for example, when they wanted to photograph important deadlines or class notes, or look up the definition of an unknown word. The author argued that higher education should not

prohibit the use of smartphones in the classroom; instead, universities should guide and assist faculty and students in incorporating them successfully.

Mobile Learning in Higher Education

Mobile technology can provide a shared space for conversational learning that is authentic, collaborative, and personalized for university students (Kearney et al., 2012; Sharples et al., 2007). An increase in learner engagement has been observed as students became empowered by using mobile technology to conduct research and decrease their dependence on the instructor (Hargis et al., 2014). Mobile learners can take control of their learning when there is an alignment of "sound educator pedagogy; relevant, lively generated content; continuous, task-focused student interaction; and low-cost, ubiquitous technologies" (Bere & Rambe, 2016, p. 195). Some of the benefits of using mobile technology for student learning are quick access to information, collaboration, communication, variety, and authenticity (Gikas & Grant, 2013). Cochrane and Bateman (2010) identified the following five benefits of mobile learning, specifically for higher education:

> (1) Exploring innovative teaching and learning practices.
> (2) Enabling the embodiment of authentic learning. . . .
> (3) Engaging students with the affordances of mobile Web 2.0 technologies. . . .
> (4) Bridging the digital divide by providing access to learning contexts and user content creation tools that are affordable and increasingly owned by students.
> (5) Moving from a model of fixed, dedicated general computing to a mobile, wireless computing paradigm that turns any space into a potential learning space. (p. 2)

With smartphones readily available, faculty are attempting to exploit the "notable capability to support intense and ubiquitous cooperative learning, social interaction, and sharing" (Kukulska-Hulme, 2012, p. 249) that these devices offer.

Implementation Examples

When considering the variety of mobile learning implementations within higher education, we can organize them based on Traxler's (2007) six categories: (1) technology driven, (2) portable e-learning, (3) connected classrooms, (4) informal and situated, (5) performance support, and (6) rural access. The higher education faculty who are incorporating smartphones into their classrooms using SMS-message polling and feedback during lectures (Seppälä & Alamäki, 2003) are demonstrating a technology-driven implementation. The informal and situated mobile learning category includes having students utilize smartphones for self-reflection, peer assessment, peer support, and idea-sharing (Ally et al., 2014). Likewise, an informal and contextually situated, learner focused category emerged in a study on the use of instant messaging by students and faculty at the South African University of Technology (Bere & Rambe, 2016). The learners in this study were actively engaged with peers, experts, and mentors in mobile learning contexts that were convenient for the learner. Faculty who require students to create video journals, e-portfolios, wikis, and micro-blogs with mobile devices (Cochrane & Narayan, 2012) fall into the category of portable e-learning by using mobile technology to re-enact a previously desktop-based technology.

As mobile integrations continue to advance, the implementation examples often fall into more than one category. For example, a mobile learning study across universities in New Zealand demonstrated instances of informal and situated mobile learning, portable e-learning, and performance support by including real-time data capture and collaboration, data sharing, asynchronous communication, scaffolding support, reflective

journaling, peer critique, situated learning, and formative feedback (Cochrane & Bateman, 2010).

Mobile Learning Adoption

Even with the majority of mobile learning studies reporting positive outcomes (Wu et al., 2012) mobile technology will not be adopted by *all* faculty, as is typical with the acceptance of educational technologies (Christensen, 2013). The diffusion and adoption of mobile devices, like smartphones, require an element of social change within higher education (Rogers, 2003). Faculty-development mobile-learning initiatives focusing on perceived enjoyment and mobility value, self-efficacy, and perceived convenience may help to drive acceptance among higher education (Hsu & Ching, 2015).

To encourage instructors to adopt mobile technology, school and university leadership also will need to incorporate and model mobile tools in administrative tasks to show public support of the technology (Grant et al., 2015; Herro, Kiger, & Owens, 2013). Similarly, it is important for administration to identify and collaborate with the early adopters on new materials (Rudd & Watts, 2008) as the opinions of prominent university personnel towards new technology could shape significantly an instructor's intention of using that technology (Cheon, Lee, Crooks, & Song, 2012).

The diffusion of innovations theory argues that the adoption of a new idea, such as mobile technology in the higher education community, is influenced by four main elements: the idea/innovation, communication channels, time, and the social system in the community (Rogers, 2003). If applying these four elements to the adoption of mobile technology in higher education, (a) the innovation would include the mobile technology/mobile learning idea; (b) the communication channels would include faculty

development programs, email messages, and face-to-face conversations between administration and faculty or among faculty themselves; (c) the time element would incorporate the decision process of adoption or rejection, the speed at which someone adopts the idea (compared to others), and the time it takes for the innovation to become widely adopted within the system; and (d) the social system would include individuals who are all working towards a common goal—for example, the faculty teaching at one university or within one department. A common problem faced by universities when introducing new technology is the slow rate of acceptance or adoption by faculty (Rogers, 2003). The rate of adoption for innovations can be plotted as an S-shaped distribution curve, with the following categories for adopters: innovators, early adopters, early majority, late majority, and laggards.

Looking at mobile technology integration from the perspective of the diffusion of innovations model (Rogers, 2003), increasing the awareness of mobile integration successes can be expected to increase faculty adoption of mobile technology. The five factors specifically identified by Rogers (2003) as proving impactful on the rate of adoption are the perceived relative advantage, compatibility, trialability, observability, and complexity of the innovation. McFarlane et al. (2007) translated Roger's adoption rate factors into a teacher's prior experience with technology, their attitude and confidence with technology, their relationship with their classes, and their outlook on taking risks. As an innovation, mobile technology will need to be widely adopted in higher education to reach a saturation level that is capable of sustainability (Rogers, 2003).

While faculty development cannot affect past experiences, it can help influence the acceptance of mobile technology within an institution that is tasked with successfully integrating mobile learning (Gikas & Grant, 2013). In a cross-institutional study conducted by Bennett et al. (2012) six implementation projects were explored from a variety of college programs, including science, education, journalism, and psychology. From the six implementations, those faculty closely aligning the selected mobile technology and pedagogy were the most successful at affecting student learning (Bennett et al., 2012). A similar pedagogical focus led Cochrane (2014) to identify six critical success factors with mobile learning, based on his review of three years' worth of projects. These factors included (a) technology integration into the course and also the assessments, (b) faculty modeling the technology use, (c) the creation of a community of practice, (d) selection of appropriate devices and social software, (e) both technological and pedagogical support, and (f) sustained interaction for both faculty and students. Cochrane (2014) placed emphasis on the need for long-term faculty development to enable widespread mobile learning adoption across an institution. In the series of mobile learning implementations included in the research, the faculty or lecturers received lesson planning support and device training prior to the implementation stage. The results revealed a paradigm shift toward student-centered instruction that was aided by faculty development (Cochrane & Bateman, 2010). Previous mobile learning studies that focused on short-term implementation projects and only provided support for those interested faculty did not approach the ontological shift necessary for sustained acceptance (Cochrane, 2014).

In an international Delphi study that included 14 mobile-learning scholars, the examination of mobile learning and teaching strategies emerged as the highest ranking priority for future research needs in mobile learning (Hsu et al., 2014). Pedagogically focused mobile technology implementations can change the relationship between instructor and students, ultimately transforming the role of the college professor to one representative of a facilitator or mentor (Idrus & Ismail, 2010; Koole, 2009). Without guidance prior to and during mobile integration, faculty resort to traditional teaching methods, replicating old computer-based tasks with smartphones rather than modernizing them (Matzen & Edmunds, 2007). Faculty development likely will be necessary to enable this transformation of pedagogy (Peng et al., 2009). As faculty adapt their teaching strategies to better align with mobile pedagogies, the course activities advance from teacher-focused to learner-focused (Laurillard, 2009). These changes in activities could evolve professors into constructivist facilitators that are comfortable integrating mobile technology, using it in learner-centered ways (Matzen & Edmunds, 2007).

Mobile Learning in Faculty Development

While targeting the enhancement of professional, personal, and institutional missions (Camblin & Steger, 2000), faculty development has been offered in various modalities, including formal and informal instruction, mentoring, demonstrations by university staff, mandatory or voluntary workshops by teaching and learning centers, pilot studies, and communities of practice (Ally et al., 2014; Drouin, Vartanian, & Birk, 2014; Matzen & Edmunds, 2007). These faculty development offerings for instructors in higher education fall into two main formats: (a) self-directed by the faculty, following an informal structure; or (b) a formal program that is facilitated and organized by the

institution (Phuong, Cole, & Zarestky, 2018). Regardless of how the faculty development initiative begins, faculty training programs can provide benefits for faculty, students, and the institution itself. Camblin and Steger (2000) posited that "faculty development is a significant key to the continued success of higher education" (p. 16) and that faculty development programs wanting to remain relevant must continue to evolve or risk generating outdated faculty practices. Modeling the pedagogies of mobile learning in faculty development sessions is an example of one such evolution that may offer faculty a model that could later be emulated within courses (Reeves & Li, 2012).

The research surrounding instances of formal faculty development that incorporates mobile learning has been primarily focused on pre-service teacher preparation programs. Of these studies, Burden and Kearney (2017) suggested that they could be divided into one of two categories: either learning about mobile learning or learning with mobile learning. In their study of 46 mobile learning activities within university teacher education programs, only three of the reported activities fell into the category of learning through mobile learning.

Scheduled faculty development programs can enable allocated space on faculty calendars to combat a major factor that inhibits technology adoption, the time necessary (Watty et al., 2016). In addition to the barrier of time, Byrum, Holschuh, and Smith (2015) found that “a lack of consistent modeling of technology integration” (p. 3098) also was inhibiting successful technology integration by the teacher-education program’s pre-service teachers at their university. As a result, the university’s educational technology faculty designed a series of one-hour faculty development workshops that met once a month throughout the academic year. Each of the seven workshops focused on a different

instructional theme and its accompanying educational technology tools. The workshops were held in a face-to-face, hands-on format and participants also had access to online mobile-friendly resources for additional information regarding each topic. While the workshops were not well attended, the researchers still deemed them a success for aiding those faculty who participated.

While reviewing 111 faculty development initiatives that took place between 2006 and 2016, Steinert et al. (2016) noted that the majority of the programs were focused on acquiring specific skills rather than on "an opportunity for renewal and reflection on personal and professional growth" (p. 779). Mobile learning in faculty development goes beyond obtaining new skills: “seminars and workshops [can serve] as a potential way to inspire resistant academics to embrace the new” (Watty et al., 2016, p. 8). Kukulska-Hulme (2012) examined the impact on mobile learning adoption by the incorporation of mobile technology during faculty development programs. Instead of a focus on their students’ needs, the attending faculty experienced a learner’s perspective by using mobile technology to advance their own knowledge and career development. The research results revealed that a focus on learning with mobile technology, not only on how to use the technology, was valued by the attending faculty. The faculty development elements that were deemed most helpful for learning with mobile devices were: (a) detailed activities, (b) hands-on experiences with the faculty's own device, (c) ample discussion, and (d) technical support (Kukulska-Hulme, 2012).

In another example of faculty development impacting mobile adoption, Ekanayake and Wishart (2014) designed a faculty development program to aid instructors who were implementing mobile phones into their curriculum. The program included a

three-day workshop series where the instructors used the designated mobile phones, worked in small groups, and planned (then evaluated) mobile learning lessons. The results of the faculty development series showed a threefold increase in mobile integration in the participants' classes.

In addition to increasing integration, faculty development programs also can offer sustained support to instructors, as was evidenced in a long-term mobile learning program conducted at the University of Wollongong where faculty were given smartphones six months before a planned classroom integration (Lefoe et al., 2009). The researchers utilized those six months to enable faculty to make the device their own while examining new mobile learning pedagogies during a series of workshops. Lefoe et al. (2009) incorporated a constructivist approach to the faculty development series and identified five supporting elements: (a) participants understood a shared theoretical mobile framework, (b) there was ample time to develop mobile technology skills, (c) the inclusion of authentic practice of new mobile pedagogies, (d) the development of a shared language and the implications of mobile learning, and (e) opportunities for regular reflection practices at each stage of integration.

Another example of mobile technology being successfully integrated in faculty development was reported by Cochrane and Narayan (2012). In this instance, the researchers had instructors developing and teaching lessons with mobile technology. To support the instructors, Cochrane and Narayan created a faculty development course that provided participants a variety of mobile Web 2.0 tools and social learning experiences via a community of practice. The results revealed that the continual contact of social media frameworks also enabled continuous learning via mobile technology. The constant

learner engagement and scaffolded support were crucial in shifting the participants' teaching strategies to adopt similar mobile technology in their classes. The researchers also cited the inclusion of participant self-reflection opportunities as a pathway for future implementation considerations.

Summary

The combination of the smartphone's ever-present connection and its potential for enhanced teaching and learning through a student-centered, constructivist approach is driving an emphasis on mobile learning (Ally et al., 2014). These potential enhancements include innovative pedagogical approaches, authentic learning, and anywhere, anytime student engagement possibilities (Kearney et al., 2012). The utilization of smartphones for mobile personalized learning could also produce characteristics of social learning and collaboration, new generation learning, just-in-time availability, and authentic learning experiences (Ally et al., 2014). As Hargis et al. (2014) observed, student engagement can increase as mobile technology empowers students to increase their independence as learners by conducting their own research. University instructors will need to help prepare students for the seemingly endless amounts of information available at their fingertips (Koole, 2009).

The majority of research in higher education mobile technology integrations has been focused on either the implementation within individual courses or integrations that are limited to teacher education departments (e.g., Ebner et al., 2010; Gikas & Grant, 2013; Kearney & Maher, 2013; Power & Thomas, 2007). Current research highlights a lack of focus on higher education faculty-development initiatives with mobile technology (Kukulska-Hulme, 2012). While the findings suggest that mobile technology could

enable learning that is “mobile, collaborative, contextualized, customized, and personalized” (Baran, 2014), merely incorporating mobile technology into the higher education classroom is not a guarantee of success. Faculty will need assistance with mobile integrations in the form of faculty development that can bring about positive changes in faculty attitudes, behavior, organizational practice, and student learning (Steinert et al., 2016). To heighten the effectiveness of mobile integration, those serving in faculty development roles should design ongoing mobile learning opportunities for faculty that include modeling, collaboration, and reflection (Cochrane & Bateman, 2010; McFarlane et al., 2007) before classroom implementations to help promote the adoption and ease the uncertainty (Rogers, 2003) of mobile learning innovation.

CHAPTER THREE: METHODOLOGY

Introduction

To date, the majority of research in the area of higher education smartphone integration have reported on individual courses or mobile technology integrated into teacher education departments (e.g., Ebner et al., 2010; Gikas & Grant, 2013; Kearney & Maher, 2013; Power & Thomas, 2007). Current practice indicates that faculty are electing to use smartphones for their own professional learning, but there is little research in the area of higher education faculty development programs integrating mobile devices, such as smartphones (Kukulska-Hulme, 2012).

The purpose of this research was to describe smartphone integration within higher education faculty development as experienced by the undergraduate faculty at the research site. The research site was a private, non-profit Midwestern university with business-focused specialized programs, such as automobile dealership and entrepreneurship, where the majority of faculty came directly from their respective industry. The university offers undergraduate and graduate degrees for residential students and adult learners in online, hybrid, and in-person modalities. At the time of this research, the undergraduate residential program employed 48 full-time faculty and 74 adjunct undergraduate faculty.

The faculty development programs at the university experienced three major transition periods prior to this case study. First, in 2007 a dedicated office was established

on the residential campus that was led by two full-time faculty who offered workshops and one-on-one consultations with instructors from across the university. Then in the summer of 2010, the faculty development office was eliminated at the recommendation of the two faculty leaders, due to both instructors wishing to return to the classroom full-time. A faculty development committee was established to continue the work of the past organization by facilitating two faculty development day-long workshops each year. These faculty development days generally included administrative informational sessions, breakout instructor or expert-led sessions, and a keynote-style presentation.

In addition to the annual faculty development days, the university instructional technologist (the researcher for this case study) facilitated technology-focused development opportunities for all faculty, and the adult degree program's instructional designer presented a variety of faculty development for instructors teaching in that university operating unit. In 2013, the instructional technologist and the instructional designer began to collaborate and offer faculty development sessions to all instructors across the university. Each faculty development session had optional attendance, except for the two faculty development days that were mandatory for full-time undergraduate faculty. Session topics were driven by end-of-course student evaluations, academic dean/division chair input, faculty survey results, future/new university resources, and available session leaders.

The university had not previously focused on, initiated, or directly promoted mobile learning with the faculty prior to this case study. Smartphone-based mobile learning tools had been sporadically included during some faculty development sessions offered by the instructional designer and instructional technologist. Specifically, the only

smartphone-based tools used were: QR codes printed on a few workshop handouts for faculty to scan with their smartphone and access demonstration videos; faculty were encouraged to use their smartphones to contribute to free-response online brainstorming prompts during two of the educational technology workshops; and the online game-based website, Kahoot!®, was used during one in-person workshop to review active learning strategies with faculty attendees. Refer to Chapter One for additional information regarding the university.

Given the context of the faculty development history at the university, a case study approach was selected to provide an in-depth understanding and to advance the practice of higher education faculty development by addressing the research questions:

1. What are faculty perceptions of smartphones?
2. How are faculty using smartphone technologies for professional learning as a part of faculty development sessions?
3. What are faculty perceptions of the use of smartphones during faculty development sessions?
4. How are faculty integrating smartphone technologies in their teaching?

The case study utilized survey, interviews, and emergent framework data analysis to frame the narrative surrounding the participants' perceptions of smartphones and their integration in faculty development. During the interview phase, each interviewee was asked whether they had already attempted to integrate any type of smartphone-based activity in their face-to-face classes. This question was posed to all interviewees because the researcher was interested in describing how faculty development activities may have been transferred to a classroom scenario. It became apparent that each of the interviewees

was already incorporating smartphones in their courses and the corresponding participant experiences became a significant portion of the collected data. As such, the fourth research question was introduced during the data collection phase. Table 3.1 indicates which questions on the data collection tools (refer to Appendices A and B for survey and interview questions) corresponded directly to the research questions.

Table 3.1 Research and Data Collection Questions

Research Questions	Survey	Interview
What are faculty perceptions of smartphones?	5, 6, 7, 8, 16	1, 2
How are faculty using smartphone technologies for professional learning as a part of faculty development sessions?	11, 13	3, 4
What are faculty perceptions of the use of smartphones during faculty development sessions?	14, 15	4
How are faculty integrating smartphone technologies in their teaching?		5

Note. Refer to Appendices A and B for survey and interview questions.

Research Methodology

The case study research method has been criticized through oversimplifications and concerns of bias (Flyvbjerg, 2007; Simons, 2009). Due to the work of researchers such as Stake (2000), Flyvbjerg (2007), Yin (2003), and Creswell (2013), social science researchers can move forward with well-designed case study research with fewer concerns about legitimacy. The definitions of case study research differ in methods, topics of study, and resulting case reports (Merriam, 2009). The specific terminology surrounding case studies also varies, while the consensus stands that case study research involves in-depth reporting on data collection of a bounded system in a real-life context (Creswell, 2013; Merriam, 2009; Stake, 2000; Yin, 2003).

The strengths of a case study are its capacity to incorporate various pieces of evidence (Yin, 2003) while researching a complex phenomenon that may include a variety of important factors (Merriam, 2009). The advantage of utilizing a case study is the opportunity to close in on real life and offer an insightful view of the issue so that readers experience a situation as though they were living it (Flyvbjerg, 2007).

The goal of this research was to explore and understand smartphone integration within higher education faculty development programs from a faculty perspective. A case study was appropriate for this research because the location was bounded by site and shared experiences of faculty at one university (Creswell, 2013; Stake, 2000; Yin, 2003). A case study is best suited for research when "a how or why question is being asked about a contemporary set of events, over which the investigator has little or no control" (Yin, 2003, p. 9). This research followed an instrumental case study design (Creswell, 2013; Merriam, 2009; Stake, 2000) because it was intended to advance the understanding and insight in faculty perceptions of smartphone integration within faculty development programs.

Research Design

All full-time and adjunct faculty who taught in an in-person setting at the university's residential undergraduate campus during the 2016-2017 or 2017-2018 academic years were invited to respond to an electronically distributed survey. The invitation and hyperlink to the online survey were sent through email during the 2018 summer semester. Participants were asked about their experiences with utilizing smartphone technology during faculty development and whether they were willing to discuss faculty development smartphone integration further. General demographic

questions included inquired about the faculty members' educational background and length of teaching experience. The survey was piloted in late June 2018 with adjunct faculty members from the adult degree program operating unit of the university. This pilot group provided feedback on the relevance and flow of the questions and the online survey tool itself. The pilot participants suggested some grammar and style edits, but no changes to content or flow.

The responses received from the survey were examined and used to select a purposive sample of participants who experienced smartphone integration during faculty development. As viable interview candidates emerged from the survey submissions, invitations were emailed to schedule one-on-one interviews that followed a semi-structured format. These interviews averaged 25 minutes in length, and some were conducted via virtual video chat as chosen by the participant. The audio was recorded from in-person interviews via a smartphone application, and the virtual interviews were recorded through the web-conferencing system (WCS, a.k.a. BlueJeans Network) used by the university.

Research data included survey responses, transcribed interview responses, and researcher notes. The case study data collection and analysis followed the schedule shown in Table 3.2.

Table 3.2 Data Collection and Analysis Schedule

Phase	Methodology	Timeline
One	Pilot and revision of the survey	06/27/18 – 07/12/18
One	Survey distribution and data collection	07/30/18 – 09/21/18
One	Survey data analysis	09/28/18 – 10/20/18
Two	Interview data collection	08/06/18 – 09/18/18
Two	Interview transcription and analysis	08/07/18 – 10/20/18

Data Management and Collection

This case study began with a survey that was distributed electronically to full-time and adjunct faculty who taught in a face-to-face modality on a residential undergraduate campus. The survey was created, distributed, and collected via Qualtrics®, including the initial email invitation and the sending of automated completion reminder emails. The Qualtrics question types used included multiple choice, multi-selection, and matrices. Upon opening the survey, respondents were presented with the Informed Consent Form (see Appendix C) as required by the Boise State University Institutional Review Board. After acknowledging and confirming informed consent, respondents saw questions about their skill level with smartphone technology and the format and frequency of their experiences with mobile faculty development activities. The survey was also used to determine which of the responding faculty had previous experience with smartphone technology integration during faculty development. Additionally, demographic questions relating to educational background and teaching experience were included to assist in selecting a variety of candidates to participate further in the research (see Appendix A for the complete survey).

The survey invitation was emailed to research candidates on July 30, 2018, with automated follow-up reminder emails sent to non-respondents on August 8, August 27, and August 31, 2018. During the initial stage of the survey response collection, it became apparent that the respondents were not reading carefully the answer choices on question #2, regarding whether or not they owned a smartphone. This response error caused an issue because if a participant indicated that their phone could make only calls and send short text messages, the survey tool would branch the participant to the end of the survey. Twelve participants had responded incorrectly to the question by the time the issue was realized; these erroneous responses made up almost a third of the total thus far (n = 42). To prevent any further user response errors, the survey collection was paused on the morning of August 27, 2018, before the automated distribution of the reminder emails on that date, and updated to require future participants who selected conflicting answers to confirm their selections before moving forward with the survey. This adjustment to the survey was agreed upon with the research faculty advisor and did not alter the data collection, but merely ensured future respondents would be branched appropriately to the next portion of the survey based on their smartphone ownership. This survey tool adjustment was critical because the survey responses of those smartphone owners were used to select interview participants. If participants indicated their willingness to be interviewed, but incorrectly responded to the initial branching question, they were ineligible for the interview pool because they had not met the basic interview criteria of smartphone ownership. The last reminder email was sent to non-respondents on September 17, 2018, with the survey closing on September 21, 2018. There were 60

completed surveys from the 121 potential participants, resulting in a survey completion rate of 49.6%.

The second phase of research consisted of one-on-one, semi-structured interviews to discuss faculty perceptions and experiences with smartphone technology during faculty development programs, to offer a variety of viewpoints and the opportunity for further examination of perceptions. The phase-one survey prompted respondents to indicate their willingness to participate in these interviews. All faculty who indicated interest were placed in a pool of participants for the phase-two interviews. The survey resulted in 25 of the 60 survey participants, or 41.7% of respondents, being placed in the interview candidate pool. The target number of interviewees was eight to ten. When selecting the candidates to be invited to the interview phase, the participant survey responses were reviewed, specifically those that referred to past experiences with smartphones during the various modalities of faculty development sessions. If participants were interested in joining the interview stage but had not indicated any previous experiences with smartphones during faculty development sessions, they were not invited to interview. If they had some past experiences, then additional responses were considered and compared with the other interview-interested candidates based on (a) years of teaching, (b) earned degree/major of study, (c) full-time/part-time status, (d) level of smartphone faculty development experience (low/medium/high), and (e) personal smartphone use (low/medium/high). Of the 25 faculty who were willing to participate in the study, 13 (52%) had experienced smartphones in faculty development. To inform the study, the initial interview invitations were sent to the five respondents who indicated they had experienced multiple faculty development sessions with smartphone technology. When a

candidate failed to respond after two attempts the researcher extended an invitation to the next desirable candidate in the list. Due to a lack of responses by four of the candidates, each of the 13 survey respondents received an interview invitation. Purposive sampling was utilized in this case study (Simons, 2009; Stake, 2000) to select the greatest variety of possible interview participants; some candidates were desirable because of their degree or experiences, others because of their smartphone usage, but the overall picture of each candidate and the possible contribution to the research were the driving factors. Creswell (2013) similarly referred to this as purposeful maximal sampling since the selection also was intended to provide differing perspectives. To promote transferability of the research findings, faculty that selected to share their perspectives in the interviews were from the broadest possible variety of background, education, work experience, and university departments. Table 3.3 displays the characteristics of the faculty who were sent interview requests and the traits that were intended to provide the greatest variation in the sample. Of the 13 faculty who were invited to participate in the interview phase of the research, nine agreed to an interview during the early-August to the mid-September time frame. The remaining four faculty members did not respond to either of the two emailed invitations; it is possible that requesting phone numbers during the survey response phase may have provided a preferred method of contact for those four faculty members.

Table 3.3 Interview Candidate Rankings

Ranking Order	Teaching Experience	Degree Earned	Faculty Status	Faculty Development Smartphone Experience	General Smartphone Experience
1	11 years	**Ph.D.**	Full-time	**High**	**High**
2	13 years	Master's	Part-time	**Medium/High**	**High**
3	**1 year**	Master's	Part-time	**Medium/High**	**Medium/High**
4	5 years	Master's	Part-time	**Medium**	**High**
5	4 years	Master's	Full-time	**Medium**	**High**
6	**13 years**	**Ph.D.**	Full-time	Low/Medium	Low/Medium
7	6 years	Master's	Full-time	**Low**	**High**
8	**28 years**	**Ph.D.**	Full-time	Very low	Medium/High
9	7 years	Master's	Full-time	**Low**	**Medium/High**
10	**6 years**	Master's	Full-time	Low	Medium
11	14 years	**Ph.D.**	**Part-time**	Low/Medium	Medium
12	6 years	Master's	Part-time	Low/Medium	**High**
13	**13 years**	Master's	Part-time	Low	Low/Medium

Note. Bold indicates desirable candidate traits. No response was received from 2, 10, 12, or 13. Identifiying information was removed from the table.

The one-on-one interviews consisted of semi-structured, open-ended questions intended to encourage the faculty to discuss their experiences with smartphone

technology during faculty development programs and their thoughts and perceptions regarding smartphone integration. Each interviewee was given the option to interview in-person or virtually via the university's WCS with web-camera and audio connections. Of the nine interviews, five were conducted in-person and four with the WCS, one of which included only audio due to the participant's lack of a functioning web-camera at the time of the interview. Questions were directed towards the nature of the faculty development programs, the attitudes of those involved, and the participants' past experiences with mobile integration (see Appendix B for interview questions). The interviews were all conducted between August 5, 2018, and September 19, 2018, and averaged 25 minutes in length. All in-person interviews were recorded via a smartphone audio recording application. All virtual interviews were conducted on a laptop computer and recorded with the WCS recording tool. The audio files were transcribed by the researcher and saved as Google® Documents.

Data Analysis and Procedures

The data collected from the survey were analyzed using Microsoft Excel® software for frequencies and percentages of viable responses. The 62 raw survey responses were exported from Qualtrics into Microsoft Excel. Two respondents did not complete the majority of the survey; their responses were removed from the data. Additionally, two respondents who incorrectly indicated not owning a smartphone later completed the remaining questions regarding their smartphone devices; therefore, the follow-up results from those respondents were consolidated into their initial responses. Respondents who indicated they did not own a smartphone device were removed from the participant data. Once the data were cleaned, 48 viable survey responses were left for

analysis. Summary tables, such as Table 3.4, were created in Microsoft Excel to get an overall picture of the viable survey responses (refer to Chapter Four for research results).

Table 3.4 Frequency of Smartphone Use in Faculty Development

Smartphone Activity	Frequently	Often	Occasionally	Rarely	Never
Informal training, such as online videos or articles[a]	4 (8.5%)	3 (6.4%)	19 (40.4%)	9 (19.1%)	12 (25.5%)
Informal collaboration with colleagues	3 (6.5%)	7 (15.2%)	13 (28.3%)	10 (21.7%)	13 (28.3%)
Formal conference sessions[b]	0 (0.0%)	3 (6.7%)	5 (11.1%)	16 (35.6%)	21 (46.7%)
Formal online webinars	1 (2.2%)	2 (4.3%)	13 (28.3%)	7 (15.2%)	23 (50.0%)
Formal in-person workshops	0 (0.0%)	1 (2.2%)	8 (17.4%)	14 (30.4%)	23 (50.0%)

Note. $n = 46$. [a]$n = 47$. [b]$n = 45$.

The quality of research design can be judged by "trustworthiness, credibility, confirmability, and data dependability" (Yin, 2003, p. 33). The validity of research is in the accuracy of the reported findings (Creswell, 2013); additionally, "ensuring validity and reliability in qualitative research involves conducting the investigation in an ethical manner" (Merriam, 2009, p. 209). During a case study, to ensure accurate reporting, the researcher should incorporate transferability, credibility, and dependability into the research design (Lincoln & Guba, 1985). The transferability of this case study included the maximum variation sampling strategy for selecting interview participants and the rich description of the case study report (Merriam, 2009). The study's credibility can be found

in the identification of typical, exceptional, and disconfirming instances (Miles, Huberman, & Saldaña, 2013) from the coding process.

Inductive data analysis was used during the phase-two interviews of this case study; the codes emerged progressively from the participant responses during data collection (Miles et al., 2013). Following each personal interview, the recordings were transcribed, then read, organized, and coded into categories of emerging themes based on chunks or phrases from the participant responses to develop the issue further (Stake, 2000; Yin, 2003). The data were categorized using the constant comparative method, highlighted by Lincoln and Guba (1985), with emerging codes repeatedly considered for understanding and refinement. To begin the process, an interview transcript was read to reflect on the overall message portrayed by the faculty participant. Then, the same transcript was reread, highlighting any references toward mobile devices, faculty development, professional learning, or classroom smartphone integrations. These highlighted portions were then transferred into a Microsoft Excel spreadsheet for ease of sorting. The data on the spreadsheet were grouped into category rows of comparable phrases based on the meaning behind the phrases; for example, “reading eBooks” and “checking sports scores” were both illustrations of how participants used their smartphone. The phrases were compared to statements by other interviewees to determine if there was consistent meaning across categories and to check for exceptional or disconfirming instances (Miles et al., 2013). Some phrases seemed to quickly form into similar ideas expressed by the participants, for instance, some of the typical terminology describing how the smartphone was used and the history of its use: extra appendage, cannot live without it, constantly on my phone, attached to us all the time. These

statements generated a clear picture of the feelings of connection that faculty have developed for their devices.

Once the grouped phrases started to develop general ideas, they were then divided further based on similarities and differences. Using the example of reading an eBook on a smartphone, when a participant was using a smartphone to read an eBook for graduate-level coursework, that was considered different from a participant using a smartphone to read a murder-mystery eBook for entertainment. Table 3.5 displays the grouped participant phrases and the first-cycle category codes that emerged based on those phrases.

Table 3.5 First-Cycle Codes and Phrases

Initial Emergent Codes	Participant Phrases
How smartphones were used in teaching	Record own lecture; discussion posts; communicating with students; Kahoot; help student 'in the moment' during homework; show industry news alerts; graphing app; view websites; take photos of content; record video of student presentations; end of class evaluations; guide student use, tell them why and when
Personal smartphone use	Games; alarms; eBooks; translate; movies; sports scores; emergency notifications
Professional smartphone use	Calendar; contacts; webinars; photographs of slides; study; research; online degree; employers; accounting app; podcasts; group discussions; newsletters; webinars; get most out of conferences; conference programs; connect with presenters
Smartphone convenience	Efficiency; capability; potential
Quick access to information	Not at my desk; no computer; connect during lunch break; don't have to travel; watch sessions live; mobile all the time; everyone has a smartphone; they never forget their phones; they don’t all have laptops
Ease of smartphone use	Figure it out; never needed assistance; favorably impressed; makes life easier

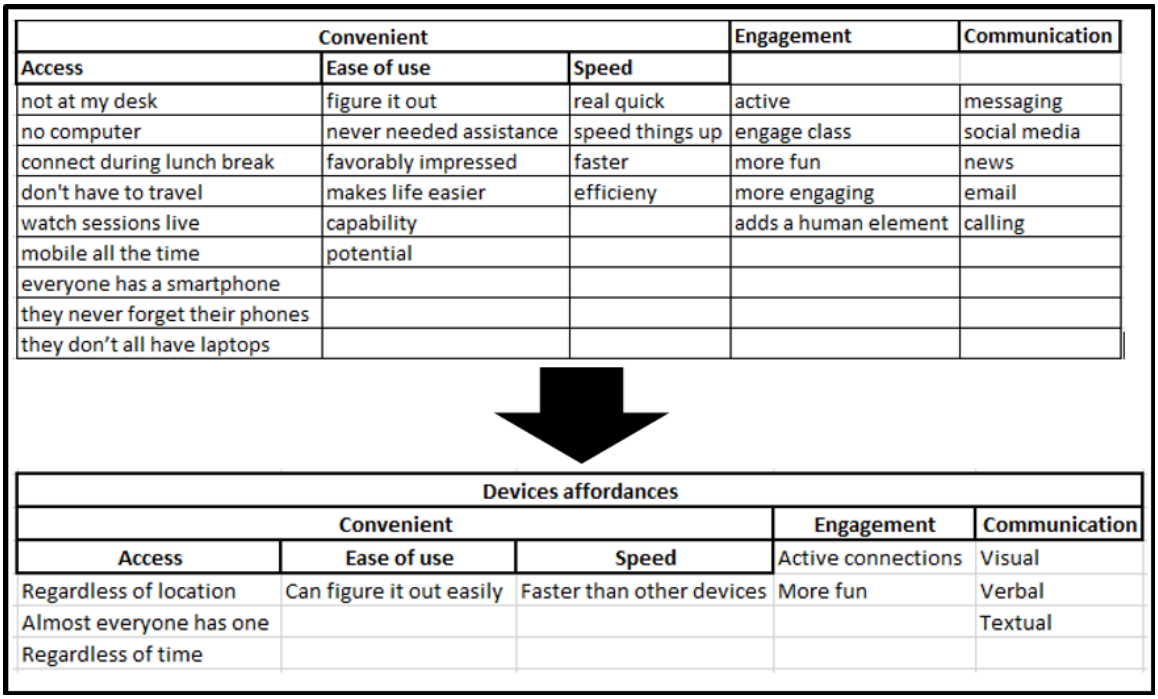
Smartphone speed	Real quick; speed things up; faster
Audience engagement	Active; engage class; more fun; more engaging; adds a human element
Communication via smartphone	Messaging; social media; news; email; calling
Connection with device	Usage seems disrespectful; extra appendage; always using it; moment I wake up; moment I go to bed; inevitable in my life; cannot live without it; reliant on it; constantly on my phone; everywhere I go; attached to us all the time; start and end my day with it; hate to admit; early adopter by necessity; makes me lazier; separation anxiety
Learning curve	Google it; playing around; user issues; try out new things; ask kids for help; seek out help; research it; get help from students; always one or two people that have issues
File storage space	Didn't want to download app and fill storage
Access to Wi-Fi	Password; some conferences have bad connections
Smartphone screen size	Prefers larger screen; big screen is easier; not good for producing; laptop needed for nitty-gritty work
Smartphone battery life	Carry a charge cord
Trends in faculty development	Happening more frequently; becoming standard; mimic industry; like most people; lead that direction; more and more people are realizing that it's useful
Faculty development engagement	Watched demonstration; observed webinar; heard about it, researched it, then tried it myself; didn't really hook into it, no follow-up; intentionally put it to use right away; where appropriate; not the focus of the session; check reliability; engaged, present; audience participation

Why smartphones were (or were not) integrated in class	Not completely shut off to the idea; huge distraction; serious worry; go back and forth about it; almost obsessive; not allowed during tests; tell them not to use their phones; normally forbid devices to prevent distractions; playing around or cheating; put them on airplane mode; not good for composing; want them put away, but mine will probably be out; stay engaged; integral in student learning in industry; app that made concept tangible to students; app that replaced end-of-life clickers; it's a part of life, so it might as well be a part of learning; short assessments; didn't want the hassle of moving to a computer lab; conducted teleconference style class from smartphone due to business travel; learning and entertainment; they learn more and come more prepared; learning tool; it's their culture; they like it; I was doing it myself through my learning; breaks up the time; awesome, active learning; mimic industry presenters; I don't ban tech from the classroom, even knowing the risk that's involved; extend the lesson; fact checker; remember deadlines; need based, laptop died; polling classmates during presentations

After each interview, these first-cycle codes (Miles et al., 2013) were reconsidered and revised to allow additional codes or subcodes to emerge. As each transcript was incorporated into the spreadsheet, the previous transcripts were reviewed again to ensure any newly revealed participant perceptions were not overlooked in the previous highlighting and sorting process. While revising the data codes, the participants' phrases guided the additional codes and subcodes; for example, the *Professional smartphone usage* code was divided based upon how the faculty were using their smartphones in their professional lives into three subcodes of degree-seeking activities, smartphone use for career management or advancement, and smartphone use to connect with industry information or leaders.

Once all of the interview transcript data were exhausted the final list of data codes were examined with second-cycle coding (Miles et al., 2013) to explore relationships or

patterns across the codes and to identify themes or explanations among the data. For example, the codes of access, ease of use, and speed were all grouped together as explanation subcodes under the area of *Convenience*. Likewise, engagement, communication, and convenience all became grouped together as examples of smartphone affordances. These groupings were completed in the Excel workbook, with each cycle of coding taking place on a new worksheet tab to ensure the categorization of the data could be traced. Once the data were reorganized, the codes were summarized to represent the participants' messages and maintain representative phrases clearly. Figure 3.1 represents the refinement of the device affordance codes.



Convenient			Engagement	Communication
Access	Ease of use	Speed		
not at my desk	figure it out	real quick	active	messaging
no computer	never needed assistance	speed things up	engage class	social media
connect during lunch break	favorably impressed	faster	more fun	news
don't have to travel	makes life easier	efficieny	more engaging	email
watch sessions live	capability		adds a human element	calling
mobile all the time	potential			
everyone has a smartphone				
they never forget their phones				
they don't all have laptops				

Devices affordances				
Convenient			Engagement	Communication
Access	Ease of use	Speed	Active connections	Visual
Regardless of location	Can figure it out easily	Faster than other devices	More fun	Verbal
Almost everyone has one				Textual
Regardless of time				

Figure 3.1. Refinement and summary process for data codes.

The final codes seemed to summarize and capture the overall ideas of the data and yielded an understanding of the faculty perspectives regarding smartphone technology in higher education. As such, the final codes were labeled as themes. The five emergent

themes and their respective codes and subcodes are listed in Table 3.6 (refer to Appendix D for a graphic representation of the emergent themes).

Table 3.6 Interview Data Themes, Codes, and Subcodes

Emergent Themes	Codes and Subcodes
Smartphone usage	Teaching (*how*); Personal use; Professional use (Degree-seeking, Career advancement, Industry connection)
Smartphone affordances	Communication variety; Active engagement; Convenience (Quick access, Ease of use, Speed)
Smartphone barriers	Learning curve; Storage space; Wi-Fi access; Screen size; Battery life
Faculty development engagement	Trending
Class integration	Reasons why not; Instructor-driven integrations (Convenience, Capability, Potential); Student-driven integrations (Convenience, Capability, Potential)

The collection and triangulation of data from multiple sources of evidence and the reviewing of interview transcripts and themes by interviewees also contributed to the credibility of the research (Merriam, 2009). Member checking with key participants assisted in the triangulation of data from the interview responses. Following the interviews, five of the nine interviewees were invited to comment on a shared Google document containing the transcript from their respective interview. None of the five key participants had any additional comments or afterthoughts. After the major themes emerged during data analysis, each of the nine interviewees received an email requesting they review the themes and indicate alignment with their thoughts and statements regarding smartphone integration during faculty development. Eight of the nine

interviewees responded to the member-checking email, all of whom indicated that the emergent themes represented their views and statements during the interviews.

Triangulation was used throughout data collection and analysis to consider alternative understandings and ensure the accuracy of recurring themes or observations in the data (Stake, 2000; Yin, 2003). For example, the surveys submitted by the nine interview participants were compared with the respective interview transcripts to determine if the attitudes toward smartphones portrayed during the interviews were reflected in the survey responses as well. To establish dependability in the research findings, data collection followed case study protocol and was used to develop a case study database with an audit trail of researcher comments and decisions (Merriam, 2009). To maintain transparency during the case study reporting, any assumptions or preconceived viewpoints by the researcher were reported to enable the reader to witness any changes or revisions in perspective as the case study progressed (Flyvbjerg, 2007).

Role of the Researcher

The researcher who conducted this case study was also the instructional technologist for the university. This connection was disclosed to the participants and also in this final research report. While this position did not include any administrative oversight towards faculty, shared duties across the university often resulted in the instructional technologist assisting on many administrative committees. If faculty perceived an association between the researcher and university administration, this affiliation may have limited participation by some instructors and possibly increased participation by others. The professional and friendly working relationship between the

faculty and researcher helped to develop rapport with the interview participants immediately.

During the phase-two interviews, the researcher maintained the role of a reflective listener with a neutral perspective to limit the two ways in which she was biased regarding the case. First, she held a positive perception of the inclusion of smartphones in faculty development programs and had included smartphone activities in workshops for faculty at the university. Second, her experience as an instructional technologist influenced her attitude towards the appropriateness of smartphones in university classroom settings, and she did not prohibit her own classes from using smartphones. During the interviews, when asked how they had used smartphones during faculty development, some participants referenced a session led by the researcher. Alternatively, some participants tried to have the researcher help them recall the details of the university sessions and seemed apologetic that they could not remember. Regardless of whether the participant had attended a researcher-led faculty development session in the past, the researcher did not provide details from the sessions when prompted. Rather, assistive phrases like "Do you remember where the session was?" were used to aid a participant in recalling details.

Ethical Considerations

The participants' names, research site, and locations of faculty development programs were anonymized in the transcription of survey results, researcher notes, interview responses, and in the final case report. A random name-generating website was used to assign pseudonyms for interviewees referenced in final reporting. Participation in this study was voluntary, and participants were free to leave the study at any point.

During data analysis of interview transcription, the researcher requested that participants review the transcript and emerging themes to ensure accuracy.

CHAPTER FOUR: RESULTS

Introduction

The purpose of this study was to describe faculty smartphone perceptions and smartphone integration within higher education faculty development as experienced by the faculty at one Midwestern private university. The majority of past research on smartphone integration in faculty development programs was primarily focused on teacher education departments. The faculty population in this study provided a unique viewpoint because they had no experience in teacher education departments. The research participants' fields of study are not education degrees; the majority of participants earned business degrees (78%). This study looked at current practices in higher education by using the following research questions: (1) What are faculty perceptions of smartphones? (2) How are faculty using smartphone technologies for professional learning as a part of faculty development sessions? (3) What are faculty perceptions of the use of smartphones during faculty development sessions? (4) How are faculty integrating smartphone technologies in their teaching? The research questions were addressed with data collected and analyzed from an online survey and interviews (refer to Appendices A and B for survey and interview questions).

All full-time and adjunct faculty who taught at least one in-person class between Fall 2016 and Spring 2018 at the residential undergraduate campus of the research site were invited to participate in the online survey. From this population of 121 faculty, 60

(49.6%) participants completed the survey and 25 (41.7%) of the survey participants indicated their willingness to participate in a follow-up interview.

To help frame the context of the case study further, participant demographics were collected from the survey including *higher education teaching experience, faculty rank,* and *highest earned degree*. Table 4.1 provides a summary of faculty rank and teaching experience, grouped into five-year increments.

Table 4.1 Faculty Rank and Higher Education Teaching Tenure

Higher Education Teaching Experience	Full Professor	Associate Professor	Assistant Professor	Adjunct Instructor
1 – 5 years	0 (0.0%)	0 (0.0%)	4 (8.5%)	11 (23.4%)
6 – 10 years	0 (0.0%)	2 (4.3%)	5 (10.6%)	7 (14.9%)
11 – 15 years	0 (0.0%)	3 (6.4%)	1 (2.1%)	4 (8.5%)
16 – 20 years	0 (0.0%)	0 (0.0%)	1 (2.1%)	3 (6.4%)
21 – 25 years	1 (2.1%)	1 (2.1%)	0 (0.0%)	0 (0.0%)
26 – 30+ years	2 (4.3%)	1 (2.1%)	0 (0.0%)	1 (2.1%)

Note. $n = 47$.

Table 4.2 is a summary of faculty rank and highest level of education completed. Interestingly, the researcher found an almost even spread of faculty with doctoral degrees among faculty rank (refer to Appendix E for more survey results).

Table 4.2 Faculty Rank and Highest Earned Degree

Highest Earned Degree	Full Professor	Associate Professor	Assistant Professor	Adjunct Instructor
Doctorate (e.g., Ph.D., Ed.D.)	3 (6.4%)	3 (6.4%)	3 (6.4%)	4 (8.5%)
Professional Degree (e.g., J.D.)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (2.1%)
Master's Degree (e.g., M.B.A., M.S.)	0 (0.0%)	4 (8.5%)	8 (17.0%)	21 (44.7%)

Note. $n = 47$.

Thirteen candidates from the pool of 25 potential interview participants were invited to participate in the semi-structured follow-up interviews because they had previously experienced smartphone integration during faculty development. Nine of the candidates participated in the interview phase. The purpose of the interviews was to draw out faculty perceptions and descriptions of smartphone use and faculty development experiences with smartphone use, which led to descriptions of smartphone class integrations practiced by the participants. Table 4.3 represents the demographics of the interview sample of adjunct instructors ($n = 3$), assistant professors ($n = 3$), associate professors ($n = 2$), and one full professor. A pseudonym was given to each interview participant to be used throughout this report, including any reference to exact quotes that were incorporated to add depth and richness to the case study.

Table 4.3 Interview Participant Demographics

Interviewees[a]	H.E. Teaching Experience	Highest Degree Earned	Faculty Status
Alton	1-5 years	Master's	Adjunct Instructor
Danielle	11-15 years	Ph.D.	Adjunct Instructor
Earl	11-15 years	Ph.D.	Associate Professor
Flynn	6-10 years	Master's	Assistant Professor
Hannah	11-15 years	Master's	Assistant Professor
Isaac	6-10 years	Master's	Associate Professor
Jemma	1-5 years	Master's	Assistant Professor
Shirley	1-5 years	Master's	Adjunct Instructor
Teresa	26-30+ years	Ph.D.	Full Professor

[a]Pseudonyms created from online random name generating tool. *Note.* H.E.=Higher Education. Personally identifying information was excluded from this table.

Research Results

Research Question One

What are faculty perceptions of smartphones? Interview participants were first asked to comment on their history with using smart-devices and to recall how long they had owned a smartphone to assist in focusing their thoughts towards smartphone devices. The average was seven years of smartphone ownership, with a minimum of four years and a maximum of ten. Some interviewees obtained their first smartphone by way of

convenient circumstances. For example, Flynn was given a used smartphone by a friend, and employers gave both Hannah and Isaac their first smartphones.

When discussing their history with smart devices, the interviewees commonly remarked about other tools that they had owned indicating that they were comfortable with mobile devices in general, such as tablets or eReaders. Comments regarding the smartphone device itself were mainly positive, except for a few explicitly geared towards the emergent research theme of smartphone barriers, specifically the barrier of small screen sizes (Cochrane & Bateman, 2010; Gikas & Grant, 2013) including:

> Alton: It's easier to focus more on a big screen, like a computer. {interview-A, p. 1, lines 10-11}

> Hannah: I use a computer screen only when I am doing [something] like Excel sheets and need a big screen. {interview-H, p. 3, lines 97-98}

When discussing the details of how they used smartphones, many interviewees mentioned a preference for a larger device when they were creating content. For example, Flynn expressed that he did not consider his smartphone a serious tool for producing documents or content, but it was a serious tool for managing his personal life. Alton made similar comments about using his laptop for the *nitty-gritty* tasks of running his own business. On the opposite end, Jemma mentioned her preference for using smartphones over a computer, even though some tasks may be more difficult.

To gain insight into the ways in which participants perceived their smartphone, the survey asked about the level of smartphone integration in the daily, *personal* lives of participants and their satisfaction with that level of integration. It was not surprising that mobile phones were being used on a daily basis by all of the survey participants, with 77% of respondents indicating they used a mobile phone at least on an hourly basis. Half

of the participants stated that they constantly used (deeply integrated) their smartphone in their daily personal life and of those 24 participants, 50% indicated they were very satisfied with that level of integration. That was more than twice of the participants who were regularly using (integrated) their smartphones and indicated they were very satisfied (21%). As is shown in Table 4.4, five (10.4%) of the participants indicated that they were somewhat dissatisfied with their level of daily personal smartphone use.

Table 4.4 Faculty Satisfaction Levels of Smartphone Personal Use

	Daily Personal Smartphone Usage			
Satisfaction Levels	Deeply Integrated	Integrated	Partially Integrated	Not at All Integrated
Very satisfied	12	4	1	0
Satisfied	9	13	4	0
Somewhat dissatisfied	3	2	0	0
Not at all satisfied	0	0	0	0

Note. $n = 48$.

Survey participants were also asked to consider the same selection options while gauging their level of smartphone integration in their daily, *professional* life; the results are presented in Table 4.5. The majority of responses (45.8%) indicated that smartphones were regularly used (integrated) in the faculty members' professional lives. It was somewhat surprising to see that 14.6% (7) of the survey participants rated their daily smartphone professional use as very infrequent (not at all integrated) because no one selected that option for the daily personal smartphone use question.

Table 4.5 Faculty Satisfaction Levels of Smartphone Professional Use

	Daily Professional Smartphone Usage			
Satisfaction Levels	Deeply Integrated	Integrated	Partially Integrated	Not at All Integrated
Very satisfied	10	1	2	4
Satisfied	2	19	3	2
Somewhat dissatisfied	2	2	0	1
Not at all satisfied	0	0	0	0

Note. $n = 48$.

While discussing smartphone devices, interview participants were asked to describe their typical daily smartphone use. The interview data, much like the survey data, reflected a high level of daily smartphone use by participants, which emerged as a theme in the research. Therefore, the researcher's noting that eight of the nine interview participants had placed their smartphones on the table or desk directly within arms-reach during the interview was not surprising. Teresa was the only interviewee who kept her smartphone out of sight during the entire conversation. When describing their daily smartphone use, the interviewees often referenced physical and emotional connections to their smartphones as is evidenced by the following quotes:

> Earl: My day-to-day use is like most people, kind of just an extra appendage. I'm always using it. {interview-E, p. 1, lines 5-6}

> Alton: You get almost like separation anxiety from your phone, so it probably has become as much of a part of an individual person as, you know, your eyes and your mouth. {interview-A, p. 4, lines 151-153}

> Danielle: It's the first thing I touch in the morning and [the smartphone alarm is] the last thing I set at night. {interview-D, p. 1, lines 16-17}

> Hannah: I don't think I can live without it now. I'm so very much reliant on it, which is not good, I know. {interview-H, p. 1, lines 10-11}

While listing the features or tools of their daily smartphone use, the participants' responses would often encompass a variety of purposes behind the tools. For example, communicating with family members, managing work schedules, connecting with industry information, and personal entertainment may all occur in a single day through smartphone applications. The most commonly mentioned smartphone uses were communicating (e.g., calling, texting, emailing), information seeking (e.g., weather forecast, news, social media updates), and scheduling (e.g., calendars and alarms). These results were consistent with the survey responses in that calling, texting, email, and social media made up over 90% of the ways in which survey respondents (n = 48) primarily used their smartphones. The combination of smartphone tools and purposes contributed to the emergent research theme of smartphone affordances.

It was interesting to the researcher to witness the conflicting messages that some of the interviewees gave while describing their smartphone use. For example, Hannah stated that her smartphone, "gives me the speed in my life, but it makes me lazier; I should accept that" {interview-H, p. 2, line 87}. Furthermore, Alton reluctantly admitted that he would stop engaging with his family to respond to a smartphone notification. Similarly, while discussing the amount or frequency of use, it was common for a participant to make a cringing facial expression or joke about their smartphone addiction just moments after praising the device's conveniences.

To assist in gauging the interviewees' self-efficacy level with their smartphones, they were asked whether they normally needed to seek assistance when attempting something new with their smartphone. The majority of responses indicated that the faculty did not seek out assistance from other smartphone users, but would often search online for a guide or demonstration video if they encountered difficulty. A few of the participants mentioned asking their own children for help occasionally, and one had taken an in-person class to learn how to use an advanced photography smartphone app.

To help determine how the faculty respondents of the survey viewed their self-efficacy with smartphones they were asked to consider a list of smartphone activities, such as connecting to Wi-Fi or sending documents via messaging, and rank their ability to complete each task. According to the survey results, an average of 91.9% of respondents found the smartphone activities easy to perform, indicating a high level of self-efficacy with smartphones.

The case study results indicate that faculty had a history of owning mobile devices, are confident in their smartphone abilities, and that smartphones are fully saturated into their daily lives. While the smartphone was not considered a replacement for laptops, it was perceived as a comparable and very useful tool. Finally, there was some general resentment towards the level of dependency on smartphones.

Research Question Two

How are faculty using smartphone technologies for professional learning as a part of faculty development sessions? Survey participants were asked to reflect upon a variety of faculty development modalities and indicate with which ones they regularly engaged to frame the context of the faculty development events. Based on the responses

shown in Figure 4.1, the majority of participants regularly engaged in informal faculty development modalities, such as accessing online videos or articles (84.1%) and collaborating with colleagues (63.6%). On average, less than half of the survey respondents regularly engaged with formal faculty development, and only 36.4% of respondents indicated that they regularly participated in formal conference sessions.

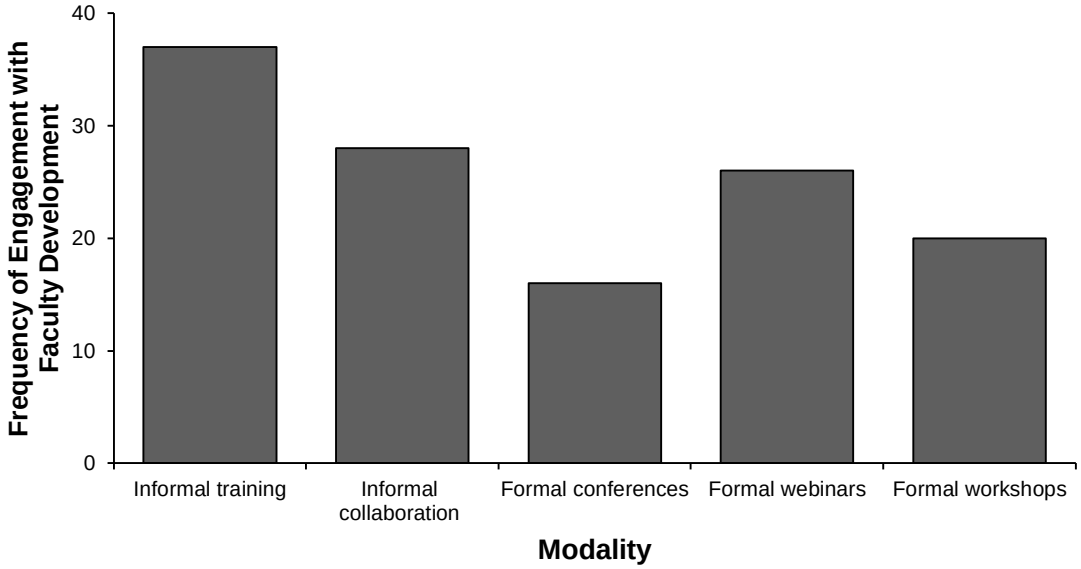


Figure 4.1. Frequency bar chart of faculty development modalities in which participants regularly engage in. *n* = 44.

During the interviews, participants were asked to describe how they had used smartphones for their own professional learning, their responses contributed to the research theme of smartphone uses. The interviewees were accessing podcasts, articles, and eBooks from their smartphones for industry or subject matter specific information. Two of the interview participants were seeking a degree or certification and commented on using their smartphones for their education. Some faculty referenced attending conferences in the past and the various ways in which they used their smartphones to

access the conference agenda or record information from a particular session. The following quotations are examples of conference-related smartphone use:

> Flynn: I'll use it to take pictures, photographs of overhead slides and things like that. {interview-F, p. 2, lines 69-70}
>
> Isaac: I interacted with either the presenter or used [my smartphone] to assess the quality of that workshop. {interview-I, p. 3, lines 90-91}
>
> Hannah: If there are concurrent sessions and I chose one, but another is also very much interesting to me, I can follow up on more than one session. And I try to get the most out of [conferences] because I'm paying for them. {interview-H, p. 2, lines 55-57}

The interview results indicated that when faculty attended industry conferences in their subject field, they used smartphones to access the conference program or app, to engage with session content or presenters, to assess and provide feedback, and to observe and participate in social media threads with other conference attendees. There were some exceptions to these usage examples; some faculty were using only basic smartphone features during conference sessions, such as represented by Flynn's example of photographing overhead slides.

Those faculty who actively were pursuing another degree or certification in their field used smartphones to complete online coursework, engage with their instructors or fellow students, and access professional research or review materials. Shirley, an adjunct instructor, commutes between her full-time job and two different universities where she teaches in-person classes. During her drive, she uses her smartphone "to listen to study tools from online for [her] CPA review" {interview-S, p. 1, line 34}.

As an adjunct instructor, Danielle commented that she could not attend faculty development programs in-person due to schedule conflicts with her other jobs. Therefore, she used her smartphone to connect to professional webinars or watch recorded sessions

during convenient times in the evenings. All three of the adjunct faculty interviewees described using their smartphones to connect to university or industry webinars. Danielle and Shirley both commented that they would not have been able to attend a number of webinars had they not used their smartphones to connect to the sessions.

Of particular interest, Hannah described using her smartphone to record the audio portion of her teaching sessions. As a non-native English speaker, she used the device for self-reflection and would listen carefully to her own pronunciations to determine where she needed to focus her improvement efforts.

To elicit comments more focused on faculty development, which contributed to the research theme of faculty development engagement, the interviewees were asked how they had used smartphones for professional learning during a faculty development session. Depending on the responses provided, the researcher may have asked for further information regarding the session facilitator, location, timing, and if there were any smartphone barriers experienced or witnessed during the event. Five of the faculty interviewees described instances of smartphone use during faculty development sessions; four experiences were initiated by the session's facilitator. The exception was social media-based note-sharing that was initiated by the interviewee at a higher education teaching and learning conference. All four of the facilitator-led smartphone integrations were targeting audience-engagement. Three of the participants mentioned a Kahoot! challenge game that was incorporated into faculty development sessions at the participants' university and one participant described using an *Ask the Presenter* screen within a conference agenda smartphone app to engage with session speakers directly. The researcher noted that the game-based learning format of Kahoot! seemed to elicit the

most excitement during the interview discussions of smartphone use in faculty development. Overall, the interview results indicated that faculty were using smartphones for professional learning in faculty development sessions in limited capacities with no mention of constructivist-based activities like reflective journaling or formative feedback.

Research Question Three

What are faculty perceptions of the use of smartphones during faculty development sessions? Survey respondents were asked to rate the importance of their smartphone in their professional learning to begin addressing research question three. Only a slight majority of survey respondents (54.2%) indicated some type of importance (e.g., *very important* or *somewhat important*). Survey participants were also asked to gauge whether or not their smartphone offered any time savings in their professional learning. According to the survey results, more than 60% of respondents either *agreed* or *somewhat agreed* that their smartphone offered time savings in professional learning. When compared to the importance of smartphone use in professional learning, a 7.5% increase in survey respondents indicated that their smartphone offered time savings in their professional learning. These results contributed to the research themes of smartphone affordances and faculty development engagement.

As a non-native English speaker, Hannah felt that the inclusion of smartphone technology in faculty development conference sessions enhanced her experience because she could check definitions and bookmark topics for future research. References to convenience and engagement were also cited by faculty when describing how they evaluated the smartphone integration in the faculty development session. These sentiments are reflected in Isaac's comments:

> Everything is happening for me through the smartphone because that's what you carry into these conferences. {interview-I, p. 2, lines 75-76}

> I'm engaged, I'm present, so, it lives on. {interview-I, p. 3, lines 90-92}

Based on the descriptions provided during the interviews, none of the faculty experienced faculty development sessions that had explicitly described the pedagogical rationale for including smartphone-based activities. This may have contributed to most interviewees only superficially remembering the activities or tool names used during the sessions. For example, Teresa was mildly interested in the smartphone technology she experienced during one faculty development session at the university. While she vaguely remembered responding to question prompts during the session, she did not experience a lasting impression from the technology that was used and commented that she did follow-up to explore the technology further after that one experience.

None of the interviewees opposed the inclusion of smartphone-based technology during faculty development programs, instead giving the impression that they would welcome it as a learning tool, but not necessarily the only target goal. This sentiment was illustrated in Earl's comments:

> I think it's good to integrate where appropriate. Done appropriately, where they're just using [smartphones] to help faculty learn another topic and it's not the focus of the session. {interview-E, pg. 2, lines 76-77}

In contrast, Jemma felt very strongly that *any* planned smartphone use during faculty development could lead to success due to higher engagement levels for attendees. She mentioned enjoying the smartphone-based activities with Kahoot! during previous faculty development sessions and that it was very easy to engage with. The following quote stood out as a reflection of her perspective towards the use of smartphones by both

faculty and students: “You know, it's part of life so it might as well be part of learning” {interview-J, p. 3, lines 98-99}. Alton and Isaac shared a similar sentiment in that smartphones were becoming an industry standard, and as more and more faculty realize how useful they are, the trend for faculty development integration only will increase.

As was noted in the Chapter Two literature review, higher education faculty are incorporating smartphones in their classrooms regardless of prior experiences with faculty development training (Kukulska-Hulme, 2012). As such, all interview participants were asked whether they previously had integrated smartphones into their classroom teaching, and to describe any smartphone integrations in regard to frequency and issues encountered. The interview data revealed that each of the nine faculty interviewees was already integrating smartphones in their classes. The next section in this case study report provides descriptions of the interview participants’ experiences of teaching with smartphones.

Research Question Four

How are faculty integrating smartphone technologies in their teaching?

Examining the adoption of smartphones by the faculty participants developed into the research theme of smartphone class integration and revealed two primary schools of thought. First, smartphones were accepted in the classroom due to the device’s convenience, capability, and potential. Alternatively, smartphones were rejected due to student misuse, classroom distractions, and because faculty did not see them as ideal tools for composition. Those faculty in the rejection school of thought included prohibitive language towards technology in the course syllabus; for example, Teresa required students to turn their smartphones to airplane mode during class sessions.

To further advance the discussion, those participants who indicated a smartphone component in their classrooms also were asked why they selected a smartphone as the desired device and whether their integration was based on a faculty development session or collaboration with a colleague. Based on their responses to the initial questions regarding smartphones, the researcher assumed that a few of the faculty interviewees would not have integrated smartphones previously into their classroom teaching. With that in mind, the researcher was surprised to find that all nine of the interviewees were incorporating some aspect of smartphone use in their in-person courses. The level and type of smartphone use varied from minimal fact-checking to weekly content production.

Two participants had similar stories of unsuccessful first attempts at incorporating a smartphone app they had used during a conference. Neither Earl nor Isaac had planned out fully their initial classroom integration but was including smartphone tools due to a desire to produce the same results they experienced at a conference. Earl wanted to give his students a more tangible, visual experience of a math concept through a new smartphone app he witnessed at a conference session. Interestingly, he commented that he had not installed the app himself because he did not want to use his phone's limited storage space, but had instructed his students to install the app for a 15-minute activity during one class session. He reflected that by not being more proactive in his approach, the lesson was not successful and that the amount of time he spent troubleshooting the students' issues made it clear he would not try it again. Isaac also wanted to recreate a conference experience in his attempt to replicate the audience engagement he had witnessed, as is evidenced by his statement:

> I had come back from [an automotive conference] where a presenter used PollEverywhere, and I came back and tried to mimic it, but didn't have enough

> information….it went horrible! So I was like, I'd better get some more information before I just try to copy somebody. {interview-I, p. 4, lines 158-161}

While Earl still encouraged students to use their smartphones after that initial failed attempt, he no longer tried to plan a lesson around smartphone tools. In contrast, Isaac actively sought out assistance from his university faculty support personnel, the university's instructional technologist, to redesign his lesson. The reasons he stated for not giving up on the idea of audience participation were that he wanted an engaged classroom and also to mimic current trends happening in the industry that his students would experience firsthand upon graduation. This desire to immerse students in workforce technology prior to graduation is consistent with recent research surrounding business-focused universities, like the one in this study (Watty et al., 2016).

The faculty participants in this case study offered a unique perspective due to their close relationships with the industries of their subject matters; the majority of interviewees were still working or consulting in their fields of study at the time of this research. This combination of rich connections with current industry practices and workplace technology led participants like Isaac to continue including smartphones in his classroom even with concerns of distraction.

> I want an engaged classroom, you know, and, I don't ban tech from the classroom, knowing the risk that's involved with it….I don't ban because I know how much I use it in [industry] settings and I want [students] to have access because when they go out into the [industry] world it's an integral part of their learning. {interview-I, p. 5, lines 181-185}

The idea of student engagement also was cited as the rationale behind the smartphone integrations by Flynn and Hannah. Prior to including smartphones as the primary engagement device, Flynn was using Turning Point® response clickers in his

accounting classes. Essentially, he was forced into using smartphones when the software tied to the clickers reached its end-of-life cycle with the product vendor. Rather than losing all of the content he had created for engagement, he upgraded the software version to the smartphone application and was able to continue with minimal issues. When asked how and why he started using the student response tools for engagement, Flynn joked that he "use[d] it just so they don't fall asleep" {interview-F, p. 4, line 141}. He learned about the response system from a faculty colleague who was using the clickers and experiencing positive results herself.

Hannah mentioned another smartphone-based classroom engagement tool, Kahoot! The product offers a competitive quizzing environment where the fastest, correct responses earn the highest points. Hannah commented that her students "come more prepared for Kahoot! than their ordinary quizzes," {interview-H, p. 3, line 126} and she chose to continue using the smartphone tool because "they never forget their cellphones" {interview-H, p. 3, line 113}.

Jemma provided the most variations of smartphone classroom integrations of all the participants. She incorporated the devices into her classes on a weekly basis and had students taking photographs of their work, using review games to collect instant feedback, texting with her outside of class times, researching current industry practices with industry leaders, recording video reflections, and compiling shared notes with their group members. While discussing the various ways in which smartphones were used in her classes, Jemma also described a student-initiated smartphone scenario that enabled a student to access course content during an in-class group project:

> He managed to open his phone and get to the part in the textbook because his laptop broke last night. So students do find ways of getting creative with their phones as well. {interview-J, p. 3, lines 111-113}

When asked where she got the idea to start using the smartphones in class she replied, "It was an idea I thought I was going to try. Probably because I was doing it myself in different situations through my [own] learning" {interview-J, p. 4, lines 164-165}.

Two participants voiced their displeasure with integrating smartphones in their classes. Danielle revealed a dependence on smartphone technology during her interview but does not actively initiate smartphone integrations with her own students. The researcher was surprised to find that Danielle requires students to keep their smartphones put away, but will openly use her device during class. Danielle fully noted the irony of her policy by stating, "Mine is out so it's kind of like, do as I say, not as I do" {interview-D, p. 4, lines 133-134}. Danielle mentioned that she allowed students to take photographs of her PowerPoint slides, but also on "the first day I talk about technology rules, and I do want [smartphones] to be put away" {interview-D, p. 3, line 130}.

Teresa had the strongest opposition to smartphones or any personal technology in the classroom environment, even though she commented on their usefulness at times. Following is a series of her comments regarding the policies and viewpoints she has for classroom technology:

> Ordinarily they're not allowed to be doing anything with them. I ask them to put them on airplane mode. {interview-T, p. 2, lines 94-95}

> [If] we're talking about something, and something pops up and I don't know the answer or we want to extend, you know, we don't know something about that topic, we can check that, you know, just check it; it's almost a little bit like a fact checker really. {interview-T, p. 3, lines 119-121}

> I've had the no laptop policy for quite a while now. And tried to shut down all the involvement with the phones because they're a huge distraction, which is, by the

> way, a serious worry that I have about [that] kind of widespread use, of especially the smartphones in the classroom. {interview-T, p. 3, lines 127-129}

These types of conflicting viewpoints and comments regarding smartphones in the classroom are similar to the types of mixed comments interviewees made regarding their own smartphone use.

The data collection results from the case study survey and interviews were presented in this chapter. The next chapter discusses the results, how they connect with previous research and possible implications and suggestions for future research.

CHAPTER FIVE: DISCUSSION

Overview

The goals of this research were to assist faculty developers in viewing smartphone integrations through a faculty lens and to enable this viewpoint to guide faculty development programs that integrate smartphones and ultimately influence faculty adoption of smartphones in their classrooms. This study followed an instrumental, single-embedded case design to describe the real-life circumstances and provide a rich description of the phenomenon (Merriam, 2009; Stake, 2000; Yin, 2003). The faculty selected for this case study aided in the transferability of results (Flyvbjerg, 2007) because their teaching context commonly occurs in higher education (residential, undergraduate, in-person teaching). To frame and guide the data collection and analysis, this study relied on Rogers' diffusion of innovation theory (2003) to reflect upon the acceptance of classroom smartphone technology and Koole's FRAME model (2009) to consider the specific smartphone integration concerns (refer to Appendix F for a summary of the research questions, data collection questions, and guiding frameworks). The findings of this case study are discussed in this section first in relation to the research, then in relation to the guiding frameworks, and finally with recommendations for future research and practice.

Discussion of Findings

The first theme to emerge during data collection and analysis was the variety of ways in which faculty were using their smartphone devices. For personal use, smartphones were being used as social communication and entertainment tools. Examining the professional side of faculty smartphone use revealed administrative tasks, degree-seeking activities, and industry connections. Faculty were satisfied overall with their smartphones for personally integrated social and entertainment use, and while somewhat less integrated, they were equally satisfied with their professional use of smartphones. Faculty interviews revealed perspectives of reliance, convenience, engagement, and a somewhat unfavorable or guilty feeling that they were dependent on their smartphones. All data sources of this case study indicated that smartphones were a helpful and convenient tool that faculty have become reliant on in their everyday lives; however, for content production or composition, laptops were preferred. These findings are consistent with previous research that identified the smartphone as a ubiquitous tool with various readily available digital resources (Havel et al., 2017; Kearney & Maher, 2013; Kukulska-Hulme, 2012).

The device affordances that are unique to smartphones developed as another research theme in this study. Aside from the portability of the devices, the variety of communication opportunities and the convenience of quick access to digital information were also common reasons why faculty preferred their smartphone to other tools, which are in line with past research findings (Hsu et al., 2014). Although the results of the interviews were generally more favorable toward devices with larger screens when

working on major projects or compositions, one exception existed. Jemma indicated that she preferred her smartphone to a laptop even when it was more difficult for composition.

In contrast with the desirable smartphone affordances, a theme of smartphone barriers appeared in the data. Specific barriers to smartphone use by the faculty included storage limits, small screen sizes, battery life, Wi-Fi access, and the time necessary to learn new features. The most frequently occurring barriers to smartphone use in this case study were small screen sizes and the time needed to discover and learn new smartphone technologies. These findings were in line with previous mobile learning research that found screen sizes (Cochrane & Bateman, 2010; Gikas & Grant, 2013), and time (Kukulska-Hulme, 2012; Watty et al., 2016) were consistent barriers to mobile learning initiatives.

The interviewees indicated that the ways in which they were using smartphones for professional learning were either informal, self-directed approaches or formal programs that were facilitated by an institution, similarly, recent research has found the same division in faculty development offerings for higher education instructors (Phuong et al., 2018). This case study revealed the following approaches to faculty professional learning via smartphone: accessing online documents, connecting to webinars, engaging with conference sessions/mobile apps, communicating with colleagues, and formal degree-seeking activities. These results led to the emergence of another research theme, the faculty perceptions and experiences of smartphone integration in faculty development programs. Once such perception was that some faculty participants noticed a trend of increasing smartphone inclusion during faculty development sessions. In addition, the integration of smartphone activities was noted by interview participants to increase the

engagement levels of attendees during faculty development sessions. This finding is consistent with past research that targeted education departments and found mobile learning capable of increasing learner engagement and participation (Hargis et al., 2014; Hsu & Ching, 2013). A careful review of the interview transcripts revealed a general sense that using their smartphones during faculty development sessions also enhanced participants' professional learning. Primarily, if the purpose of a faculty development session was well served by integrating smartphones, faculty were open to the idea. In other words, some faculty were open only to smartphone use during faculty development based upon the contingency of the end-goal. These case study results appear to align with previous literature that indicated faculty found added value in using smartphone technology during sessions focused on teaching and learning methods, not solely on how to use the technology (Kukulska-Hulme, 2012).

The final theme examined here was the integration of smartphones in the participants' teaching. During the interview phase of this research, it became apparent that faculty have noticed nearly all of their students bringing a smartphone to class. As such, faculty were integrating smartphones in the classroom when it was appropriate for the lesson and situation, even when there was a *no cell phone* policy included in the syllabus. Halaweh (2017) offered a possible reason for the smartphone integrations in that each faculty member personally witnessed the need for smartphone use in class; for example, looking up the definition of a word or photographing assignment deadlines from the whiteboard. One of the participants, Teresa, who had very strong concerns about the disruptive and pervasive nature of smartphones (Hsu et al., 2014) in her classroom,

openly remarked that her students often used them for quick fact-checking activities during class discussions.

Faculty attitudes impact adoption and use of technology (Watty et al., 2016) so it was surprising to discover that some participants, like Teresa, who held negative attitudes towards smartphone integration still were using them on a steady basis during their lessons. Table 5.1 summarizes the interview participants' perspectives on class smartphone integrations along with their active class integration practices.

Table 5.1 Interviewee Class Smartphone Integrations

Interviewees	Class Integration Perspective	Class Integration Practices
Alton	Very open to smartphone integration	Occasionally (on an *as needed* basis)
Danielle	Not really open to smartphone integration	Occasionally (on an *as needed* basis)
Earl	Somewhat open to smartphone integration	Regularly (multiple times each semester)
Flynn	Not really open to smartphone integration	Regularly (multiple times each semester)
Hannah	Somewhat open to smartphone integration	Regularly (multiple times each semester)
Isaac	Very open to smartphone integration	Regularly (multiple times each semester)
Jemma	Very open to smartphone integration	Regularly (multiple times each semester)
Shirley	Open to smartphone integration	Occasionally (on an *as needed* basis)
Teresa	Not at all open to smartphone integration	Occasionally (on an *as needed* basis)

Note. Class integration perspectives were drawn from survey question 16 and interview question 5.

The types of smartphone integrations varied widely among the faculty participants. The researcher found that only some of the interviewees were integrating a few constructivist-based smartphone activities into their classrooms: real-time virtual collaboration, data sharing, and formative feedback. These results may be connected with the lack of education focused degrees by the interview participants. With no formal training in education theory, it is likely that the interviewees may not have been familiar with constructivist-based activities. The interviews revealed that only the faculty-driven smartphone integrations that were targeting a specific goal or purpose were deemed successful by those faculty incorporating them in the classroom. Faculty who tried to integrate smartphones for the novelty of it, with no focus on the outcome, indicated that they were not successful. These results were consistent with past research that found that faculty who aligned technology and pedagogy were the most successful in affecting learning (Bennett et al., 2012). It was not surprising that the faculty who were integrating smartphones on a regular basis were also the ones with a specific purpose or end goal in mind. The desirable class outcomes that were cited by interviewees as their end goals included classroom engagement, enhanced learning, or quick assessment that could be mediated by smartphone technology. Again, these results align with previous research that found the success of mobile integration based on fully planned out technology implementations, with pedagogical rationale included (Ekanayake & Wishart, 2014; McFarlane et al., 2007).

Frameworks for Smartphone Acceptance and Use

This study examined the smartphone from the faculty perspective through the lens of Koole's (2009) aspects of device and learner, as well as Rogers' (2003) considerations

of innovation and time. Viewed through the diffusion of innovations model, the adoption rate of smartphones is influenced by the perceived relative advantage, compatibility, trialability, observability, and complexity of the smartphone technology (Rogers, 2003). Some of the factors affecting Roger's rate of adoption were translated previously into an instructor's past technology experiences, attitude, and confidence with that technology (McFarlane et al., 2007). Research on technology use by university faculty has shown a positive association between self-efficacy and the perceived usefulness of the technology in question (Buchanan, Sainter, & Saunders, 2013). The survey results in this case study implied that some respondents rated their self-efficacy high enough to complete smartphone tasks for the first time without requiring assistance, when comparing the survey respondents' ability to complete smartphone tasks and the number of respondents who had never completed the tasks previously. The interview results revealed that participants had a high comfort level with their smartphones, and the majority could be characterized as completely comfortable with their smartphone use. Additionally, both data sources indicated that the faculty participants were satisfied with their smartphone use, while their perception of smartphone importance was almost evenly spread. Table 5.2 combines the survey and interview data from the interviewees to reflect these confident attitudes and perceptions.

Table 5.2 Interviewee Smartphone Self-Efficacy and Perceptions

Interviewees	Satisfaction with Smartphone	Proficiency with Smartphone	Smartphone Importance
Alton	Very satisfied	Proficient	Values smartphone
Danielle	Satisfied	Somewhat proficient	Values smartphone
Earl	Satisfied	Proficient	Does not entirely value smartphone
Flynn	Satisfied	Proficient	Does not value smartphone
Hannah	Very satisfied	Distinguished	Highly values smartphone
Isaac	Satisfied	Somewhat proficient	Somewhat values smartphone
Jemma	Satisfied	Proficient	Somewhat values smartphone
Shirley	Satisfied	Proficient	Values smartphone
Teresa	Very satisfied	Proficient	Does not entirely value smartphone

Note. Satisfaction ratings are a combination of survey questions 6 and 8. Proficiency ratings are a combination of survey question 9 and interview question 2a. Smartphone importance is a combination of survey questions 14 and 15.

These results indicate that the research participants are likely to adopt smartphones in their classes because faculty attitude and confidence with technology have been shown to positively influence the rate of adoption with that technology (McFarlane et al., 2007; Rogers, 2003).

Only two of the nine interview participants had experienced a faculty development session that fully incorporated smartphone technology into the program. These findings support the idea that "most educators have had limited opportunities to observe and experience mobile pedagogies" (Burden & Kearney, 2017, p. 113). Both Jemma and Isaac described smartphone-based learning activities during development programs. This indicated a possible reason that both of these two instructors were also the

only interview participants that were very open to integrations and also regularly integrating smartphone activities in their courses. Like Jemma and Isaac, the third interviewee that was “very open” to classroom smartphone integrations had also earned an MBA degree, a finding that was consistent with previous research indicating mobile learning frequently occurring in and supporting professional studies (Wu et al., 2012).

If "faculty development is a significant key to the continued success of higher education," (Camblin & Steger, 2000, p. 16) then faculty development programs must continue to evolve in order to remain relevant or risk outdated faculty practices. Viewing faculty development as the communication channel for diffusion (Rogers, 2003), it is reasonable to conclude that offering faculty development opportunities that include theory-based preparation, smartphone integrated activities, and faculty reflection opportunities (Cochrane & Bateman, 2010) could aid in the adoption of smartphone technology in the classroom. Additionally, increased awareness among faculty of pedagogical smartphone successes could lead to wide-spread faculty adoption (Rogers, 2003). To promote acceptance, faculty development programs should focus on smartphone affordances that are ideal for “small screens and slower text entry, as well as those affordances that are unique to [smartphones] (e.g., the built in geotagging, media recording capabilities, and communications tools)” (Cochrane & Bateman, 2010, p. 4).

One instructor emerged during this research as a clear early-adopter (Rogers, 2003) of classroom smartphone implementation. Jemma regularly included opportunities that have emerged in recent research as ideal smartphone-based mobile learning activities, such as Kahoot! review games to collect in-the-moment feedback (Havel et al., 2017), enhanced instructor-learner interactions by texting with her students outside of the

scheduled class times (Isiyaku et al., 2018), and learner reflections through smartphone video recordings (Ng'ambi & Lombe, 2012). Using Koole's FRAME model to analyze a smartphone implementation like Jemma's involves reflection on each aspect of the model. First, the smartphone was selected as the mobile device because students were comfortable already with their own smartphones, and the device capabilities allowed students to focus on the tasks at hand, rather than on the device (Koole, 2009). Next, the mobile learning activities that were guided by Jemma included assessing the current knowledge of the learners, varying multimedia and stimuli, and the personalization of experiences, which offered convenient access to multiple formats of content (Koole, 2009). The third area of the FRAME model—social aspects—required Jemma to utilize a shared vocabulary and clearly communicate her expectations or guidelines for smartphone integration activities. Essentially, the students' consumption and creation of knowledge needed to be culturally relevant to the class (Koole, 2009).

Additionally, the overlapping portions where the three areas of device, learner, and social aspects of the FRAME model need to be considered in relation to the others. As an example, the device and learner areas combine to include considerations of smartphone durability and connect-ability, ease of use, and learner control of aesthetics. The device-social intersection that must be considered includes setting a minimum wireless network expectation in the physical classroom and the necessary collaboration platform (e.g., Kahoot!). Finally, the social-learner combination requires reflection on the relationships, social interactions, and preferences of learners, as well as the mobile spaces needed to facilitate learning with mentors or experts. The experts could include the textbook authors, the class instructor, or, in a smartphone example given by Jemma,

leaders from the industry with whom students engage online. When the three aspects of Koole's FRAME model combine at the center of the Venn diagram shown in Figure 5.1, the resulting mobile learning system impacts interactions, information processing, life-long learner skill sets, and the roles of teachers and learners (Koole, 2009).

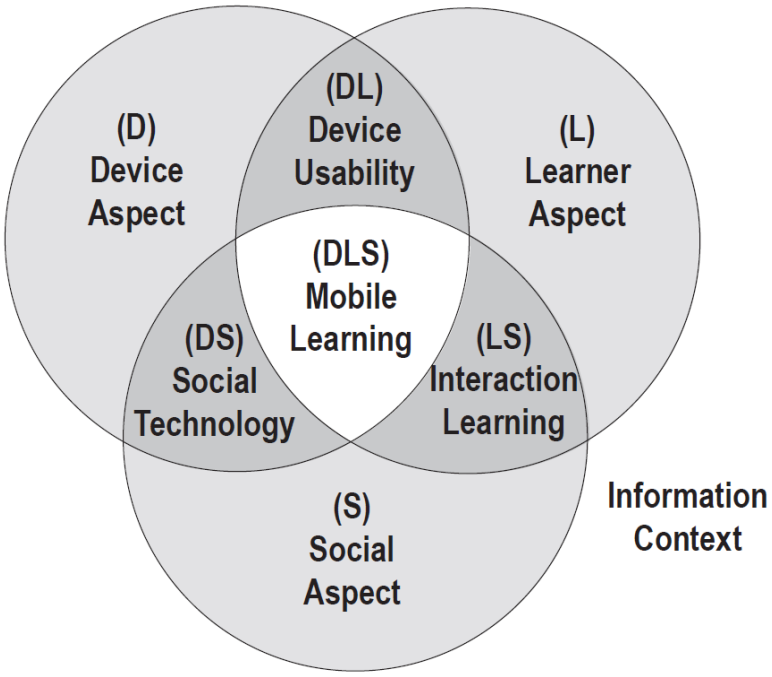


Figure 5.1. The FRAME Model presented as a Venn diagram. From "A Model for Framing Mobile Learning," by M. L. Koole, 2009, in M. Ally (Ed.), Mobile Learning: Transforming the Delivery of Education and Training, p. 27. Copyright 2009 by AU Press. Used with author's permission.

The faculty in this case study were using smartphones during both professional learning and classroom teaching in ways that were the most convenient to reach their desired goals. While some focused on bringing industry-relevant content and practices into their classes, others still were limiting smartphones to basic fact-checking scenarios or cameras to document important notes from an overhead screen. Based on these experiences, the educational community is still "grappling with how best to utilize mobile technologies and apps for teaching and learning" (Khaddage et al., 2015, p. 626).

Recommendations for Future Research

Addressing the four research questions in this case study revealed that there are still questions left to answer. For instance, evidence in this study showed that faculty do not readily collaborate with colleagues when implementing smartphone-based lessons. Further research into the smartphone integrations of faculty development programs might examine the potential of cross-discipline collaboration. As faculty are given more opportunities to work together when preparing smartphone lessons, their usage of these devices can increase (McFarlane et al., 2007). This recommendation is also supported by other researchers who posited that cross-discipline faculty would do well to collaborate on mobile learning initiatives (Wu et al., 2012) and that communities of practice are critical to mobile learning success (Cochrane, 2014).

Future researchers also could focus on newly emerging smartphone affordances because some technology can become out of date while research is still in progress (e.g., Lefoe et al., 2009). Another area for future research is the impact of faculty development smartphone integrations on the attitudes of faculty. It has been noted that pedagogically focused mobile technology implementations can alter the teaching and learning relationship, essentially transforming a professor into a facilitator or mentor (Idrus & Ismail, 2010; Koole, 2009). This transitioning of roles may affect faculty attitudes in terms of job satisfaction or how they see themselves as professors.

Recommendations for Practice

The smartphone's readily available technology (Havel et al., 2017; Kearney & Maher, 2013; Kukulska-Hulme, 2012) can help faculty diversify content and promote innovation and collaborative, contextual learning (Hsu et al., 2014; Isiyaku et al., 2018).

Faculty development smartphone initiatives focused on devices, learners, and social aspects can guide and offer collaborative opportunities for faculty to experience well-planned smartphone integrations from a student perspective. As the integration of smartphones in faculty development programs becomes more prevalent, these case study results can help guide faculty developers to design purposeful implementations with pedagogical considerations. The results of this case study were clear regarding faculty levels of comfort and self-efficacy with their smartphone devices. Faculty were confident and willing to take risks with their own smartphone. Those planning smartphone-based faculty development programs will not need to provide mobile devices to attendees because attending faculty will be used to their own devices.

Faculty were opting to use smartphones for convenient access to their own professional learning needs. Faculty developers may consider designing materials that are mobile-friendly and specifically targeted to meet the needs of their institution, such as a cloud-based content repository compiled specifically for individual university departments.

Faculty were willing to utilize smartphones during faculty development programs that were working purposefully towards an end goal. Faculty developers could clarify their intentions for using a smartphone-based tool during a development program to provide guidance for those instructors who wish to mimic the same tool in the classroom. To help promote innovation, faculty developers can offer a variety of useful tools in a series for instructors to experience each tool and select the one that best fits their individual needs.

Faculty were incorporating smartphones as a teaching and learning tool in their classrooms. To assist in the successful inclusion of smartphone-based class activities, faculty developers can provide an outline of Koole's (2009) FRAME model for instructors to use as a guide when designing and evaluating the class activities.

With no previous focus on mobile learning at the research site, the researcher had not anticipated that every one of the interviewees already would be incorporating smartphones into their teaching. This case study finding will have a direct impact on the smartphone integrations within future faculty development programs at the research site. The instructional technologist (the researcher) and the instructional designer for the university will make an increased effort during faculty development programs to make visible the considerations of all aspects of the FRAME model while demonstrating best practices with mobile learning.

Limitations and Delimitations

A case study must be designed to understand fully the specific and bounded system being studied, not to be focused on generalizing the findings (Stake, 2000). In such a design, a researcher is tasked with relaying a rich description of context, situation, and data that enable readers to draw their own conclusions. As Merriam noted, "It is the reader, not the researcher, who determines what can apply to his or her context" (2009, p. 51). A lack of participation or the ability to recall past experiences may have limited the amount of data gathered. In fact, one interview participant repeatedly indicated that she could not remember whether or not she had used her smartphone during faculty development and commented that had she been interviewed closer to the actual event, it may have improved the research. Additionally, the basic criterion for a faculty member to

be invited to the interview phase was that he or she must have previously experienced a faculty development session that incorporated smartphones to some extent. With the faculty development events at the research site being primarily optional to attend, the interview candidates may have already shown a bias towards the inclusion of smartphones in faculty development merely by opting to attend such sessions previously.

The delimitations of this study included the chosen faculty population sample and the specified mobile learning environment and device. The researcher had direct access to faculty teaching at the selected private, non-profit university and chose to include only those faculty teaching on an undergraduate residential campus in an in-person modality because it offered the prospect of transferability of results to a broad audience. The smartphone was selected as the mobile learning device due to its omnipresent nature among the higher education landscape, and faculty development smartphone integration because of the noted research gap pertaining to mobile learning (Kukulska-Hulme, 2012).

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APPENDIX A

Survey

1. What is your level of use of the following mobile devices? [selection options: Very frequently (hourly or more), Regularly (a few times per day), Minimally (once per day or less), Rarely (a couple of times per week or less), Never]
    a. Mobile phone
    b. Laptop computer
    c. Tablet device (e.g., iPad)
    d. eBook reader (e.g., Kindle)

2. What are the characteristics of your mobile (cellular) phone? *Select all that apply*.
    a. Can *only* make calls and send/receive simple text messages
    b. Can send and receive longer text messages
    c. Can send and receive photos
    d. Can send and receive data (e.g., audio or video)
    e. Can browse the internet

[*Confirmation required when response includes "a"*] You indicated that your mobile phone can ***ONLY*** make calls and send/receive simple text messages. This type of mobile phone is NOT considered a smartphone.

    a. I do NOT own a smartphone
    b. My mobile phone is actually a smartphone (can send/receive photos and browse the internet)

[*Logical branching-when answer is "a": participant jumps to #16*]

[Logical branching-when answer is NOT "a"] It appears that you own what is known as a "smartphone" (which is how we will refer to it from now on). Please answer the following questions about it.

3. Which of the following best describes your smartphone's data plan?
    a. I use/pay for a minimum amount of data per month
    b. I use/pay for between 4GB and 16GB per month
    c. My plan includes unlimited data per month
    d. Unknown/unsure

4. How do you primarily use your smartphone?
    a. Calling/texting
    b. Watching videos
    c. Sending/reading email
    d. Reading articles/eBooks
    e. Using social media

5. To what degree do you believe your smartphone is part of your daily, *personal* life?

a. deeply integrated (constantly used)
b. integrated (regularly used)
c. partially integrated (used from time to time)
d. not at all integrated (very infrequent use)

6. How satisfied are you that your smartphone is __[*response from #5*]__ into your daily, personal life?
    a. Very satisfied
    b. Satisfied
    c. Somewhat dissatisfied
    d. Not at all satisfied

7. To what degree do you believe your smartphone is part of your daily, *professional* life?
    a. deeply integrated (constantly used)
    b. integrated (regularly used)
    c. partially integrated (used from time to time)
    d. not at all integrated (very infrequent use)

8. How satisfied are you that your smartphone is __[*response from #7*]__ into your daily, professional life?
    a. Very satisfied
    b. Satisfied
    c. Somewhat dissatisfied
    d. Not at all satisfied

9. Consider this list of smartphone activities and whether you are able to complete each task: [selection options: easy to do, may need assistance doing, cannot complete without assistance]
    a. Connecting to Wi-Fi
    b. Connecting to a Bluetooth enabled device
    c. Managing contacts (adding/editing/deleting)
    d. Accessing websites or online documents
    e. Installing new applications (apps)
    f. Sharing files or images with others through email/SMS/text messages

10. Consider this list of smartphone activities and indicate how frequently you complete each task: [selection options: every day, multiple times per week, multiple times per month, multiple times per year, never]
    a. Connecting to Wi-Fi
    b. Connecting to a Bluetooth enabled device
    c. Managing contacts (adding/editing/deleting)
    d. Accessing websites or online documents
    e. Installing new applications (apps)
    f. Sharing files or images with others through email/SMS/text messages

11. To what extent do you use the following smartphone activities for your own professional learning as a faculty member? [selection options: frequently, often, occasionally, rarely, never]
    a. Connecting to Wi-Fi
    b. Connecting to a Bluetooth enabled device
    c. Managing contacts (adding/editing/deleting)
    d. Accessing websites or online documents
    e. Installing new applications (apps)
    f. Sharing files or images with others through email/SMS/text messages

12. Faculty development takes many forms. Please indicate the type of faculty development activities in which you regularly engage. *Select all that apply.*
    a. Informal training, such as online videos or articles
    b. Informal collaboration with colleagues
    c. Formal conference sessions
    d. Formal online webinars
    e. Formal in-person workshops

13. Consider this list of faculty development activities and indicate how often you have used smartphones in each modality. [selection options: frequently, often, occasionally, rarely, never]
    a. Informal training, such as online videos or articles
    b. Informal collaboration with colleagues
    c. Formal conference sessions
    d. Formal online webinars
    e. Formal in-person workshops

14. How important is your smartphone in your professional learning?
    a. Very important
    b. Somewhat important
    c. Somewhat unimportant
    d. Unimportant

15. Indicate your response to the following statement: My smartphone offers time savings in my professional learning.
    a. Agree
    b. Somewhat agree
    c. Somewhat disagree
    d. Disagree

16. From this list of affordances of smartphones, indicate which you would consider implementing in your in-person classes. *Select all that apply.*
    a. Real-time virtual collaboration

b. Data sharing
c. Reflective journaling
d. Peer critique
e. Personalized learner support
f. Formative feedback

17. Are you willing to participate in a one-on-one interview to discuss using smartphones in faculty development?
    a. Yes
        i. [pop-up box] Enter your name and email address
    b. No

18. Select your current faculty status:
    a. Full Professor
    b. Associate Professor
    c. Assistant Professor
    d. Adjunct Instructor

19. Select your highest level of education completed: [entry box for each to] Enter "Major area of study"
    a. Doctorate (e.g., Ph.D., Ed.D.)
    b. Professional Degree (e.g., J.D.)
    c. Master's Degree (e.g., M.B.A., M.S.)
    d. Other

20. How long have you been teaching in higher education?
    a. [drop-down box] 0 to 30+ years

APPENDIX B

Interview Questions

1. What is your history with using smart-devices?
    a. How long have you had a smartphone?

2. What does your typical daily use of smartphones look like?
    a. Do you normally need to seek assistance when attempting something new with your smartphone?

3. How you have used smartphones for your own professional learning?

4. How have you used smartphones for professional learning during a faculty development session? (Learning with mobile or learning about mobile?)
    a. Who was facilitating the program?
    b. Where/When?
    c. One time event or one of series?
    d. Did you experience any problems while using your smartphone during this program? Personally or witnessed others?
    e. Do you feel this smartphone integration enhanced your professional learning?
    f. How do you evaluate the impact your smartphone made on your professional learning?

5. Have you integrated smartphones into your classroom teaching?
    a. If so, please describe the integration (primarily group work or individual student work, mixture of student based activities or instructor based activities, primarily lecture, etc.).
    b. Why did you select smartphones (as opposed to laptops)?
    c. Did you integrate smartphones before or after your first smartphone faculty development experience?
    d. Did you use any of the ideas from faculty development or a colleague during the smartphone integration? If so, which ones?
    e. How often do you typically include smartphones in your classroom?
    f. Do you typically encounter any problems incorporating smartphones into your lessons?

APPENDIX C

Online Survey Consent Form

Approved IRB Protocol Number: 101-SB18-127

You are invited to participate in a research study titled "Faculty Perceptions of Smartphone Integration in Professional Development." This study is being conducted by Jeanna Cronk (Doctoral Candidate) and Ross Perkins (Associate Professor) from Boise State University. You were selected to participate in this study because you are a faculty member that teaches in-person classes on a residential, undergraduate campus.

The purpose of this research study is to learn more about what faculty like and dislike about smartphone integration in professional development programs. If you agree to take part in this study, you will be asked to complete an online survey/questionnaire. This survey/questionnaire will ask about mobile technology and mobile learning and will take you approximately 6 minutes to complete.

You may not directly benefit from this research; however, we hope that your participation in the study may help those in faculty development further advance their practices.

We believe there are no known risks associated with this research study; however, as with any online related activity, the risk of a breach of confidentiality is always possible. To the best of our ability your answers in this study will remain confidential. Contact information will not be used in any written reports or publications which result from this research. Data will be kept for three years (per federal regulations) after the study is complete and then destroyed.

Your participation in this study is completely voluntary and you can withdraw at any time. You are free to skip any question that you choose.

If you have questions about this project or if you have a research-related problem, you may contact the primary researcher, Jeanna Cronk at (989) 600-1078 or Dr. Ross Perkins at (208) 426-4875. If you have questions about your rights as a research participant, you may contact the Boise State University Institutional Review Board (IRB) by calling (208) 426-5401 or by writing: Institutional Review Board, Office of Research Compliance, Boise State University, 1910 University Dr., Boise, ID 83725-1138.

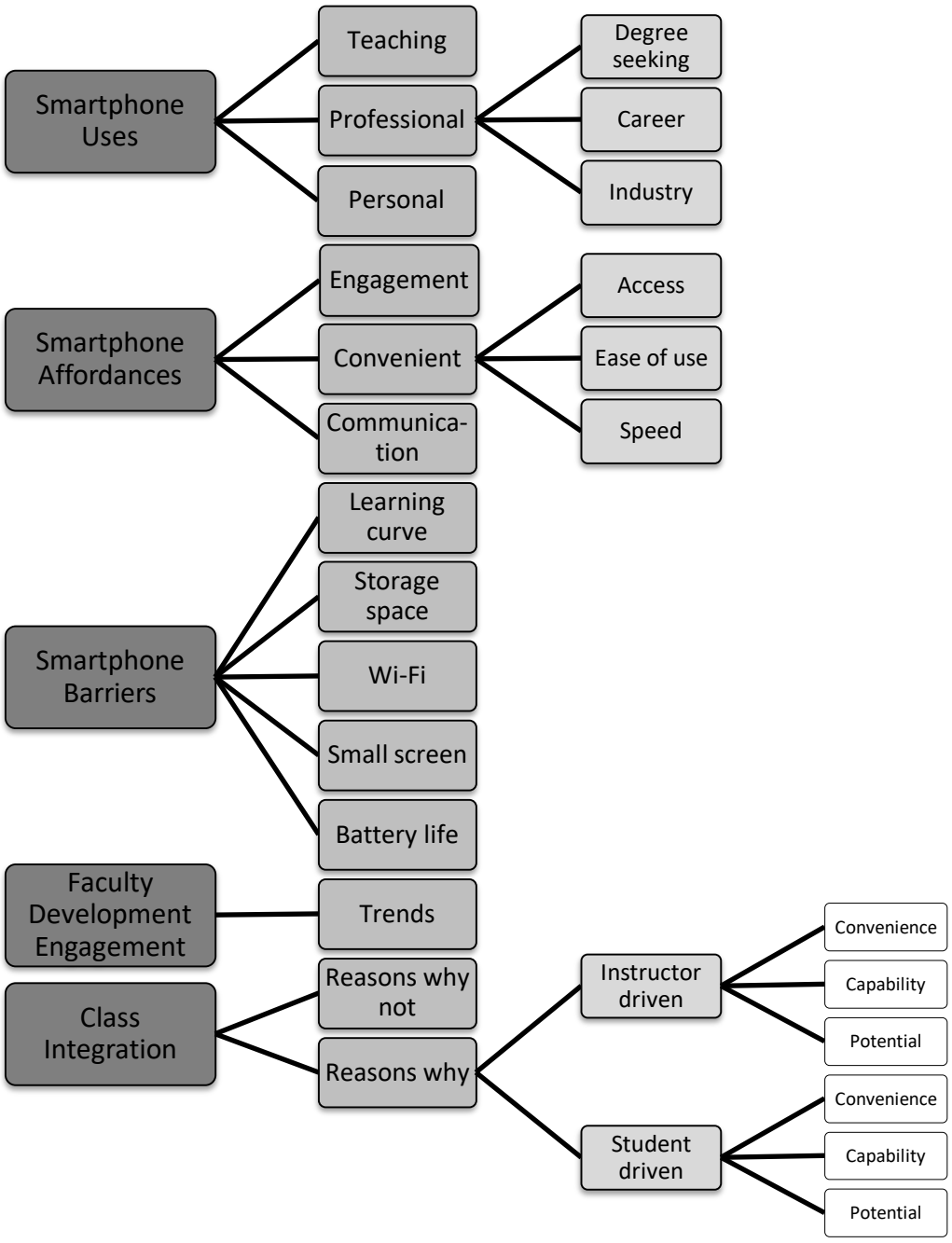
By clicking "I agree" below you are indicating that you are at least 18 years old, have read and understood this consent form and agree to participate in this research study. Please print a copy of this page for your records.

a. I agree

b. I do not agree

APPENDIX D

Emergent Themes



APPENDIX E

Survey Results

Table E.1 Faculty Level of Use: Mobile Devices

Device	Very frequently	Regularly	Minimally	Rarely	Never
Mobile phone	37 (77.1%)	11 (22.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Laptop computer	19 (39.6%)	19 (39.6%)	4 (8.3%)	5 (10.4%)	1 (2.1%)
Tablet device	5 (10.4%)	14 (29.2%	8 (16.7%)	10 (20.8%)	11 (22.9%)
eBook reader[a]	0 (0.0%)	3 (6.4%)	7 (14.9%)	9 (19.1%)	28 (59.6%)

Note. $n = 48$. Selection options included: Very frequently (hourly or more), Regularly (a few times per day), Minimally (once per day or less), Rarely (a couple of times per week or less), Never. [a]$n = 47$.

Table E.2 Faculty Smartphone Data Plans

Data Plans	Count
I use/pay for a minimum amount of data per month	6 (12.5%)
I use/pay for between 4GB and 16GB per month	17 (35.4%)
My plan includes unlimited data per month	22 (45.8%)
Unknown/unsure	3 (6.3%)

Note. $n = 48$.

Table E.3 Faculty Smartphone Use

Primary Smartphone Use	Count
Calling/texting	28 (58.3%)
Watching videos	1 (2.1%)
Sending/reading email	11 (22.9%)
Reading articles/eBooks	1 (2.1%)
Using social media	7 (14.6%)

Note. $n = 48$.

Table E.4 Faculty Smartphone Self-Efficacy

Smartphone Activity	Easy to Do	May Need Assistance Doing	Cannot Complete Without Assistance
Connecting to Wi-Fi	46 (95.8%)	2 (4.2%)	0 (0.0%)
Connecting to a Bluetooth enabled device[a]	38 (80.9%)	9 (19.1%)	0 (0.0%)
Managing contacts (adding/editing/deleting)	47 (97.9%)	1 (2.1%)	0 (0.0%)
Accessing websites or online documents	47 (97.9%)	1 (2.1%)	0 (0.0%)
Installing new applications (apps)[a]	43 (91.5%)	3 (6.4%)	1 (2.1%)
Sharing files or images with others through email/SMS/text messages	42 (87.5%)	6 (12.5%)	0 (0.0%)

Note. $n = 48$. [a]$n = 47$.

Table E.5 Faculty Personal Smartphone Activity Frequencies

Smartphone Activity	Every Day	Multiple Times per Week	Multiple Times per Month	Multiple Times per Year	Never
Connecting to Wi-Fi	36 (75.0%)	6 (12.5%)	3 (6.3%)	3 (6.3%)	0 (0.0%)
Connecting to a Bluetooth enabled device[a]	18 (38.3%)	6 (12.8%)	10 (21.3%)	7 (14.9%)	6 (12.8%)
Managing contacts (adding/editing/deleting)	8 (16.7%)	11 (22.9%)	21 (43.8%)	8 (16.7%)	0 (0.0%)
Accessing websites or online documents	36 (75.0%)	11 (22.9%)	0 (0.0%)	0 (0.0%)	1 (2.1%)
Installing new applications (apps)[a]	0 (0.0%)	8 (17.0%)	19 (40.4%)	18 (38.3%)	2 (4.3%)
Sharing files or images with others through email/SMS/text messages	17 (35.4%)	16 (33.3%)	7 (14.6%)	7 (14.6%)	1 (2.1%)

Note. $n = 48$. [a]$n = 47$.

Table E.6 Faculty Professional Learning Smartphone Activity Frequencies

Smartphone Activity	Frequently	Often	Occasionally	Rarely	Never
Connecting to Wi-Fi[a]	23 (47.9%)	7 (14.6%)	5 (10.4%)	7 (14.6%)	6 (12.5%)
Connecting to a Bluetooth enabled device	4 (8.5%)	4 (8.5%)	7 (14.9%)	9 (19.1%)	23 (48.9%)
Managing contacts (adding/editing/deleting)	4 (8.5%)	3 (6.4%)	15 (31.9%)	12 (25.5%)	13 (27.7%)
Accessing websites or online documents	11 (23.4%)	12 (25.5%)	15 (31.9%)	4 (8.5%)	5 (10.6%)
Installing new applications (apps)	1 (2.1%)	2 (4.3%)	17 (36.2%)	15 (31.9%)	12 (25.5%)
Sharing files or images with others through email/SMS/text messages	6 (12.8%)	6 (12.8%)	15 (31.9%)	10 (21.3%)	10 (21.3%)

Note. $n = 47$. [a]$n = 48$.

Table E.7 Frequency of Smartphone Use in Faculty Development

Smartphone Activity	Frequently	Often	Occasionally	Rarely	Never
Informal training, such as online videos or articles[a]	4 (8.5%)	3 (6.4%)	19 (40.4%)	9 (19.1%)	12 (25.5%)
Informal collaboration with colleagues	3 (6.5%)	7 (15.2%)	13 (28.3%)	10 (21.7%)	13 (28.3%)
Formal conference sessions[b]	0 (0.0%)	3 (6.7%)	5 (11.1%)	16 (35.6%)	21 (46.7%)
Formal online webinars	1 (2.2%)	2 (4.3%)	13 (28.3%)	7 (15.2%)	23 (50.0%)
Formal in-person workshops	0 (0.0%)	1 (2.2%)	8 (17.4%)	14 (30.4%)	23 (50.0%)

Note. $n = 46$. [a]$n = 47$. [b]$n = 45$.

Table E.8 Faculty Consideration of Smartphone Affordances

Smartphone Affordances	Would Consider for Class Implementation
Real-time virtual collaboration	18 (37.5%)
Data sharing	21 (43.8%)
Reflective journaling	10 (20.8%)
Peer critique	11 (22.9%)
Personalized learner support	18 (37.5%)
Formative feedback	20 (41.7%)

Note. $n = 48$.

APPENDIX F

Research Questions, Data Collection Questions, and Guiding Framework

RQ1: What are faculty perceptions of smartphones?	
Survey Questions	How satisfied are you with your smartphone? From this list of affordances of smartphones, indicate which you would consider implementing in your in-person classes: Real-time virtual collaboration; Data sharing; Reflective journaling; Peer critique; Personalized learner support; Formative feedback.
Interview Questions	What is your history with using smart-devices? How long have you had a smartphone? What does your typical daily use of smartphones look like? Do you normally need to seek assistance when attempting something new with your smartphone? Have you integrated smartphones into your classroom teaching? If so, why did you select smartphones (as opposed to laptops)?
Theoretical Framework	Koole's FRAME model: Device and learner Rogers' Diffusion of Innovation model: Innovation, time/rate of adoption
RQ2: How are faculty using smartphone technologies for professional learning as a part of professional development sessions?	
Survey Questions	To what extent do you use the following smartphone activities for your own professional learning as a faculty member? [Connecting to Wi-Fi; Connecting to a Bluetooth enabled device; Managing contacts; Accessing websites or online documents; Installing new software applications; Sharing files or images with others through email/SMS/text messages] Consider this list of faculty development activities and indicate how often you have used smartphones in each modality. [Informal training, such as online videos or articles; Informal collaboration with colleagues; Formal conference sessions; Formal online webinars; Formal in-person workshops]
Interview Questions	How you have used smartphones for your own professional learning? How have you used smartphones for professional learning during a faculty development session?
Theoretical Framework	Koole's FRAME model: Device, learner, and social Rogers' Diffusion of Innovation model: Innovation, communication channels, and social system

RQ3: What are faculty perceptions of the use of smartphones during professional development sessions?	
Survey Questions	How valuable is your smartphone in your professional learning? Indicate your response to the following statement: My smartphone offers time savings in my professional learning.
Interview Questions	Did you experience any problems while using your smartphone during a faculty development program? Personally or witnessed others? Do you feel this [faculty development] smartphone integration enhanced your professional learning? How do you evaluate the impact your smartphone made on your professional learning?
Theoretical Framework	Koole's FRAME model: Device, learner, and social Rogers' Diffusion of Innovation model: Innovation, communication channels, time, and social system
RQ4: How are faculty integrating smartphone technologies in their teaching?	
Interview Questions	Have you integrated smartphones into your classroom teaching? If so, please describe the integration (primarily group work or individual student work, mixture of student based activities or instructor based activities, primarily lecture, etc.).Why did you select smartphones (as opposed to laptops)? Did you integrate smartphones before or after your first smartphone faculty development experience? Did you use any of the ideas from faculty development or a colleague during the smartphone integration? If so, which ones? How often do you typically include smartphones in your classroom? Do you typically encounter any problems incorporating smartphones into your lessons?
Theoretical Framework	Koole's FRAME model: Device, learner, and social Rogers' Diffusion of Innovation model: Innovation, communication channels, time, and social system