“PARTICIPANT PERCEPTIONS OF LEARNING TO PLAY GUITAR IN A MOBILE DEVICE BASED LEARNING ENVIRONMENT (MDBLE): A CASE STUDY OF GITSHED.COM”

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ABSTRACT

Mobile devices are transcending educational and professional environments at an ever-increasing rate by redefining our understanding of how, when and where we learn. The purpose of the study was to inform researchers of the attitudes and opinions related to the participant experience in a Mobile Device-Based Learning Environment (MDBLE) and to improve the effectiveness of the web-based instructional module, mobile videoconference intervention, and the social mobile learning aspects of the MDBLE. This research employed a single case study design that thoroughly investigated and documented student experiences using the MDBLE. The bounding frame was comprised of the literature on mobile technology, mobile learning theories, community of practice, social media, gamification and mobile flipped online instruction. Data gathered from interviews, surveys and researcher observations were analyzed to provide a rich description of the case. Overall results indicate that respondents were self-directed learners. Positive attitudes supported the belief that online courses provide opportunities for learners to interact with their peers via different channels, indicating a favorable desire for collaboration when taking online course. Multiple significant conclusions were reached.

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CHAPTER 1. INTRODUCTION

Learning to play guitar was an interest I developed when I was twelve years old. This interest developed after attempting to play clarinet before switching to the snare drum in my grade school band class. When I told my parents, I wanted to switch again – to guitar – they said that it was ok as long as I purchased the guitar myself. This meant I had to earn the money and buy it without their assistance. In hindsight, I now understand the lesson that they were teaching me: I needed to demonstrate a commitment to my instrument of choice and that switching was not an expense to take lightly.

I performed many chores and saved up enough money to buy a guitar that I found at a local store. However, a funny development occurred around the time that I purchased the guitar. I turned thirteen and became more interested in girls and sports. I never got over the initial finger pain that every beginner experiences, and that first guitar ended up sitting in a corner. I still wanted to learn, but it was not a priority; I was already very good at sports and very interested in girls.

Years went by and I kept telling myself that I was going to learn someday. That day came at the age of twenty-six, when I grew tired of simply thinking about learning to play; I decided to purchase an acoustic guitar and keep at it until I could play. I purchased a beautiful *"Kelly Green"* Yamaha acoustic that I named "Kelly" and took a couple of lessons from an exceptional "Blues" guitarist in Washington, D.C.

Shortly after I started my lessons I moved back to my hometown of Detroit, Michigan and started looking for a job. I attempted to follow the book that I had purchased at my instructor's direction, but it was another four years before I took formal lessons again. I started taking lessons at a local music store, but life quickly intervened once again when I was transferred to Des Moines, Iowa as a District Sales & Service Manager for the Cadillac Motor Car Division of General Motors; later, marriage also created a great demand on my time. Kelly came with me from D.C., to Detroit, to Des Moines, and back to Detroit before I finally took formal lessons again.

At thirty-five years old, I was more committed to following my dreams and focused on doing and learning things that gave me the same sense of pleasure and accomplishment that I received from being a college-trained visual artist. I ended my terrible marriage and was able to

find solace in my guitar learning. I found a very talented Jazz guitar player and started taking lesson that cost me $15.00 per half hour. He taught me the basics and some good practice exercises. However, I quickly found out that he was in control of the pace of my development. He was not motivated to move me along at the pace my enthusiasm and prior knowledge demanded, so I dropped him and started purchasing videos and books to help me with my development.

I was fortunate enough to not only be invited to join my church's guitar group that played in absence of the full choir on Saturday evenings, but I was also invited to support the choir at Sunday services. I learned more from playing with the choir than I had learned from my previous experiences and I finally began developing as a musician. I still continued to buy books, CDs, DVDs and other learning materials. During this time, I was running a graphic design & photography business while working part-time as a substitute teacher. My initial teaching experience taught me to be more critical about learning materials and I found most of the guitar related instructional products to be very deficient in their methods and audiovisual effectiveness. Many of the people producing the materials I explored could play well, but they could not teach. Even the better-produced materials presented a key problem: a lack of interaction; the inability for students to ask and have questions answered. Not having someone to sit face-to-face and see what I needed help with – not having someone to answer my questions – made the learning materials more challenging.

In the Fall of 2008, I completed my Master of Education degree specializing in visual art education. As part of my studies, I was required to select a cognate of courses outside of the visual arts. Being a child of the 1960s, a period of space exploration and technological innovation, I became interested in inventions that began to emerge, such as Audio Cassette Tapes (1962), the Computer Mouse (1964), Electronic Fuel Injection (1967), the Hand Held Calculator (1967) and the Artificial Heart (1969), among many other innovative products (Byars, 2012). Because of this interest, I have found new technologies to be of constant interest to me. I was elated to have the option of selecting Educational Technology as my master's degree cognate. This was, in my mind, a natural choice due to my attraction to new and emerging technologies, my use of computers in my visual arts business and teaching experiences as well as because of my growing interest in mobile phones and their potential use in education. I therefore selected

Educational Technology as my cognate and that choice led me to the University of Hawai`i at Mānoa where I started on this dissertation journey.

During graduate studies in both my master and doctoral programs, there has been a major focus on K-12 education and the in-classroom learning environment. My experience with K-12 education, corporate training and informal learning in seminars and gaming motivated me to not limit my view of where teaching and learning takes place. As a supporter of life long learning, I have expanded my view to one of Kindergarten to Grave (K-G), teaching and learning. This view involves the consideration of homeschool, community college, university, corporate, non-profit, distance and virtual learning environments as potential Mobile Learning (m-Learning) spaces.

When I began the doctoral program in the fall of 2009, my interests specifically focused on developing Mobile Devices (MDs) for educational use. I was intrigued by the ability to both watch videos and hold videoconferences on the mobile phones available at that time. Due to the rapid pace of change in mobile technology, my interest quickly shifted from MD development to Virtual Learning Environment (VLE) development, utilizing the videoconferencing capabilities of MDs.

According to Fanning (2008), a VLE is an online space designed to create a specific learning experience. These VLEs can involve online learning, distance learning, game-based learning, and even immersive simulations (Fanning, 2008). My attraction to emerging MD videoconferencing technology, and VLEs, motivated me to investigate the development of Mobile Device Based Learning Environments (MDBLE). My working definition for a MDBLE is: a VLE exclusively designed with a "mobile first" design perspective, for use by learners utilizing MDs.

Mobile devices are transcending educational and professional environments at an ever-increasing rate, redefining our understanding of how, when, and where we learn. As these trends continue, it is imperative to highlight, research, and interpret such data in an effort to inform and support the development and ongoing evaluation of effective learning environments, which are utilized by MDs.

The increase presence of mobile devices in the marketplace are providing an alternative to desktop and laptop computers. Pathak (2013) suggested, "in the near future, over one billion smartphones will be sold for the single calendar year 2013." Topolewski states, "It took decades

for China to become the largest PC market, for smartphones only a few years, exemplifying the astounding rate of digital acceleration" (Topolewski, 2013). Smartphones, Phablets and Tablet computers "are radically transforming how we access our shared knowledge sources by keeping us constantly connected to near-infinite volumes of raw data and information (Sergio, 2012). The question becomes: "With billions of mobile devices in the hands of ordinary citizens, how best [do we] utilize this incredible opportunity to improve education for so many" (Topolewski, 2013, p. 157). By using these devices, "we enjoy unprecedented instant access to expertise, from informal cooking lessons on YouTube to online university courses" (Sergio, 2012).

My experience with learning to play guitar and teaching basic guitar to individuals and groups in after-school programs has led me to explore the ways that mobile devices can be used to overcome the lack of face-to-face interaction for remote learners via videoconferencing; this exploration turned my focus toward a learner centric pedagogy. The lack of face-to-face interaction and small screen sizes has been the focus of early online m-Learning research literature. With the emergence of the Community of Practice (CoP) learning theory, the advancement in mobile device videoconferencing technology and the increase in screen sizes, I believe the potential for overcoming the barriers I experienced as a guitar learner are now possible with m-learning.

The learner centric CoP pedagogy proposed in this research attempts to enable self-motivated learners to use mobile devices to fit their learning styles while facilitating support from others with the same learning objective. For this reason, it is assumed that the learners' motivation for learning originates with the learner. I have explained my learning experience and what motivated me to stick with it to finally become a guitar player. However, why potential research participants want to learn is not the focus of this research. The focus is in what way does the proposed mobile learning environment enable participants to learn, and in what ways does using existing educational theories support learners. For this reason, the instructor positionality is not as important as the learner experience and attitudes related to the use of mobile devices. This exploratory investigation looks at MDBLEs and how they can be developed and refined.

Introduction of the Study

Perez (2011) shared information from The International Data Corporation (IDC), an American market research, analysis and advisory firm, specializing in information technology, telecommunications and consumer technology, which reported that smartphone manufacturers shipped 100.9 million devices in the fourth quarter of 2010, while PC manufacturers shipped 92.1 million units worldwide (para. 1). She simplified the analysis with the statement, "smartphones just outsold PCs for the first time ever" (Perez, 2011, p. 1). According to a Cisco (2013) White Paper, "by the end of 2013, the number of mobile-connected devices will exceed the number of people on earth, and by 2017 there were nearly 1.4 mobile devices per capita" (p. 3). Mobile devices (MDs) are transcending the educational and professional environments at an ever-increasing rate, redefining our understanding of how, when, and where we learn. As these trends continue, it is imperative to highlight, research, and interpret such data in an effort to inform and support the development and ongoing evaluation of effective learning environments utilized by MDs.

Statement of the Problem

In the constantly changing technological landscape, researchers need not only to be aware of new MD innovations, but also need to plan curriculums around MDs, test potential educational uses, and investigate potential learning experiences. This researcher believes that, as videoconferencing and mobile device technology advances, their use will redefine distance-learning practices. Participants for this study were drawn from a population of adult mobile device users interested in learning to play basic guitar. They possessed a variety of mobile device expertise and willingness to collaborate in a mobile learning community. Of particular research interest were the participant's attitudes and opinions related to their experience with regards to the use of mobile device videoconferencing to supplant face-to-face instruction.

Learning with mobile devices has thus far been challenged by the lack of face-to-face interaction. San Jose's (2009) dissertation findings showed higher affective learning in face-to-face environments as opposed to online. However, according to Doggett (2007), videoconferencing is a way to mimic face-to-face interactions with remote students. Therefore, videoconferencing technology may be a potential intervention for the lack of face-to-face interaction associated with mobile learning.

Mobile videoconferencing is a feature built into smartphones, phablets and tablets. As broadband speeds continue to increase, the visual and interactive quality of this feature also increases, potentially allowing for a genuine face-to-face experience. International Smartphone, Phablet, and Tablet adoption in large numbers suggests that the time is right for the development of learning environments that exploit the features and technological benefits of these devices, including the use of videoconferencing in Virtual Learning Environments (VLE). According to Fanning (2008), a VLE is "an online space designed to create a specific learning experience" (p. 1). These VLEs "can involve online learning, distance learning, game-based learning, and even immersive simulations" (p. 1).

The potential of VLEs, and their suggested applications, motivated my development of the MDBLE model that implements the Community of Practice (CoP), with a Video-based Mobile Flipped-Instruction (MFI) method, supported by Mobile Videoconferencing and gamification. For this study, the MDBLE was specifically designed for use by learners utilizing MDs to pursue learning objectives. This exploratory investigation looked at the GitShed.com MDBLE and how it can be further developed and refined using participant recommendations.

Purpose

The purpose of this multiple method case study was to examine the attitudes and opinions related to the participant experience using the MDBLE and its videoconferencing intervention as designed by this researcher. Research data were used to improve the effectiveness of the web-based instructional module, mobile videoconference intervention, and the social mobile learning aspects of the MDBLE.

Sandoval (2014), "describes a technique for mapping conjectures through a learning environment design, distinguishing conjectures about how the design should function from theoretical conjectures that explain how that function produces intended outcomes" (p. 18). To investigate the MDBLE concept, intervention design and learning outcomes, I created and applied this concept to GitShed.com, a community-based basic guitar learning website. Lessons were created (Appendix A) and desired learning outcomes were defined. The MDBLE concept is reified by this high level conjecture:

MDBLE that utilize a Community of Practice, social media, video-based instruction and videoconferencing support to supplement face-to-face interaction can produce positive learning outcomes.

Figure 1 shows how Sandoval's conjectures are connected in the MDBLE design.

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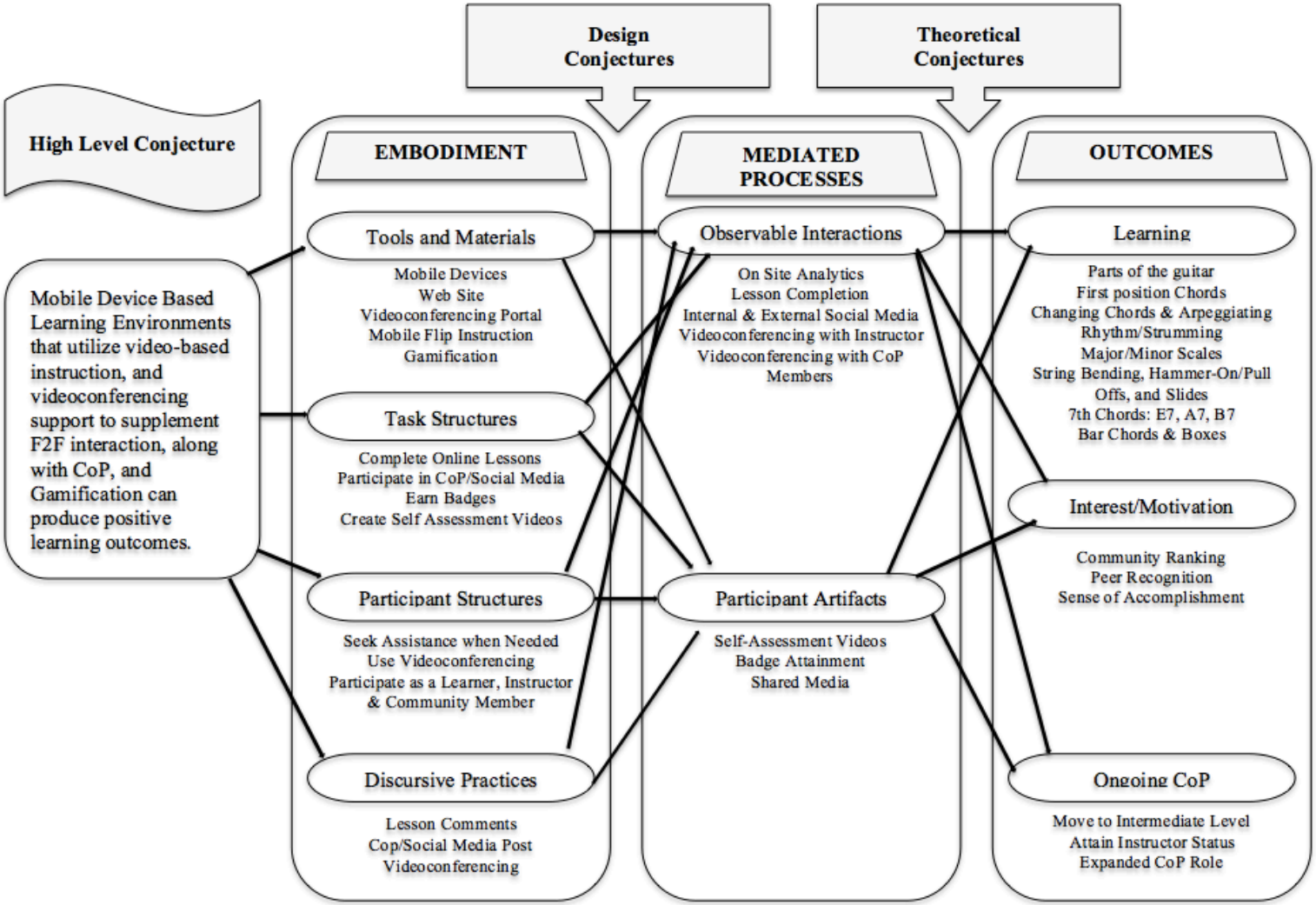


Figure 1. MDBLE Generalized Conjecture Map

This generalized conjecture map should be viewed as a learning environment planning tool. It can be read as an educational goal with a list of actual tasks which need to be accomplished in order to enable attaining the learning objective. For learning environment development, all aspects of the learning experience are outlined on the map, making it an essential part of the MDBLE instructional design strategy. View the MDBLE conjecture map from left to right, with the high level conjecture statement presented as a design hypothesis, followed by the embodiment of what it takes to reify the actual design, followed by the mediated process used to observe interactions within the learning community and the artifacts created by its members. Finally, theoretical and practical evaluation of the learning environment is presented on the right side of the image, with desired learning and community outcomes. The conjecture map also helped to align my conceptual and theoretical frameworks when discussing this dissertation research.

Theoretical Framework

The FRAME Model (Koole, 2009) was used in this investigation to provide a theoretical framework to both clarify the MDBLE concept as well as guide the investigation. The FRAME (Figure 2), "describes mobile learning as a process resulting from the convergence of mobile technologies (D), human learning capacities (L), and social interaction (S)" (Ally, 2009, p. 25). In a MDBLE, smartphone, phablet and tablet mobile technologies, human learning capacities and social interaction through the use of a Community of Practice (CoP) and social media are intended to converge and produce positive learning outcomes. FRAME also provides a structure for evaluating user attitudes related to the instructional model and its MD videoconferencing intervention. (See Appendix B for a more detailed description.)

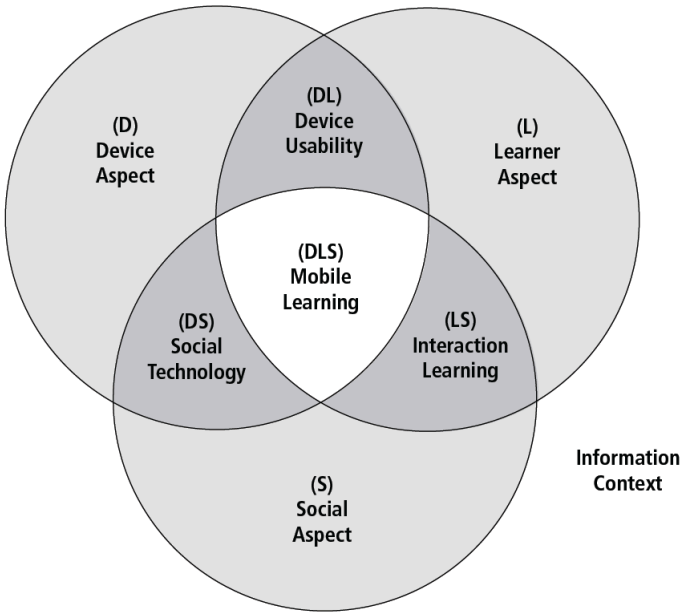


Figure 2. The Frame Model (Koole, 2009)

As with many web sites, this online learning environment is expected to evolve through periodic updates. The way that the participant's learning experiences, attitudes related to the videoconferencing intervention, and the iterative aspects of a Community of Practice (CoP) inform the design evolution of the MDBLE is a key part of this study. To test the concept, and direct the investigation, research questions and sub-questions were developed and are covered in the following section.

Research Questions

The three FRAME aspects, device, learner, and social aspects (DLS), are representative of the MDBLE model. Other aspects of FRAME, including mobile device usability (DL), interaction learning (LS), and social technology (DS) are incorporated into this investigation to answer the research questions:

- **(RQ1)** How, if at all, do participants believe the MDBLE's design aspects (DL, DS, LS) facilitate learning?
- **(RQ2)** What are the participants' attitudes toward mobile learning resulting from their experience with the FRAME design aspects (DL, DS, LS) of the GitShed.com MDBLE?

Question 1 sought to obtain participant's beliefs related to the MDBLE's D, L, and S design aspects and the intersections (DL, DS, LS aspects). Question 2 investigated the participant's attitudes and opinions toward this form of mobile learning and any design recommendations they provided, based on their experience with the GitShed.com MDBLE's D, L, and S aspects and the associated intersections (DL, DS, LS) aspects).

Significance of the Study

Studies that explore the use of new MD centric education models and learning environments can provide insight into their use as pedagogical tools. There is a gap in knowledge related to mobile learning environments that have been developed to utilize videoconferencing capable MDs, video-based instruction and a community of practice/social media. While the literature contains various studies on mobile learning, distance learning, and the use of videoconferencing in education, few studies on this specific mobile learning environment topic exist.

This research study was conducted to gain an understanding of the user learning experience and their attitudes toward learning in this MDBLE model. In addition, the study was conducted to not only test the MDBLE's implementation of the Mobile Flipped-Instructional (MFI) method utilized in the model, but also to investigate how the participants informed the design and evolution of the research site. The topic of participant perceptions of mobile learning supported videoconferencing in a CoP is important because educational technologists and instructional designers could potentially benefit from research data that informs and supports the development of effective mobile learning environments. This investigation of MDs as educational tools, along with qualitative user experiences, attitudes and opinion data related to the use of videoconferencing in the mobile learning environment is an important contribution that will expand the existing body of knowledge and inform future development. This study serves the fields of education, computer information science and business.

Conceptual Framework

The FRAME Model (Koole, 2009) provided the conceptual framework for this investigation. The Device (D), Social (S) and Learner (L) aspects are associated with the device aspect (D) use of mobile videoconferencing support to supplement face-to-face interaction, the

video-based instruction learner aspect (L), the CoP social aspect (S) and design variables positioned in the MDBLE to produce positive learning outcomes (DLS). The videoconferencing intervention is integrated into the secondary variables of the FRAME (*Figure 3*) as it relates to the controls and constraints of the device usability (DL), interaction learning (LS) and social technology (DS) intersection aspects of the FRAME. Within the context of the study, the researcher investigated the participant use, acceptance levels and the potential benefits of the mobile videoconferencing intervention shown in Figure 3.

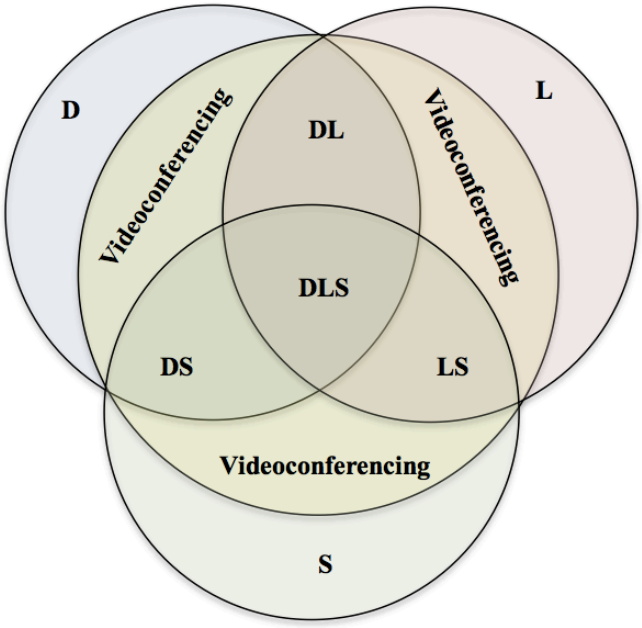


Figure 3. The FRAME Model with Videoconferencing Intervention Integration

In the Kenny, Van Neste-Kenny, Park, Burton, and Meiers (2009) study investigated the FRAME model in an exploratory formative evaluation of a project to integrate mobile learning into a Western Canadian college nursing program. The researchers used Koole's FRAME model to not only define mobile learning, but also as an organizational aid for the presentation of the study results (Kenny et al., 2009, p. 75). While this MDBLE investigation used Kool (2009) as the conceptual framework, the study also utilized a replicated survey from Koole, McQuilkin, and Ally (2010) and employed the FRAME model as an exploratory tool for formative evaluation and as an organizational aid. The following section presents a narrative that describes the design process and the principals used in the MDBLE design.

Overview of Methodology

Creswell and Plano Clark (2010) reported that "early examples of case studies are found starting in the 1920s when sociologists conducted studies to depict and describe ordinary life in the U.S. cities" (p. 242). In the 1990s, Yin (1994), Stake (1995), and Merriam (1998) published scholarly books on the subject of case study research. The use of the qualitative case study methodology is common in education (Merriam, 1998, p. 26). The disciplinary framework used in this research investigation is similar to the approach used in sociological case studies (Merriam, 1998) in that there is an interest in the social interaction and roles people play when learning with mobile devices in a virtual community of practice.

According to Yin (1994), "a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life contexts, especially when the boundaries between phenomenon and context are not clearly evident" (p. 13). How and why participants interact with the instructor and each other, using the mobile videoconferencing intervention to support their learning, is the phenomenon investigated and described. The context that bounded this empirical case study is the online GitShed mobile device based learning environment. The mobile device based learning environment concept is innovative in the ways that it combined the mobile, learner and social aspects described in the FRAME, along with the application of a mobile videoconferencing intervention aspect.

To test the MDBLE concept, an exploratory and embedded, single-case study methodology, bound by an online web-based MDBLE setting, guided this inquiry. To obtain a complete picture of participant attitudes and experiences related to the MDBLE setting, this case study utilized a descriptive multiple method research design with a qualitative priority. Artifacts, interviews, researcher observations and survey data were collected from a group of basic guitar learner participants. Purposive sampling was used to identify and select participants who have experience with collaboration, mobile devices, social media or intervention support. Naturalistic inquiry characteristics guided interviews with purposefully selected participants. Criterion for the sampling included: Adult learners comfortable with Internet use and mobile devices (Smartphones, Phablets, Tablets).

Role of the Researcher

Case study researchers assume many different roles, and "of all the roles, the role of interpreter, and gatherer of interpretations, is central" (Stake, 1995, p. 99). When discussing the role of the case researcher as teacher, Stake (1995) takes the position that, "the main thing is approaching the task of case study with a certain dedication to the readers, with the purview of good teaching" (p. 93). As the researcher, I maintained a practitioner-oriented focus and gathered information from learners utilizing multiple methods while collaborating with participants to improve teaching and learning with mobile technology. A multi-method approach suggests that I take on the role of explorer or explainer when investigating a research problem. This is appropriate for the investigation of participant perceptions of emerging learning environments.

In this investigation I fulfilled several researcher roles. Those roles are: learning design and technology developer, researcher as guitar instructor in the constructivist learning environment, researcher as learning community facilitator, and researcher as interviewer, key instrument, evaluator and reporter. Utilizing a constructivist approach "helps a case study researcher justify lots of narrative description in the final report" (p. 102). Reeves (2000) sets the tone for instructional designers and educational developers by suggesting, "Instructional technologists engaged in research are above all reflective and humble, cognizant that their designs and conclusions are tentative in even the best of situations" (p. 11). Thus, the goal of this researcher was to gain a deep and rich understanding of participant experiences in the MDBLE in an effort to refine and develop an effective MDBLE model and contribute to further implementations of MDBLEs in other contexts.

Limitations

Ethical risks in qualitative inquiry are substantial; inquiries are subjective and detractors present a compelling argument for caution (Stake, 1995, p. 45). The special features of case study research also presented certain limitations. Yin (1994) reports, "although the case study is a distinctive form of empirical inquiry, many research investigators nevertheless have disdain for the strategy" (p. 9). He goes on to identify the major criticism that case studies "provide little basis for scientific generalization" (p. 10). In addition to generalizability, Merriam (1998) points out additional limitations involving the issues of reliability and validity.

The researchers role as "the primary instrument of data collection and analysis" may be seen as an advantage by some, but "also presents ethical challenges that impact research reliability" (p. 42). The character of the investigator may limit qualitative case studies. Therefore, "both readers of case studies and the authors themselves need to be aware of biases that can affect the final product" (p. 42).

In addition to the qualitative inquiry concerns mentioned, Harland (2014) makes the point that case study "is typically criticized for being specific to the circumstances of individual practice and, therefore, limited in what it can offer theory" (p. 1115). This purposeful multi-method single case study research project is specific and unique. The research paradigm is subjective in that it was conceived with the intent of investigating potential future educational practices based on the synthesis of existing educational theories and emerging educational technologies. From this perspective, "subjectivity is not seen as a failing needing to be eliminated but as an essential element of understanding" (Stake, 1995, p. 45). Some may view the potential for bias to be high due to the extensive involvement of the researcher. The validity and reliability of the research may also be perceived as questionable due to the purposeful selection of participants and the researcher's role as an instrument. I designed and built the MDBLE research site and its design is supported by the elements of the theoretical framework (FRAME) used to guide the investigation. This may appear to be a conflict of interest because of the time and commitment made by myself as the researcher in the development of the mobile learning environment and the use of the compatible framework.

The participation criteria for the MDBLE research and narrow scope of the sample selection excluded potential perspectives from the sampled population. Excluded from the research participation were those that were not currently using mobile devices, the Internet, social media and those unwilling to complete research interviews and surveys.

Descriptive demographics and site access data were used to for the purpose of not only answering research questions, but also to illuminate the nature of the participants and their use of the online research site. The limitations of the target audience focused the investigation on the use of mobile device technology in the learning environment and the proposed intervention. Results are only representative of the attitudes, experiences and recommendations of the participants. Future research is needed to gain an understanding of minors and beginner users of MDs and Social Media. Additional studies also are needed to assess attitudes toward learning in

these particular mobile device based learning environments. The findings from this study should not be generalized beyond the scope of this study.

Definition of Key Terms

The following key terms are defined conceptually and/or theoretically in regard to their operational relevance to this study is described. Terms are organized by topic for better understanding of their operational relevance. When appropriate, citations from the literature are included:

Community of Practice (CoP) - Cowan (2012) mentions that "CoPs have been defined in a variety of ways, but in the most general sense CoP refers to a group of people (the community) involved in practice (the social construction of knowledge)" (p. 12).

Connectivism - "Connectivism is the integration of principles explored by chaos, network, and complexity and self-organization theories" (Siemens, 2005, p. 4). A connectivist approach was used in the development of the MDBLE model and should not be confused with the Constructivist learning method.

Constructivism – Driscoll (2000) (as cited in Siemens, 2005, p. 2), suggests that learners create knowledge as they attempt to understand their experience.

Course/Learning Management System (CMS/LMS) - A web based organizer software or plugin used to manage online courses, lessons, instructors and their learning resources. The software provides access to course information, registration, assignments, calendar, communication and other functions used to manage online courses.

Face-to-Face (FTF/F2F) - Meeting in person face-to-face.

Flipped Instruction – "Started with a simple observation: Students need their teachers present to answer questions or to provide help if they get stuck on an assignment; they don't need their teachers present to listen to a lecture or review content. From there, Jonathan Bergmann and Aaron Sams (2012) began the flipped classroom – students watched recorded lectures for homework and completed their assignments, labs, and tests in class with their teacher available" (para. 1).

Framework for the Rational Analysis of Mobile Education (FRAME) - The FRAME (Figure 2) "describes mobile learning as a process resulting from the convergence of mobile technologies (D), human learning capacities (L), and social interaction (S)" (Ally, 2009, p. 25).

The secondary aspects of the FRAME, **DL** - Device Learner, **DS** - Device Social and **LS** - Learner Social are aligned with the main elements of the MDBLE design.

Gamification - The implementation of game based learning principles into instructional practice.

https://www.gitshed.com - The MDBLE research site used in this study. It has been developed using the principle that states that connectivism is the "ability to see connections between fields, ideas, and concepts" (Siemens, 2005).

Mobile Devices (MD) - Smartphones, Phablets and Tablet computers "are radically transforming how we access our shared knowledge sources by keeping us constantly connected to near-infinite volumes of raw data and information" (Sergio, 2012, para.1). These three MD categories are the primary devices used in this study.

Mobile Device Based Learning Environment (MDBLE) - A Virtual Learning Environment specifically designed for use by learners utilizing MDs to pursue learning objectives. They have built-in course management systems and learning communities which utilize videoconferencing to provide face-to-face interaction across all aspects of the learning environment. MDBLEs are also gamified to provide an engaging learning experience.

Mobile Learning (m-Learning) - According to Liu et al., (2010), "m-learning enables citizens covering all social-economic levels to access training and education in a ubiquitous and even lifelong manner, using their personal devices" (p. 211).

Videoconferencing (VC) - The use of video technology to hold a conference with one or more individuals in different locations.

Video-Based Instruction (VBI) – Instruction using recorded video lessons. Lessons may be presented individually or consist of a series of videos in a learning module.

Virtual Learning Environment (VLE) - According to Fanning (2008), a Virtual Learning Environment (VLE) is an online space designed to create a specific learning experience" (p. 1).

Summary

Mobile devices are increasingly being introduced in asynchronous and synchronous learning environments. They are being integrated into educational, corporate, non-profit and personal learning networks at an ever-increasing rate, redefining our understanding of how,

when, and where we learn. As MDs change the computing landscape, it is necessary to explore and test how they can be implemented in new learning environments. The changing computing mobile technology landscape challenges researchers to not only be aware of new innovations, but to also plan and design mobile learning environments for potential implementation as well as investigate the experiences of students in these new environments.

Koole (2009) provides the theoretical FRAME framework, which connects to the use of mobile smartphone, phablet and tablet technologies (D), videoconferencing to support human learning capacities (L) and CoP/social media use to provide social interaction (S), all of which this study employs. The FRAME as a conceptual framework for this research project is relevant because it is a constructivist educational theory that suggests learners build their own knowledge in a mobile learning environment. The framework fits the exploration of videoconferencing technology as a constructivist tool for finding answers. By supplementing face-to-face interaction and through the collaboration between learners, their peers and community learning coaches and instructors, learners construct their knowledge. The research sought to determine how the constructivist use of videoconferencing in mobile learning environments could have an impact on current and future distance-learning practices as broadband and mobile technologies continue to improve over time. This key aspect of the study has the potential to solve the lack of visual context that challenges visual learners and others in online environments. Mobile device videoconferencing also has the potential to support blended education and corporate training initiatives by enhancing the social aspect of their learning endeavors.

The innovative pedagogical method used in this study is based on a synthesis of CoP Learning Theory, MFI, Game Infused Education and Mobile Learning Theory. The social considerations of Gee (2007) and Wenger (2002) are the basis for the development of the research site's game infused learning module and community. Combining a CoP learning theory with a game based instructional design module that utilizes the "MFI method" and MD videoconferencing to support and reinforce instruction creates the researcher's Mobile Device Based Learning Environments (MDBLE) concept.

The current technological excitement related to this subject is tempered by the possibility that the general public may or may not share the researcher's interest in MDs and videoconferencing or see them as beneficial educational tools. This research study tested the MDBLE concept, its instructional model and videoconferencing intervention design to provide a

view of user attitudes toward learning in a mobile device based learning environment. Participant's feedback and refinement recommendations resulting from the use of a case study research design with qualitative priority enabled an authentic view of the potential effectiveness of user involvement in development of new educational environments. The community aspect of the study has sociological implications and the outcome informs the fields of education, computer information science and business.

CHAPTER 2. REVIEW OF LITERATURE

Mobile technologies continue to be extremely popular. Moore's Law has provided a basis for predicting computer processing speeds and miniaturization of mobile technologies, and as predicted, mobile device affordances will continue to change over time. This digital acceleration is impacting and transforming eLearning, mobile learning and online learning. Tsinakos (2013) presented the following data related to the proliferation and penetration of mobile devices in the United States.

> Mobile phones and smartphones are very popular in USA. The statistical numbers of the proliferation of mobile technologies verifies this trend. In USA, mobile phone subscribers totaled **331**.**6** million in early 2012, indicating an amazing penetration rate, which equals **104**.**6**%. (Ctia.org, 2012). It is estimated that more than **110** million people in US owned smartphones during the three months ending in June 2012, up **4**% versus March 2012, according to Internet analytics of comScore. Furthermore, **234** million Americans age **13** and older used mobile devices for the three-month average period ending in April 2012, according to comScore, Inc. with the estimation that **107** million people owned smartphones during the same period, up **6**% versus January 2012 (New Media Trend Watch Asia-Pacific, 2012). This high rate of proliferation of mobiles provides a great opportunity for the development and implementation of a variety of mobile projects. Although the USA government has initiated several national programs of mobile learning projects, many programs tend to be school-based while a number of state and provincial programs also exist. (Tsinakos, 2013, p. 8)

Topolewski (2013) posited, "with billions of mobile devices in the hands of ordinary citizens world wide, the question becomes how best to utilize this incredible opportunity to improve education for so many" (p. 157). As learners evolve with new technologies, educational environments and methods should evolve to support the emerging learners and their use of the current affordances of these mobile devices. The anticipated need for mobile learning environment development inspired the design of this researcher's Mobile Device Based Learning Environment (MBDLE) concept.

Criteria for Inclusion and Exclusion

To understand the context for my study, this review of the literature covers Mobile Learning Environment Development and the Theoretical Frameworks related to the development of the MBDLE concept. Included is the Framework for the Rational Analysis of Mobile Education (FRAME) Model. The FRAME model was used to evaluate the MDBLE.

While mobile learning environment development is the focus of this research, videoconferencing, Web 2.0 Tools and other mobile device affordance aspects of the designed intervention are mentioned to provide an understanding of their role in the learning environment. The conceptual framework is reviewed and includes the video-based mobile flipped learning instructional method, Community of Practice (CoP) social media learning support and gamification elements (with the purpose of enhancing learner engagement). The aforementioned components were not the focus of the investigation, but are covered in order to provide a pedagogical lens. Related research studies and theoretical perspectives which advanced over time provide support for the intervention design. Information not relevant to the investigation and the development of the MBDLE concept were excluded from this literature review.

Conceptual Framework

Mobile Learning Theory

Keskin and Metcalf (2011) identified current mobile learning theories as: "Behaviorism, Cognitivism, Constructivism, Situated Learning, Problem-Based Learning, Context Awareness Learning, Socio-Cultural Theory, Collaborative Learning, Conversational Learning, Lifelong Learning, Informal Learning as well as Activity Theory, Connectivism, Navigationism, and Location-based learning" (Keskin & Metcalf, 2011, p. 202). This statement presents current mobile learning theories, but how is mobile learning defined?

Mobile learning, also known as m-learning, can be viewed as any form of learning that occurs when mediated through the use of wireless, mobile, portable or handheld devices which extend learners' ability to communicate and access information, enabling learners to collaborate using wireless networks, mobile Internet access, text messaging and voice communications (Ally, 2009; J. Herrington, 2009; Koole et al., 2010).

Traxler (2007) reported, "attempts to develop the conceptualizations and evaluation of mobile learning, however, must recognize that mobile learning is essentially personal,

contextual, and situated; this means it is 'noisy' and this is problematic both for definition and for evaluation" (p. 1). Further, "unlike most mobile services, m-learning does not always bring an immediate sense of gratification, but probably rewards a learner in the long term, hence the use of m-learning will depend on how learners value their education tasks" (Liu et al., 2010, p. 221).

According to Liu et al. (2010), "m-learning enables citizens covering all social-economic levels to access training and education in a ubiquitous and even lifelong manner, using their personal devices" (p. 211). In addition to helping learners overcome the digital divide, mobile learning provides multiple contributions to the distance education experience and can be implemented in both collaborative and independent learning (Fuegen, 2012; Yousuf, 2007). Distance learning is considered to be more flexible than education that takes place in a traditional classroom. However, while mobile learning is informal, it is also more interactive and enables learners' to be more focused for longer periods with a stronger emphasis on communication and collaboration with others (Fuegen, 2012; Yousuf, 2007).

Mobile devices continue to evolve and become capable of greater feats. Furthermore, the related technologies integrated into mobile devices have a long history of educational use. Beginning in the mid-1970s, universities started to implement the use of email and asynchronous text-based conferencing to support their courses (Harasim, 2000). The current history of mobile learning began in October 2005, when the first comprehensive handbook of mobile learning was published (Traxler, 2007). Over the past decade, m-learning has grown from a minor research interest to become a thriving research field. Increasingly used in workplaces, museums and schools, mobile learning provides a wide array of new education possibilities (Liu et al., 2010).

Today, the literature is expanding with a broader variety of mobile learning studies and mobile devices are now being used in many forms of education (Koole et al., 2010). This research investigation used an experimental learning environment that can be viewed as a mobile learning service. Therefore, it is necessary to improve the relevancy, timeliness, adequacy, and uniqueness of the mobile learning materials developed. How devices and mobile learning services are implemented and received by users is fundamental to this research. Additionally, these general definitions are used in this research study and place smartphones, phablets and tablets – the devices to be studied – in the m-learning device category.

The following related research studies provide insight regarding student's experiences both with, and perceptions of, m-learning.

First, in a quantitative study, Mathur (2011) used a survey-based cross-sectional design to query 98 students from a district in southern California which contains two community colleges in order to gain an understanding of students' perceptions of the m-learning application, Blackboard Mobile Learn (BML) as a Course Management System (CMS). In this study, the technology acceptance model (TAM) was used as the theoretical framework for exploration of the linear relationship between the independent variables of students' perceptions of usefulness and students' perceptions of accessibility with the dependent variable of the students' intent to use BML. The results of multiple regression analyses indicate that students' perceptions of usefulness and students' perceptions of ease of use were both significantly and positively related to students' intent to use BML. This study is important in that it provides college administrators and faculty with supportive m-learning data; the key positive social change provided is a CMS m-learning solution for students to be lifelong learners. The Mathur (2011) investigation of students' perceptions of the m-learning application study is relevant to the investigation of this study on the focus of students' perceptions of the mobile device based learning environment and the provision of a CMS m-learning solution (a CMS is implemented in the mobile device based learning environment to support student learning).

A second related study, based on 13 undergraduate college student volunteers at Florida State College at Jacksonville (FSCJ), Kissinger (2011) explored the learning experiences of Introduction to Sociology course students, eight from the face-to-face course and five from the online course using mobile e-book readers. The researcher found that “employing qualitative case study methods and techniques was considered most aligned with the purpose of documenting in-depth student learning experiences.” This multiple case study design was an inductive, open-ended, exploratory inquiry that attempted to build an understanding of the students’ use of mobile e-book readers as instructional technology. Kissinger utilized data from a variety of sources because of their ability to produce insight into the learning experiences of the students. The data analysis was comprised of three levels of increasing stages of granular examination. This investigation resulted in six major conclusions: students expressed competence in their use of the mobile e-books and feelings of high self-efficacy when using the mobile e-books. Overall, they valued the use of the e-book for their learning and were individualized and metacognitive in their learning with mobile e-books. They enhanced their learning socially and within situated learning opportunities and the students and instructor had

divergent views on the value and utility of social, interactive textbooks. In summary, the students were found to be confident, metacognitive, competent with the technology and desirous of more social learning opportunities within their e-books.

Kissinger's exploration of the students' learning experiences and perceptions of the mobile device-based learning environment is relevant to the investigation of this study. Each individual student – and all of the students as collective – are viewed as informants in order to yield greater insight into the analysis and refinement of the mobile device-based learning environment design and iterative development based upon their experiences.

The FRAME Model

This study uses the Framework for the Rational Analysis of Mobile Education (FRAME) to evaluate the MDBLE intervention as deployed in the GitShed.com research site. The framework "describes mobile learning as a process resulting from the convergence of mobile technologies, human learning capacities, and social interaction" (Ally, 2009, p. 25). The three primary FRAME aspects – DLS – are representative of the MDBLE design. According to Koole et al. (2010), "the framework can help researchers generate a 360-degree view of the learning environment and can also help us better understand the controls and constraints within mobile learning environments" (p. 64). The FRAME model (Figure 2) "defines mobile learning as a convergence of device, learner and social aspects, and positions the mobile learning system within a context of information" (p. 62).

The framework "addresses contemporary pedagogical issues of information overload, knowledge navigation, and collaboration in learning," and "is useful for guiding the development of future mobile devices, the development of learning materials, and the design of teaching and learning strategies for mobile education" (Ally, 2009, p. 25). The device aspect (D) refers to the mobile devices and their physical and functional characteristics. The learner aspect (L) refers to the learner's cognitive abilities, prior knowledge, memory capacity, values, and motivations. The social aspect (S) describes social rules governing conversation and cooperation among people. Evaluation of the MDBLE learning materials, teaching and learning strategies with the FRAME model enables a focus on the device usability (DL), learning intersection (LS) and social technology (DS) aspects in order to generate a 360-degree view of related participant experiences and perspectives of the learning environment.

For this investigation, the FRAME model was used to evaluate the MDBLE intervention design as deployed in the GitShed.com online research site. The device (D), learner (L) and social (S) aspects of the FRAME are matched to the MDBLE's device usability, interaction learning and social technology intervention design elements. The FRAME's ability to generate a 360-degree view of the MDBLE's primary aspects (DLS) guides the search for answers to the research questions:

- **(RQ1)** How, if at all, do participants believe the MDBLE's design aspects (DL, DS, LS) facilitate learning?
- **(RQ2)** What are the participants' attitudes toward mobile learning resulting from their experience with the FRAME design aspects (DL, DS, LS) of the GitShed.com MDBLE?

These main questions, shown in Table 1, require qualitative feedback to determine if the MDBLE intervention produces the DLS primary aspects and functions as a filter through which the participant learners can assimilate information from the environment and locate solutions to their unique content related problems (Koole, 2009).

Table 1

MDBLE, Research Questions & FRAME DLS Alignment

FRAME Aspect	Q1	Q2
Mobile Learning (DLS)	How, if at all, do participants believe the MDBLE's design aspects (D, L, and S) facilitate learning? (In what ways?)	What are the participants' attitudes and opinions toward mobile learning resulting from their experience with the FRAME design aspects (DL, DS LS) of the GitShed.com MDBLE?

When "learners (L)" interact with the MDBLE using the features and characteristics associated with "smartphones, phablets or tablets (D)," the impact on the learning experience related to DL becomes relevant. For this investigation, it is appropriate to extend the view of DL characteristics to include those that are associated with the accessed learning environment. Those characteristics include the affordances and capabilities of the device used, information

availability, psychological comfort, and satisfaction with device functionality and usefulness within the learning environment.

The LS aspect of the FRAME model embodies the "learner (L)" and "social (S)" intersection. Self-Directed learners are enabled to participate in a very social-constructivist form of interaction learning. In the MDBLE intervention, learners interact with others using a CoP developed with BuddyPress, a social networking plugin for WordPress. Participants and community members can give and receive feedback supporting the building of content understanding.

"Social Technology (DS)" is the cross-over between the "device (D)" and "social (S)" aspects and is characterized by networking and the use of collaborative tools. In addition to the MDBLE's internal BuddyPress social network, popular mainstream social media sites are integrated to provide greater availability of information access for users of different social networks. Qualitative feedback related to the MDBLE's "device usability (DL)," "learning intersection (LS)" and "social technology (DS)" aspects are sought in order to generate answers to the research questions.

In the Kenny et al. (2009) study, the FRAME model was used in an exploratory formative evaluation of a project to integrate mobile learning into a Western Canadian college nursing program. The researchers recruited "third-year students as participants that used Hewlett Packard iPAQ mobile devices for five weeks in a practice education course from April to May, 2007" (p. 75). The researchers used Koole's FRAME model to define mobile learning as an organizational aid for the presentation of the study results (Kenny et al., 2009, p. 75).

Again, Ally (2009), states that the FRAME model positions the mobile learning system within a context of information; the Kenny et al. (2009) participants "found the ability to retrieve information helpful, however they did not find the mobile devices useful for communication purposes, despite the inclusion of local cell phone service" (p. 91). The researchers indicated that it is therefore not clear from their pilot study that m-learning (in the context of nursing practice education) can enable communication and collaboration among instructors and students, nor if the use of mobile devices can effectively support the distance components of a blended learning course of this sort. However, the Interaction Learning intersection focuses on the social interaction enabled by social technology, and the results of the study appear to indicate that m-learning is useful from this perspective to a certain extent. In their conclusion, the researchers

found that their study confirmed that the use of m-learning, at least with mobile devices providing the breadth of features afforded by the HP iPAQ, is feasible in actual nursing practice education settings and, at a minimum, mobile devices have the potential to be very effective in allowing students and instructors ready access to resources at the point-of-care (Kenny et al., 2009).

The aspects of the FRAME model are directly related to this study. The following sections of this review of relevant literature are organized to align with the human learning capacities, mobile technologies and social interaction aspects of the FRAME model. The first section begins with an introduction of educational theories and an exploration of human learning capacities as viewed through the relationship between constructivist learning theory and self-efficacy as a constructivist approach to learning. The section concludes with a presentation of the principles of connectivism related to the MDBLE development of this study.

Proposed Conceptual Intervention

The conceptual framework for the MDBLE was used to create the basic guitar learning community and research site GitShed.com. The site has environmental and instructional components that align with the "Device, Learner and Social Aspects" aspects of the FRAME framework. It is a synthesis of learning theories and design principles.

The Device Aspect consists of a Course Management System (CMS) portal, linked to social networking communities and participant's videoconference capable MDs (smartphones, phablets, and tablets). In addition to the researcher's concept for the MDBLE, concepts from Tognazzini (2003a) state that his principles are fundamental to the design and implementation of effective interfaces, whether those interfaces are used for traditional Graphic User Interface environments, the World Wide Web, or MDs. These principles (Appendix C) are being used to support the human interaction design of the GitShed.com CMS.

The Learner Aspect of the GitShed.com MDBLE uses a modified form of the Flipped Classroom Instruction (FCI) principle. J. Bergmann and Sams (2012) provides the context for the contemporary FCI principal: "students need their teachers present to answer questions or to provide help if they get stuck on an assignment; they don't need their teachers present to listen to a lecture or review content" (J. Bergmann & Sams, 2012). This context is relevant to this "*Learner and Device Aspect*" of this study through the instructional method and conceptual

intervention in that it uses web-based video lessons and Mobile Flipped Instruction (MFI) in tandem with instructor support using MD videoconferencing when needed.

The Social Aspect of the intervention uses gamification and CoP learning theory to address the "*Learner and Social Aspect*" of the FRAME framework. Gamification was used to add an element of challenge and reward intended to support learner engagement. J.P. Gee (2007) suggests 36 principles for consideration when developing learning environments (Appendix D). These principles were considered in the development of the MDBLE.

Authors E. Wenger, McDermott, and Snyder (2002) developed seven design principles (Appendix E) for creating a sense of "*aliveness*" in CoPs. Combining CoP learning theory (Social Aspect) with an instructional design module (Learner Aspect) which utilizes the "FCI method," videoconferencing (Device Aspect) and game-based engagement to support and reinforce instruction to create the researcher's MDBLE concept; this concept is supported by the device, learner and social Aspects of the FRAME framework. Videoconferencing via mobile devices is evolving along with mobile device technology. If, how and why consumers choose to use videoconferencing is impacted by their "Device Usability (DL)" beliefs.

Device Usability (DL)

The device usability intersection contains elements that are associated with the device (D) and learner (L) aspects of the FRAME model, which "connects the needs and activities of learners to the hardware and software characteristics of their mobile devices" (Koole, 2009, p. 34). Important DL criteria include portability, access to information, psychological comfort and satisfaction. How fast a learner can understand and begin using their device impacts the user's ability by affecting their cognitive load. Koole (2009) suggests that intuitive mobile devices can help to lessen cognitive load and improve task completion rates. Device usability is a key secondary aspect of the FRAME and impacts the receptiveness and efficacy of the videoconferencing intervention support directly related to this research study. In this section, considerations from the literature related to DL and the Mobile Learning Environment Development, Web-Based Instruction, Video-Based Learning, and Mobile Technologies are explored.

Mobile Technologies

According to Traxler (2007), "the use of wireless, mobile, portable, and handheld devices are gradually increasing and diversifying across every sector of education, and across both the developed and developing worlds and it is gradually moving from small-scale, short-term trials to larger more sustained and blended deployment" (p. 2). MDs are changing the computing landscape, the manner in which they may be used in education and potential learning experiences. These devices are gaining momentum among education research topics. Investigating the design of potential environments in which mobile devices may be used is needed to understand the context of this study. Of particular interest to this researcher is the user experience with Web 2.0/3.0 Social Media functions and videoconferencing capabilities to supplant face-to-face instruction while supplementing peer-to-peer learning and collaboration. To begin this investigation of mobile learning environment development and the resulting learner experience of learning with mobile devices, a discussion from the literature regarding the technical affordances of mobile devices follows.

Mobile Devices & Affordances

This investigation looks at the use of three devices in the mobile category: smartphones, phablets and tablets. Koole et al. (2010) indicated that "these easy-to-carry tools allow more freedom to interact with others and to access a variety of multimedia information remotely using wireless networking capabilities" (p. 60). Tablets are defined by Fuegen (2012) as "small profile computers with mobile-optimized operating systems, generally lacking a physical keyboard, that provide interactive opportunities through built-in functionality and third party applications" (p. 1). Smartphones are mobile handsets with data connections via cellular and/or wireless networks and have similar capabilities as tablets but are generally smaller in size. The term "phablet" is relatively new, and the name describes mobile devices with sizes that range between smartphones and tablets. The footprint of phablets is larger than the 4.0-inch screen size of a smartphone, but smaller than tablets (which average at least 9.7 inches in size). Phablets are essentially phones that are also tablets; small profile computers with mobile-optimized operating systems. The flexibility, mobility and accessibility of these devices add to a general positive impression on students (Fuegen, 2012). These "technologies are creating more and more places and modes that people can inhabit, where communities can form, where ideas, identities, images

and information can be produced, stored, shared, transmitted and consumed and thus these technologies, each in their different ways, transform rather than merely reproduce the nature of learning" (Traxler, 2012, p. 199). It is the connection between the capabilities MDs afford users coupled with the formation and transformation of learning communities that this research sought to explore.

Anywhere Anytime Mobility

The portability and access to learning materials provides smartphone, phablet and tablet devices a distinct advantage over desktop and laptops computers. When discussing the increasingly mobile nature of people, mobile learning is viewed as specifically different from computer-based educational learning approaches (Liu et al., 2010). Anytime mobility serves the needs of students that want to be in control of when, how and where they learn (Fuegen, 2012).

Other Affordances

In addition to mobility, some of the other mobile device affordances related to this study are Web 2.0/3.0 collaboration tools, multiple communication features and applications (apps). Mobile devices have generated a market for mobile apps. These applications are available under myriad titles for a variety of operating systems. The programmability of app software and operating systems allows for a customizable learning experience that can be adapted for both student and faculty needs (Fuegen, 2012). Apps can add to the functionality and usefulness of mobile devices, and educational apps enable learning to be extended beyond the classroom.

Web-Based Instruction

Web-based instruction (WBI) was the focus of another closely related online study in which 14 piano teachers were surveyed. In order to rationalize the best use of WBI for teaching music theory to private piano students in the later primary grades, Carney (2010) used an integrative research methodology for defining, designing and implementing a curriculum that includes WBI. A synthesis of research from the fields of music education, educational technology, educational psychology and interaction design was used to outline several research-based principles that instructional designers can use to design a completely blended learning environment for use within the piano studio. This formative research outlined the potential best use of face-to-face instruction, collaboration amongst students, teachers and parents, and provided a complete model for integrating a web-based instruction platform that can guide instructional designers and music educators. Results indicated that reviewers consistently

believed the implementation of the research-based principles were quite successful. This finding is connected to the similar conclusion by Cruz (2012), which found that the awareness of the instructors/learning coaches technological knowledge and their acceptance of the proposed intervention can play a significant role in study outcomes. It is of key significance that the participants were drawn from a CoP comprised of music instructors and that their involvement in the study provided data from a knowledgeable professional network. This closely related study provides a reference for the use of iterative methods to explore the potential best use of videoconferencing in order to supplement face-to-face instruction, promote collaboration amongst self-directed learners, instructors and CoP members. The study provides replicable aspects for integrating web-based instruction that can guide instructional designers and mobile learning developers.

The obvious relationship of (Carney, 2010) to this study is not only web-based music instruction, but also the use of integrative research methodology for defining, designing and implementing curriculum in a nontraditional online learning environment. The studies share a synthesis of research from educational fields and interaction design to investigate and develop several research-based principles that can be used by instructional designers to design blended learning environments. The potential best use of videoconferencing to supplant face-to-face instruction and support collaboration amongst students, teachers and community members. Further, videoconferencing provides a complete model for MDBLE instruction that can guide instructional designers and educators from all disciplines. However, while the reviewers in (Carney, 2010) consistently believed the implementation of the research-based principles were successful, this study focused on the learner attitudes and experiences to inform and guide the iterative development of the research site: GitShed.com.

Video-Based Learning

Maniar (2008) reported that,

> Evidence gathered from papers published between 1985 to 2006 identified that video can help students visualise [*sic*] how something works, show information and detail that is difficult to fully explain using text or static images, grab students' attention, thus motivating them and engaging them with the subject, provide concrete real life examples, thus demonstrating the relevance of the subject to the real world, simulate discussion, and cater for different learning styles, specifically for students who are *'visual learners'*." (p. 53)

Additionally, theories suggest that video may be much more effective than text or non-animated graphics" (p. 52). "A video-based learning resource can engage students in conversation and debate on the subject matter and in some case video can highlight theoretical concepts when teaching specific subjects (p. 53).

In a study of 15 students at the University of Portsmouth in the United Kingdom, Maniar (2008) investigated the impact of screen size on video-based mobile learning. This empirical investigation used surveys and an experiment. Results indicated that the physical screen size of a mobile device does influence learning and larger screen size results in a distinctly higher amount of information learned via video when compared to smaller screen sizes (p. 58). As reported, these findings indicate that m-learning environments that rely heavily on video-based material displayed on a MD with a small screen may result in diminished effectiveness of the intended intervention and learning experience (p. 58).

The issue of screen size is relevant to this study because the MDBLE utilizes web-based video instruction. The research of Maniar (2008) and M. Martin (2005) inform this study through their investigation of the impact of screen size on mobile learning, collaboration, video-based instruction, videoconferencing and mobile device technology development. Technologies like handheld mobile devices have enabled the flexibility of learning while on the go and Internet technologies have enabled the delivery of interactive video-based learning (p. 51). "It is suggested that the delivery of video via Internet is becoming ubiquitous due to the advantage of delivering video to a wider audience in a controlled, interactive and integrated environment" (p. 54). While early mobile learning research found that the small physical screen size of early mobile devices negatively impacted learning, current mobile device screen sizes have trended larger (p. 58). Considering that the acceptance of mobile learning ultimately depends on whether people believe it to be useful, it can be argued that the effort to develop video-based applications is justifiable (p. 59). The merger of mobile video, videoconferencing, and Internet technologies present opportunities for developing a new form of mobile learning instruction suited for online mobile learning environments.

Communication

In a study of 438 distance learning students from Allama Iqbal Open University, in Pakistan, Yousuf (2007) evaluated student's attitudes and perceptions toward the importance of mobile learning in distance education to examine to what extent distance learners had become

accustomed to mobile learning. The researcher used a five-point Likert scale survey questionnaire called the Survey of Mobile Learning in Distance Education (SMLDE) for data collection. Results of this survey indicated that "facilitating mobile learning can improve the entire distance education [experience] by enhancing ways of communication among distance learners, tutors and supporting staff" (p. 114).

According to Koole et al. (2010), mobile devices offer a wide variety of modes of communication and allow learners to easily carry reference tools with them into real-world environments (p. 61). She adds, "the flexibility of mobile devices permits frequent dialogue with experts and peers, just-in-time retrieval of information, documentation of personal experiences and integration of course-based knowledge into aspects of the learners' daily lives-all permitting learners to receive feedback and assess their progress" (p. 61). Fuegen (2012) added that mobile technologies also assist students with staying organized through the use of calendaring and scheduling applications while enabling communication, collaboration and knowledge construction through the use of built-in messaging and file sharing features (p. 51). Internet access and communication provided by mobile devices enable users to access Web 2.0 tools. A review of these Web 2.0 and collaboration tools is covered in the next section.

Mobile Learning Environment Development

Topolewski (2013) discusses the challenges of successful mobile learning adoption. By examining some of the early results, Topolewski (2013) found that "it is clear that at least some of these challenges need to be overcome for the mobile learning revolution to take place" (p. 166). An investigation of mobile learning environment development challenges would be weakened by the absence of conversation related to mobile infrastructure. Topolewski (2013) makes the connection to a major debate associated with the need for mobile infrastructure growth. He points out that there are several groups in the mobile learning ecosystem; some have different goals and agendas that impact the ability to promote and justify a global investment in mobile learning.

Compared to the numerous participants in mobile device design and development, the infrastructure of wireless services has few players represented in each country. This results in much more power residing within the infrastructure of wireless services providers as opposed to other players in the mobile ecosystem. Because services providers are the critical controller of access, especially in rural areas where it may not be economically feasible to have more than one

supplier of wireless access services, this may be one area that national governments may intervene, similarly to the steps the government of China has taken in its markets. If competition truly "drives better services for customers, once the infrastructure is in place," mobile learning is strategically "positioned for a bright future and a major positive impact on humanity" (p. 167). These mobile learning ecosystem challenges are not unique to Asia and potential wireless access solutions that assist users may prove to be useful on a global scale. Even though concerns about mobile learning exist, with regards to current mobile infrastructure, the "flexibility, limitation of transactional distance, and educational advantages appear to outweigh the disadvantages" (Fuegen, 2012, p. 53).

While infrastructure and bandwidth improvements continue to advance through normal technology evolution cycles, this study is possible because of the recent dramatic improvements in mobile devices and communication services. The study is undertaken with the understanding that technology issues are to be anticipated. Any negative infrastructure or web service impacts on the study were documented. Other education challenges exist beyond infrastructure, as mobile learning has not come close to reaching its full potential. Thus, the chasm between what is promoted and what was used is clear (Liu et al., 2010).

Another environment development consideration that supports the "*Device-Learner Aspect*" of the study framework was the use of a Course Management System (CMS). At this time, applications and services are emerging that attempt to provide content that is "responsive," i.e. content that adjust its visual fit and functions based on the device being used by the learner. Fuegen (2012) reports, "expectations are growing for not only a CMS system in distance education, but for an all-encompassing electronic learning environment" (p. 51); "the number of students asking for a more integrated course experience (including mobile integration) is growing" (p. 53). Using a well-designed and configurable CMS solves the demands of students and enables the ability to take advantage of the adjustability and flexibility of current mobile technology and software.

However, technology does not itself cause mobile learning, and the key success factor is understanding the needs of learners while simultaneously identifying the factors that lead to mobile device user's willingness to adopt mobile learning (Liu et al., 2010, p. 220). This statement is the essence of what motivates the curiosity that drives this investigation: What are mobile device user's mobile learning adoption concerns? And, what participant provided insights

might contribute to learning attainment success and their acceptance of mobile learning in the GitShed MDBLE?

One concern to be aware of, in the context of MDBLE development, is the quality of the learning experience. The FRAME framework provides a lens for understanding the participant's perceived quality of the device, learner, and social aspects of the MDBLE. The issue of "perceived quality of products or services impacts customer's intentions to use them" (Liu et al., 2010, p. 217). A qualitative investigation of participant insights related to the quality of mobile learning products or services will generate data that contributes to the refinement of the MDBLE design and provide a view of the mobile device owner's intentions to use them for learning.

Fuegen (2012) ultimately believes that instructors and "students are looking for their online learning/course management systems to provide a broader experience than simply delivery of text content" (p. 53). This research study is unique in that it created and explored a learning experience specifically designed for mobile device implementation. The investigation of the proposed intervention using the GitShed MDBLE sought to reveal the desired learning experience needs and considerations of mobile device users. It is reasonable to conclude that, although mobile technology presents a great potential for learning, the test for learning technologies is to build mobile device-based learning environments and deliver instruction using smartphones, phablets and tablets that teach learners' effectively (p. 53).

Interaction Learning (LS)

According to Keskin and Metcalf (2011), there are nine theories of learning that can be examined through the lens of a mobile environment: Behaviorist, cognitivist, constructivist, situated learning, problem-based learning, context awareness learning, socio-cultural theory, collaborative learning and conversational learning. When discussing these mobile learning theories, Fuegen (2012) states, "mobile devices are well suited to applications of those theories." She provides the example, "collaborative learning seeks to promote learning through the use of active participation and communication between students" (p. 50). The constructivist theory of learning is the foundational education theory examined through the mobile learning experience in the MDBLE investigated in this study.

Social Constructivism

E. Wenger (2009) provides the following definition of Constructivist Theory:

> Constructivist theories focus on the processes by which learners build their own mental structures when interacting with an environment. Their pedagogical focus is task-oriented. They favor hands-on, self-directed activities oriented toward design and discovery. They are useful for structuring learning environments, such as simulated worlds, so as to afford the construction of certain conceptual structures through engagement in self-directed tasks. (p. 217)

Franklin, Sun, Yinger, Anderson, and Geist (2013) suggest mobile devices, when viewed as a constructivist educational support, are beneficial and intriguing to educators because of their ability to deliver information to students anywhere they are. This ability could help students learn to take ownership of their education through the mobile construction of their own knowledge (p. 3703). Indeed, the constructivist theoretical model is related to this MDBLE video-based instructional method of this study. Learners must be willing to construct their knowledge, and self-efficacy is required for learners to engage the learning content.

Self-Efficacy Theory

Topolewski (2013) suggested that, "Mobile learning will push students from learning passively to actively" (p. 164). Mobile learning students are confronted with the separation from both teachers and learning peers, and this separation requires an important need for self-efficacy for students to have the ability to self-manage their own personal learning issues (Liu et al., 2010).

The use of mobile devices is unlike the use of other technology or the Internet. An exploration of the self-efficacy of students using mobile videoconferencing is also impacted by the learners' ability beliefs relating to how successfully they are able to accomplish a desired skill or task (Kissinger, 2011). The main roadblock to productivity in the future of mobile learning was limited user confidence and the ability to use mobile learning environments. Building on the Wang and Wang (2008), case for studying the specific, unique aspects of mobile computing, the Kissinger (2011) collective case study also attempted to explore the self-efficacy of students using mobile e-books. It has been suggested that due to the flexibility provided by mobility, access to information and instruction, self-directed users might find m-learning better suited to their learning styles (Fuegen, 2012).

The purpose of the Kenny et al. (2009) study was to assess the self-efficacy of nursing faculty and students related to their potential use of mobile technology in order to ask what implications this technology has for their teaching and learning in the context of practice

education. The researchers used a cross-sectional survey design involving students and faculty in two nursing education programs in a western Canadian college. The survey was completed by a sample consisting of 121 faculty members and students. The results showed a high level of ownership and use of mobile devices among the respondents. The median mobile self-efficacy score was 75 on a scale of 100, indicating that both faculty and students were highly confident in their use of mobile technologies and were prepared to engage in mobile learning. To ensure a continuous and effective use of m-learning, promoting user's self-management capability of learning is essential, as it is learners themselves who are in charge of their own learning issues (Liu et al., 2010).

Learning Support

While FCI is the chosen instructional method for the proposed intervention, it is also relevant to discuss the MDBLE role of the instructor as the learning coach. The utilization of FCI alters the interaction between instructor and students. This new interaction increases the coaching role of MDBLE instructors. The interaction between learners and instructors in the GitShed MDBLE was intended to provide the learner with support beyond the video-based instruction. Participants in need of clarification, demonstration, validation of learning content, or direct assessment can request a videoconference with an instructor. This encourages a learning coach relationship between participants and instructors.

In a qualitative case study of learning coaches, Hasler Waters (2012) attempts to discover the beliefs and behaviors of 5 participants, 4 parents and 1 guardian that served as learning coaches for their children enrolled the Hawai'i Technology Academy (HTA) cyber charter school. The grounded theory approach was used to examine a phenomenon yet to be fully explored. The results of this study indicated that, to support their children, the learning coaches engaged in the four mechanisms of behavior as described by the Hoover-Dempsey and Sandler Model of Parental Involvement.

The study revealed that learning coaches created learner-centric environments, and that technology was absolutely instrumental in helping learning coaches perform their roles by enabling them to provide flexible learning. Based on the study findings, Hasler Waters (2012) provided the following recommendations for cyber charter schools that are incorporated in this study: (a) investigate what is needed for learning coaches and their students to be successful, (b) improve the use of technology systems to enable learning coaches to provide more effective

teaching and learning, (c) provide differentiated training and support services to meet the instructional support needs of learning coaches, and (d) study the roles of teachers and learning coaches to gain a better understanding of how to assign their responsibilities in order to maximize student learning in cyber charters (Hasler Waters, 2012).

These findings are relevant to this investigation because of the parallel between the role of learning coaches in cyber charter schools and the role of instructors and community members as learning coaches. In the MDBLE's CoP: (a) the needs of learning coaches and their students are intertwined, (b) the use of a videoconferencing system enables learning coaches to virtually engage face-to-face for more effective teaching and learning, (c) the use of Social Media and videoconferencing provides vehicles for additional communication, differentiated training support and individualized services to meet the unique needs of instructors as learning coaches, and (d) the significant role of CoP members as learning coaches were investigated to gain a better understanding of how to maximize learning for students in the MDBLE. Indeed, learning coaches play a significant role in not only cyber charters, but *all* learning environments.

An instructor played a significant role in another study of 13 intermediate-level English language learners (ELLs) at an American high school between ages 14 and 18 from 10 different countries (the study also included one instructor). Cruz (2012) attempted to learn how a supplemental iPod-based vocabulary review tool influenced students' perceptions of learning biology vocabulary outside of classroom hours. In addition to short weekly questionnaires, qualitative interviews with student participants were used. Interviews with their biology teacher were conducted to complement student testimony from the point of view of an educational professional with ELL teaching experience. After eight weeks of using the mobile vocabulary tool, student participants reported both negative and mixed impressions of the tool. However, the majority of students had positive perceptions of their experiences. The instructor participant had mixed impressions of the tool and information from her interviews suggested that this may have been because she her strong feelings about the effectiveness of her established teaching methods. However, the veteran ELL teacher seemed to understand the impact that the tool might have on unmotivated students, demonstrating that her perception of the tool remained flexible (Cruz, 2012).

These studies are relevant to this investigation because they provided support for the methodological use of short weekly questionnaires and qualitative interviews with participants.

Further, the awareness that the instructor's/learning coaches' technological knowledge and their acceptance of the proposed intervention can play a significant role in study outcomes. Learning coaches were trained in the methods, goals and objectives of intervention to assure that they have the technological awareness required to utilize the environment and accept the intervention. In addition to learner participant feedback, input from CoP members and the instructor were also used to improve the MDBLE. This allowed for a second suggestion stream to consider when evaluating learner provided data.

Videoconferencing to Supplant Face-To-Face Interaction

While San San Jose (2009) findings indicate student participants in the face-to-face (FTF) environment reported higher affective learning than students in the online environment (p. iii), those findings are seemingly contradicted by the Doggett (2007) study, which found that "videoconferencing is closest to a face-to-face experience for students in remote locations" (p. 40). The social impact of face-to-face experiences has the ability to support learning objectives. In the Cowan (2012) study, students in the Internet-Based Masters in Educational Technology (iMet) program that met 25% face-to-face and 75% online became highly engaged not only with each other, but also with technology integration and content development.

M. Martin (2005) reported that videoconferencing appears to be as effective as face-to-face contact "for distance learning applications," and that "videoconferencing can be used to address a variety of intelligences and personal learning styles" (p. 398). Ten years ago, M. Martin (2005) hoped that, "as the concept of technology-facilitated distance learning is increasingly accepted at all stages of education, videoconferencing might gain credence as a valid educational resource" (p. 404). She interpreted that technological advancements in broadband would enable people to videoconference from home and use mobile conferencing in almost any location. Today, her conclusions have been confirmed with the move to an "*Internet Protocol"* that has facilitated *"always on"* videoconferencing, making this investigation of mobile device-facilitated videoconferencing to supplement face-to-face mobile learning possible.

M. Martin (2005) presented case studies from the Western Education & Library Board (WELB) in Northern Ireland "that demonstrated the versatility of videoconferencing across a variety of subject areas, age groups, and learning styles. Data from demonstrated collaborative work in education via videoconferencing is a stunningly effective form of distance learning. The development of educational uses for mobile device videoconferencing is supported by her

statement: “If we wish to ensure that the educational benefits of this technology are *always* exploited, we need to make provision now” (p. 405).

Since this statement was made, Web 2.0 applications and “the development of digital media technology in the twenty-first century has led to a rapid development of moving images as an educational medium” (Maniar, 2008, p. 51). The mobile devices investigated in the Maniar study all have videoconferencing capability, making it necessary to revisit the issue. This research explores smartphones, phablets and tablets with screen sizes between 4 and 10 inches, as well as how the learners feel about learning and collaborating in a community. Larger screen sizes and faster broadband that enables videoconferencing to supplant face-to-face interaction are relevant considerations for the development of the mobile learning environment. This study investigates mobile learning environment development utilizing the “Device Aspect,” “Learner Aspect” and “Social Aspect” of the Framework for the Rational Analysis of Mobile Education (FRAME). Through the experiences and perceptions of the MDBLE, student participants the (the “Learner Aspect”) were used to gauge user acceptance and the site’s instructional design for mobile learning effectiveness. The “Social Aspect” was used to gauge both social media technology learning support utility and associated student peer interactions. Finally, specific “Device Aspect” perspectives related to the acceptance of video-based instruction and videoconferencing to supplant face-to-face interaction were sought in order to provide qualitative feedback based on real world experiences in the GitShed MDBLE.

Gamification

Collaborative learning can be accomplished with multiple Web 2.0 tools, social networks, mobile educational gaming, e-mail or mobile videoconferencing (Keskin & Metcalf, 2011, Fuegen, 2012). Relevant to this MDBLE study was the use of gamification features to add an additional social engagement and competition aspect to the mobile learning environment experience. As suggested by researchers (Keskin & Metcalf, 2011), this study uses leveling, ranking and badging to engage and motivate learners. Of interest was the learner experience with these game features as deployed in the learning environment and whether or not they found that the leveling, ranking and badging features contributed to their learning experience. The following related gamification study presents contradictory findings. However, they provide useful and valuable background information to consider when developing game-infused MDBLEs.

In a related research study of 169 student participants from the University of Central Florida, DeRouin-Jessen (2008) investigated whether game-based learning systems would perform as billed. The study manipulated two specific game features: multimedia-based fantasy vs. text-based fantasy and reward vs. no reward in a computer-based training program on employment law. Students were randomly assigned to either one of the four experimental conditions or a traditional computer-based training condition. The author discovered that, contrary to hypotheses, the traditional PowerPoint-like version was found to lead to better declarative knowledge outcomes on the learning test than the most game-like versions, although no differences were found between conditions on any of the other dependent variables. Another important finding was that "participants in all conditions were equally motivated to learn, were equally satisfied with the learning experience, completed an equal number of practice exercises, performed equally well on the declarative knowledge and skill-based practice, and performed equally well on the skill-based learning test" (p. iii). However, adding the *"bells and whistles"* of game features to a training program won't necessarily improve learner motivation and training outcomes" (p. iv). The use of gamification features in this study were implemented in moderation as suggested by DeRouin-Jessen (2008).

Social Technology (DS)

The social technology intersection (DS) of the FRAME "describes how mobile devices enable communication and collaboration amongst *multiple* individuals and systems" (Koole, 2009, p. 34). Criteria associated with DS include device networking, system connectivity and collaboration tools. Social media is a component of the MDBLE and was used in this research study to enable learner participants to communicate with each other and provide a platform both to learn content sharing as well as community assessment. This section investigates the literature associated with Web 2.0 technologies, the community of practice and collaborative learning.

Collaborative Learning

When discussing mobile learning theories, Fuegen (2012) states that mobile devices are suited to their combined application. The author provides the example, collaborative learning attempts to support learning through the use of active participation and communication between students in order to utilize mobile devices and their many Web 2.0 tools, such as social networks, mobile educational gaming, e-mail or mobile video conferencing (p. 50). Fuegen (2012) asserts,

"the connection between the Internet and mobile devices has become even more relevant and dynamic as Web 2.0 (and, on the horizon, Web 3.0) tools and social networking applications have evolved into more sophisticated products that are designed to interact with mobile devices" (p. 50).

Mobile devices with Internet access have a greater collaborative learning potential. Tsinakos (2013) suggests that the social networking features built into most mobile education technology services opens up a form of collaborative learning where students learn best by performing tasks and teaching others. This is enabled by mobile learning, which provides a unique, always-on connection to other students, thus accomplishing universal learning. Siragusa, Dixon, and Dixon (2007) support the view that the Internet provides amazing possibilities for computer-meditated communication and learning as opposed to other forms of educational technologies.

In a study of 49 distance students at the University of Pittsburgh, who used Web 2.0 technologies outside of the official boundaries of their online course, Kearns and Frey (2010) investigated how campus and distance graduate students in a library science program communicated with one another outside the official boundaries of their courses. A 14-item web-based survey was implemented in two phases. The results showed that, while students used a variety of technologies to communicate with one another, those enrolled at a distance made greater use of the technology. The most frequently used technologies by students to communicate with one another were eMail, cell phones (talking), collaborative editing tools, collaborative authoring tools and social networking.

The authors also found students in the 36-to-45-age range to be the most frequent users of Web 2.0 technologies that facilitate task-oriented collaboration. In their Web 2.0 study, Kearns and Frey (2010) reported that the wide variety of social networking tools increases opportunities for additional avenues of communication. However, even though social networking tools play an important role in the development of a learning community, younger students may need encouragement and guidance to explore these tools for collaborative learning (p. 49). The Kearns and Frey (2010) study is related to this research project through the connection of Web 2.0 technologies that facilitate task-oriented collaboration, the importance of social networking and the focus on adult learners to investigate collaborative learning.

Community of Practice

While Cowan (2012) mentions that a community of practice (CoP) has been defined in many ways, it is generally accepted as a community which "refers to a group of people (the community) involved in practice (the social construction of knowledge)" (p. 12). Etienne Wenger, Trayner, and de Laat (2011) discuss CoP Learning Theory and suggest the ways in which communities form, develop and evolve, while also discussing the importance of community management to promote contribution. Encouraging contribution to online communities provides an important discussion of the tension between the need for innovation and individuals to influence the community as opposed to the need for the community to maintain the continuity of its identity and practices (Kraut et al., 2012). Cowan (2012) reported that between 2000 and 2009, 243 students in 11 cohort groups participated in the Internet-Based Master in Educational Technology Program (iMet). The study noted that an important factor in the program's success was the use of a community of practice (CoP). Building on the work of these author's, a CoP was used in the proposed intervention to support learning and to see the manner in which the GitShed.com MDBLE community forms, develops and evolves. Appropriate Social Aspect inquiry examples are: In what way or ways do participants social media use in the learning environment generate suggestions for improvement? What is the nature of the learning community? Finally, what relationships develop between community participants?

Community learning is a collaborative effort and when discussing *"Principal 35,"* the Affinity Group Principle. J.P. Gee (2003) states, "Learners constitute an "affinity group," that is, a group that is bonded primarily through shared endeavors, goals and practices and not shared race, gender, nation ethnicity or culture" (p. 197). This suggests that the social experience associated with the domain is important to learning. This investigation's form of mobile learning promoted collaborative learning through the use of active participation, videoconferencing and other forms of Web 2.0 communication between students.

Web 2.0 Social Media

A (2012) report of the top ten emerging learning technologies included the community of practice (CoP), gamification and flipped classroom instruction (FCI). These topics are not the focus of the research study, however, as they are used in the intervention design to support

learning objectives. The social interaction aspect of these topics provides a clear statement when viewed as learning supports: “You are not alone, learning is fun, and a flipped pedagogy will guide your learning.” As ideal as this sounds, the impact of social media on the participant learning experience must be measured and evaluated appropriately. Therefore, Web 2.0 topics were investigated in this literature review.

To support and reinforce the learning objectives of this study, social media was used to provide a sense of community. Research director Michael Wolf (2008) speculated that, "Subscriber numbers for mobile social networking will climb at a relatively modest rate for the next three or four years, but will then start to accelerate sharply" (p. 1). Utilizing social networking in learning environments may help educators to prepare for the projected increase in mobile social networking.

An example of the growing popularity of social media is demonstrated by the ranking of the 15 Most Popular Social Networking Sites from April of 2014 via estimated unique monthly visitors, provided by the website eBizMBA.com. The top five social media sites shown in Table 2 account for 1,730,000,000 estimated unique monthly visitors. These almost two billion monthly visitors represent the potential audience for educational training and services delivered through social media using mobile device technologies.

Table 2

Top 5 Most Popular Networking Sites

Rank	Social Networking Site	Estimated Unique Monthly Visitors
1	Facebook	900,000,000
2	Twitter	310,000,000
3	LinkedIn	250,000,000
4	Pinterest	150,000,000
5	Google Plus+	120,000,000

In 2014, Facebook, the No.1 Internet social network in the world, said its total number of active monthly users reached 1.28 billion as of March 31, with 1.01 billion of those users accessing its service using smartphones and tablets (Oreskovic, 2014). The growing public acceptance of social networking is influencing emerging educational research studies. The

following related studies investigated the educational use of social media and Internet social networking.

Barbour and Plough (2009) discuss one K-12 online school's attempt to address the social aspect of their student's experience by using social networking. In a video, students that had very few ways to meet other kids expressed their appreciation for having an OCHS school-supported social network. Students in the study discussed how using Web 2.0 tools and social media helped to keep them engaged and provided collaborative opportunities on the web. In their analysis of social networking trends, the authors found that "the social network has been the public space that has allowed the students a sphere for their social development…similar to the kind of public space they would have experienced in the traditional school environment" (p. 59). They also found that it was important to involve staff and students to ensure that everyone use the social media environment and communications appropriately. This finding is related to the development of learning communities and the social responsibility of their members. Burgess (2009) suggests, "facilitators should carefully design what goes on *inside* the course by incorporating and acknowledging the contextual realities of what is happening *outside* of the course" (p. 67). Acknowledging outside realities may contribute to the learning community's development.

Cowan (2012) found that students formed bonds by exploring emerging technologies and creating technology integrated content that have lasted beyond the length of the program (p. 18). Learning communities that are formed around the use of social networking sites may not only provide the potential for students to form bonds that continue beyond the initial learning objective, but that also support community development. According to Burgess (2009), social networking sites are interactive, user-driven, spontaneous and allow members to participate in discussion threads, share files, post links and create knowledge by posting "blogs." It is the interactive, user-driven and spontaneous nature of social networking technologies that may contribute to success of mobile learning within the broader field of education.

In a closely related and influential dissertation research study of 287 students at a community college in Hawai'i, Lacro (2013) attempts to answer the question: "Can social networking technologies, linked with academic coursework and student support services, increase levels of self-efficacy leading to student success and retention?" (p. iii). The study was conducted in a design-based research environment and took place over the course of three

semesters. The course used for the study was Math 9, a five-credit course offered during the spring 2012 semester and onward. Each semester, the sections were divided into control and treatment groups utilizing the researcher's social networking platform. Participants were surveyed electronically using Survey Monkey and the "Sociability Scale" developed by Kreijns, Kirschner, Jochems, and van Buuren (2007, p. 181) to investigate the specific measures of perceived sociability. A path analysis evaluation showed that peer interaction and the treatment intervention had a predicted effect on academic self-efficacy and the test of indirect effects of using the social networking on student success and retention showed small, but significant, indirect effects mediated through self-efficacy. The Lacro (2013) study is closely related and influential to this research study because of the focus on testing the researcher's social networking platform design, the importance of learner self-efficacy, perceived sociability and the use of quasi design-based research method in a dissertation study.

In another related qualitative study of five students from Albright College in Reading, Pennsylvania, and five students from the Michigan Technological University in Houghton, Michigan, Ferguson (2010) examined the reasons two distinct higher education institutions implemented college-created social networking sites (SNSs) as a way to recruit undergraduate students. The non-instructional aspect of this social networking research is related to the non-instructional benefits of social interaction. The research demonstrates that there are marketing and community communication benefits to social networking.

Results determined that the institutions had explored the phenomenon of social networking as a recruiting strategy because online SNSs are a popular platform that college and high school students use to engage in conversation during the college choice process. In each instance, both of the institutions had a culture of experimentation and an associated individual or vendor who had envisioned using social networking as a college-recruitment platform.

Another finding was that staff members at these institutions shared a common belief that SNSs are a marketing tool that enable institutions to be "authentic" by allowing members to create, collect and share stories in relation to its college environment. The design of these college-specific SNSs was strongly influenced by Facebook and MySpace, evinced by the college-based SNSs focusing on member-created content as the basis for communication. Finally, the researcher determined that institutions must connect its SNS to its student information system in order to assess the effectiveness of a college-created SNS (Ferguson,

2010). This determination may have broader benefits for mobile learning. If mobile learning is to be an effective educational delivery system, marketing and other administrative aspects of educational service delivery need to be considered in the development of MDBLEs. The finding that staff members at these institutions shared a common belief that SNSs are marketing tools which enable institutions to be "authentic" supports an investigation into other potential benefits of SNSs.

Question number two of Ferguson (2010) investigated how the institutions implemented a college-created networking site for the purpose of recruiting undergraduate students. This query magnifies the significance of SNS as a marketing tool and learning support aid. Additionally, the use of interviews and social network site observation methods used by Ferguson (2010) support the replication of those methods in this investigation.

While this research project investigated SNS as a function of the “Social Aspect” according to the FRAME framework, it is necessary to consider how MDBLEs attract and manage self-directed learners, instructors and CoP members. Having an MDBLE participant marketing plan and registration process is part of the Institutional Review Board (IRB) application process. Having a marketing plan is also a vital development consideration for mobile learning researchers, as it is beneficial to strategize for the promotion and recruitment of learners and community members. Indeed, the consideration of the SNS administrative and marketing aspects may impact the validity of the research and mobile learning outcomes.

Summary

Web 2.0 technologies, social media and the community of practice have been used in online education for many years. Online learning and related practices are expanding to include mobile learning. While the so-called ‘early adopters’ are willing to use new technologies for pedagogical purposes, it is not yet clear that there are sound theoretical reasons for the use of mobile devices in learning (J. Herrington, 2009). Nevertheless, mobile learning is evolving to include social media, gamification and the technologies associated with mobile devices.

The emergence of mobile devices and their use as educational tools can be investigated further to determine appropriate uses of Web 2.0 technologies and social media in a community of practice. Mobile learning environment development can benefit from the consideration of using SNSs as marketing tools to promote and support CoP learning. It is important that learning

all community members – both instructors and students – monitor the appropriateness of music, language and pictures in online learning environments. Structured research of the learner experience with these technologies, guided by the FRAME framework, as demonstrated in the studies cited, informed the development of this and potentially future MDBLEs.

Case Study Research

Early examples of case studies are found starting in the 1920s when sociologists conducted studies to depict and describe ordinary life in U.S. cities (Creswell & Plano Clark, 2010, p. 242). Merriam (1988) describes a case study as "a basic design that can accommodate a variety of disciplinary perspectives on the nature of research itself, can test theory or build theory, incorporate random or purposive sampling, and include quantitative and qualitative data" (Merriam, 1988, p. 2). According to Yin (1994), "a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life contexts, especially when the boundaries between phenomenon and context are not clearly evident" (p. 13). A third scholar, Stake (1995), eloquently states that a "case study is the study of the particularity and complexity of a single case, coming to understand its activity within important circumstances" (p. xi).

The use of the qualitative case study methodology is common and accepted throughout the field of education (Merriam, 1998). Within education, qualitative case studies can be defined deeper by grouping them into "categories or types based on disciplinary orientation or by function" (p. 34). The disciplinary framework used in this research investigation is similar to the approach used in sociological case studies in that there is an interest in the social interaction and roles people play when learning with mobile devices in a community of practice.

The mobile device-based learning environment concept is innovative in the ways that it combines the mobile, learner and social aspects described in the FRAME framework, along with the application of a mobile videoconferencing intervention aspect. Case study methodology can be specifically useful for investigating educational innovations (Merriam, 1998). Earlier in this chapter, a related dissertation, Kissinger (2011), was discussed. That case study informed this research project through its focus on mobile devices and its use of the case study method. Other recent related studies that utilize multi-methods and/or case study methodology include, Uzunboylu, Bicen, and Cavus (2011), Müller, Gove, and Webb (2012), Adedoja, Adelore, Egbokhare, and Oluleye (2013), and Naftali and Findlater (2014) and are introduced next to

provide support for this manner in which this study employs the multiple method, embedded single-case study research methodology.

In a case study of 55 graduate students from the Department of Computer Education and Instructional Technologies (CEIT) at Near East University in North Cyprus, Turkey, Uzunboylu et al. (2011), investigated students' opinions regarding the usefulness of the Web 2.0 tools such as podcasts, vidcasts, slideshare, broadcasts, screencasts, surveys etc., used with Windows Live Spaces (WLS). The study sought whether or not the students had changed their opinions about the usefulness of Web 2.0 tools by the end of the 12-week study. The students attended lessons and accessed learning materials online.

Using descriptive statistics and a paired sample t-test, in order to compare pre-experience and post-experience test means, and "the univariate of variance (ANOVA) to compare group means," the study found that students maintained positive opinions of the use of the WLS environment and that Web 2.0 tools brought a new dimension to their distance learning (p. 722).

This research is related to this study through the use of case study methodology to investigate participant opinions associated with a mobile learning environment development and the usefulness of web 2.0 tools. Students "were able to co-operate and share information with their friends, thanks to the WLS environment" (p. 722). A focus on an online learning environment that uses web 2.0 tools to provide an anytime and anywhere solution helps learners focus on critical points and guides them as they engage in reflective practice. How and why learners collaborate using the web 2.0 the videoconferencing intervention was also a major focus of this study.

In a multi-method study seeking to learn about tablet use, 33 participants were recruited from three locations across the US: San Francisco (12), New York (11), and Milwaukee areas (10) (Müller et al. (2012). Over the course of the two-week period, they "collected 774 written diary entries, 157 video diary answers, 18 detailed participant profile write-ups from field visits, and observations from four contextual inquiries, in addition to raw video recordings, transcriptions and photos" (p. 3).

The researchers "conducted their analysis in three stages: 1) quantitative analysis of the written diaries, 2) qualitative analysis of the field research and video diaries, and 3) triangulation of insights to develop a set of conclusions" (p. 3). The study found that tablets are mostly used for personal purposes, that users are very passionate about specific activities that they engage in,

that tablets are used more during weekdays and that a portion of tablet activities include a transitioning from or to other devices or activities. Another related finding that is an important consideration for developers was that tablet use occurs mostly in the home, often during other activities separate from the tablet, such as watching TV, eating, cooking or while simply passing time. Where and when learners choose to use mobile devices is closely associated with the how and why investigation of learning with mobiles. Another study aspect related to this study was the use of multi-methods and the triangulation of data to develop a dense description of the participant experience and development recommendations.

In a multi-method case study with a sample of 201 students from the University of Ibadan (UI) in Nigeria, Adedoja et al. (2013), researchers in the Distance Learning Centre (The DLC at UI) investigated students' acceptance of mobile phones for learning purposes. Instead of research questions, the project was particularly focused on exploring the use of mobile phones for distance learning tutorials and sought to go beyond simply communicating information and providing access to learning resources, seeking additional support and engagement with distance education students (p. 82). The study used the Technology Acceptance Model (TAM), as its framework along with multi-method data collection to both obtain rich data from respondents and provide triangulation. Cronbach's Alpha reliability coefficients were calculated to establish construct reliability; data collection took place over a ten-day period. The results of the descriptive analysis suggested a positive and high level of interest in using mobile technology by students who perceive it as easy to use and beneficial. Responses suggested that students considered the mobile learning mode to be flexible. They also believed mobile technology was found to both exciting to participants while reducing fatigue to a minimum. The students demonstrated a positive attitude and high interest in using the mobile platform. This "could be attributed to the way in which learning activities were structured" (p. 89).

In addition to the related use of a multi-method case study, this exploration supported and engaged mobile learners by providing structured learning activities. The common use of structured learning activities is associated with the Learner Aspect of the FRAME theoretical framework used in this study. Rich data collection and descriptive analysis are areas that are also related to this research study investigation.

Using "an online survey with 16 participants and multi-method case studies with four expert smartphone users" Naftali and Findlater (2014) investigated how smartphones were being

used on a daily basis by individuals with motor impairments. Specifically, they studied what activities the smartphones enabled and what contextual challenges users were encountering (p. 209). After the first online survey study with 16 respondents, a more in-depth second study took place using case study methodology. Four expert smartphone users participated in "an initial interview, two weeks of diary entries, and a 3-hour contextual session that included neighborhood activities" (p. 209). After qualitatively coding the data, researchers "identified four main themes covering 18 categories," then "first present[ed] each case individually, focusing on physical use and the themes of enablement and situational impairments, followed by a cross-case analysis" (p. 212).

Researchers found that participants used the devices frequently for a range of tasks. Their findings highlighted the ways in which smartphones enabled everyday activities for individuals with motor impairments, particularly in managing accessibility challenges in a physical context as well as with support of accessible reading and writing. Researchers also identified challenges with touchscreen input and situations that continue to impact users with motor impairments. They predicted "that wearable devices were a fruitful direction for addressing these challenges in the future, better supporting truly mobile access for people with motor impairments" (p. 216).

The multi-method case study approach and qualitative coding procedures are related to this investigation, as how and why smartphones, phablets and tablets can be made more accessible and adaptable for bodily kinesthetic and psychomotor learning are important considerations. The insights gained from the identified challenges with touchscreen input and situational impairments can be used in the development of mobile learning environments for all users.

Case Study Limitations

The special features of case study research also present certain limitations. Yin (1994) reports that "although the case study is a distinctive form of empirical inquiry, many research investigators nevertheless have disdain for the strategy" due to the belief that case studies "provide little basis for scientific generalization" (pp. 9-10). In addition to generalizability, Merriam (1998) points out that additional limitations involving the issues of reliability and validity, suggesting that choosing a study design "requires understanding the philosophical foundations underlying the type of research" (pp. 1, 43). An advantage that "also presents ethical challenges that impact research reliability" is the researcher's role as "the primary instrument of

data collection and analysis" (p. 42). The character of the investigator may limit qualitative case studies. Therefore, reviewers of case studies and authors need to be aware of the potential biases that can impact the final product.

Case Study Relevance to the Proposed Study and Discussion Across Themes

The researcher arrived at the conceptual framework and intervention by considering the potential educational use of smartphones with videoconferencing capabilities. The conceptual framework aligns with the FRAME framework and has environmental and instructional components. It is a synthesis of learning theories, instructional methods and mobile learning design principles. Harland (2014) provided a personal view of case study research:

> In a pedagogic sense, case studies teach me about the theories of higher education, how these are applied in real situations and then how the process of application generates new thinking and ideas, both for practice and changing research priorities. (p. 1119)

The disciplinary framework used in this research investigation is similar to the approach used in sociological case studies in that there is an interest in the social interaction and the roles people play when learning with mobiles in a community of practice. How and why participants interact with the instructor and each other, using the mobile videoconferencing intervention to support their learning, is the phenomenon to be described. The context that bounds this empirical case study is the researcher-designed GitShed mobile device-based online learning environment. In this investigation, the Flipped Classroom Instruction (FCI) principle was modified for users of Mobile Devices (MD). Authors, J. Bergmann and Sams (2012) provide the context for their creation of the contemporary FCI principal: "It started with a simple observation: Students need their teachers present to answer questions or to provide help if they get stuck on an assignment; they don't need their teachers present to listen to a lecture or review content" (p. 4).

J.P. Gee (2007) suggests 36 principles for consideration when developing learning environments (Appendix D). Authors E. Wenger et al. (2002) developed seven design principles (Appendix E) for creating a sense of "aliveness." Combining CoP learning theory with an instructional design module that utilizes the "FCI method," MD videoconferencing and game-based engagement to support and reinforce instruction, creates the researcher's MDBLE concept.

This review of the literature was undertaken to explore this researcher's academic interest in mobile learning environment development and its related themes: mobile learning, videoconferencing as a supplement for Face-to-Face interaction between learners, instructors and

Web 2.0/3.0 social media community members. The theoretical framework and design-based research methodology were discussed in support of the investigation. Previous research related to mobile learning and the potential ways in which mobile devices are changing education. Potential limitations were also discussed. The reality that provides the motivation driving this investigation is the fact that "familiarity with handheld devices and technologies does not ensure that teachers and students would like to use them in teaching and learning scenarios" (Liu et al., 2010, p. 212).

In the past, many researchers found learner experiences with screen size to be an important factor in mobile learning, with small screens being inhibiting factor to successful mobile learning. The devices currently entering the market are much larger and may resolve the screen size limitation of the past.

Social media continues to play an emerging role in educational practices today, though it is not free from challenges. In the development of the intervention for this study, the exposure of personal identifiable information through social media use was an important consideration. The MDBLE registration process addresses the participant's exposure of personal information and procedures for reporting "hostile behaviors such as cyber bullying, sexual offenses, or potential cheating during online learning assessment [are] some of the additional roadblocks to consider when adopting of mobile learning" (Tsinakos, 2013).

Conclusion

This researcher arrived at the conceptual framework by considering the potential educational use of mobile devices with videoconferencing capabilities and the potential mobile learning environments that could result from the integration. Koole (2009) provided an appropriate framework for guiding this investigation. The mobile learning aspect DLS and the FRAME have been successfully integrated into device usability, interaction learning and social media technology in the MDBLE. This qualitative research shares a focus on DLS as it is specifically related to collaborative learning, social media use and feasibility of mobile device videoconferencing technology in the supplementation of face-to-face interaction. The FRAME and case study methodology were appropriate for this specific evaluation of the MDBLE model design and development.

This chapter looked at specific issues found through an investigation of mobile devices, mobile learning, social media tools and community of practice research literature. The social media, video and videoconferencing affordances of mobile devices and mobile learning environment development were identified as major factors in the researcher's design and implementation of a replicable MDBLE design. These variables are related to the proposed intervention, research design. Yin (1994) suggests that, "a studies questions, its propositions, if any, its unit(s) of analysis, the logic linking the data to the propositions, and the criteria for interpreting the findings" are the five especially important components of a research design (p. 20). This statement founds the methodology of this study.

CHAPTER 3. MDBLE DEVELOPMENT

Previous chapters introduced the statement of the research problem and presented the purpose and background for the Mobile Device Based Learning Environment Development (MDBLE) research investigation. This chapter is a departure from the standard dissertation format in that it is an additional chapter dedicated to the development processes of the MDBLE model. The perspective taken in this educational technology/learning design development initiative was to build a practical MDBLE that functioned as a dissertation research site and prototype.

Key to the early development of the MDBLE is focused on addressing the potential learning utility for emerging mobile devices. To achieve all of the desired features, components and characteristics of the learning environment tools were used to allow development to take place without coding knowledge. Tasks consisted of gathering existing web development tools that enabled educators without extensive coding knowledge the ability to duplicate the building of an MDBLE. Therefore, limited effort was made toward modifying the original source codes of the theme and plugins used to build the prototype. The objective of this chapter is to both describe what an MDBLE accomplishes as well as denote the development tools used to build the prototype. For a clearer picture of the learning environment, a site tour and three possible user scenarios are provided.

User Scenarios

The following three potential user scenarios are presented to provide a narrative look at how the MDBLE is designed to function*:*

User Scenario 1

If after reviewing and practicing the online lesson, the learner needs help, he or she can use the community for assistance. Learners can contact a peer or use the videoconferencing intervention with an instructor when face-to-face interaction is needed. A typical scenario could be imagined from the perspective of someone on a twenty-minute bus or train home:

Jenny is riding the bus and thinking about her guitar lessons. She takes out her smartphone and connects to the GitShed.com MDBLE. Having completed the first module, she navigates to

the Basic Guitar Module and reads the First Position Chords and Arpeggiation lesson page. Next, she follows the links and watches three lesson videos. She arrives at her stop and while walking the short distance home she reviews the site's social media activity feed and watches a Muddy Waters video.

After relaxing at home, Jenny grabs her guitar and her smartphone. She opens up the lesson that she reviewed on the bus and attempts to accomplish the playing goal. She cannot quite get the gist of how to connect the learning content to her actual playing, so she navigates to the activity feed and posts a question to seek help from the learning community.

After about fifteen minutes and needing assistance to resolve the issue, Jenny selects the videoconference icon and enters the Google Hangout. Here, a live videoconference instructor greets her. The instructor can see how she is attempting to play the guitar and answer Jenny's questions. Jenny receives the support that she needs and practices over the next couple of days. When she feels comfortable, she uses her smartphone to record a video of herself playing the assignment and posts it on the activity feed. Assignment accomplished, she is awarded her lesson completion badge and can now move on to the next lesson. She can also approve and award badges for students that are working on lessons that she has already completed.

This is how the mobile flip instruction design of the MDBLE is designed to work. Self-directed learners take responsibility for their learning by putting the time in to engage and review the learning content. Should they need assistance, members first seek help using the learner social (LS) aspect of the interaction design. They post in the MDBLE's community activity feed and, if they need further assistance, are able to request a quick videoconference. Getting immediate help through the community feed, via the messaging system of the site or using a videoconference enables learners to maintain their engagement and enthusiasm.

User Scenario 2

David, a learner that has attempted to learn guitar a couple of times in the past, signs up for GitShed.com. He does not like searching for online lessons, but likes the idea of free lessons in a course format. After completing the registration process, David takes the first lesson of Module 1, as seen in Figure 4.

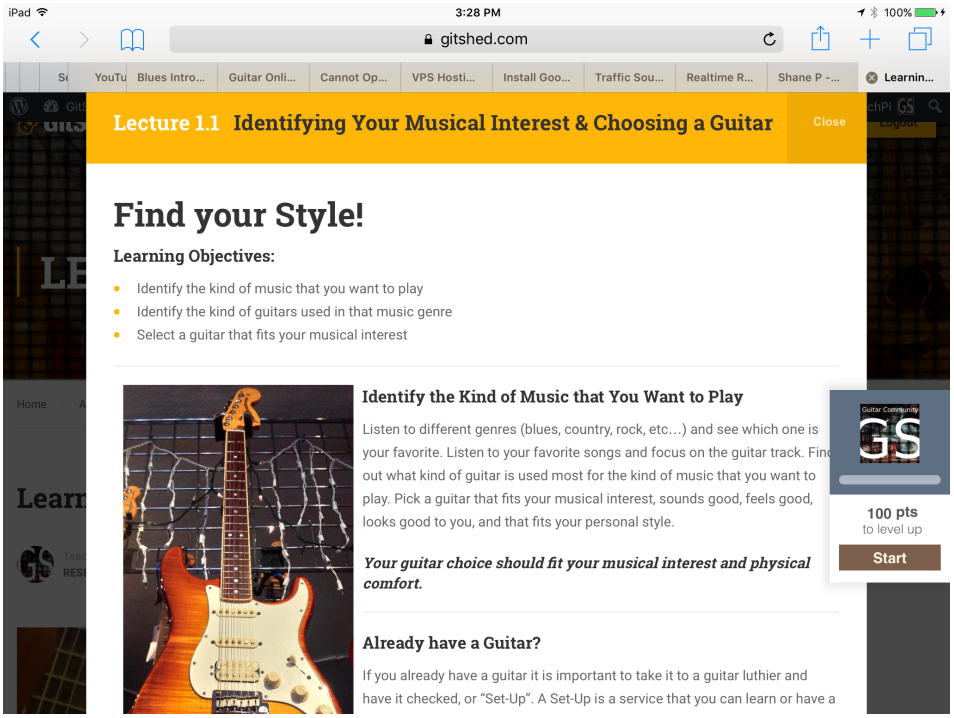


Figure 4. GitShed lesson with gamification pop-up.

After completing the lesson, David visits the community activity feed and browses through the posts. He finds a comment related to the kind of guitar that he wants to purchase and follows a link for more information. David continues to take lessons, but does not post lesson assignments or ask question in the activity feed. He *does* use the internal and external social media feeds for guitar related subject matter and entertainment. This is an acceptable use of the MDBLE because the learning environment is designed for all levels of social learning. Some users may choose to be very collaborative. Others, like David may choose to use their mobile devices for learning while limiting their interaction with others. This instructional design choice was made to accommodate different learning styles and learning preferences. The design goal of the MDBLE is to allow users to customize their learning experience. This instructional design goal is met when learners are able to craft their learning experience and successfully accomplish their learning objectives using their mobile devices and the MDBLE.

User Scenario 3

Cameron works the late shift and often has difficulty finding a guitar instructor that can fit his schedule. After seeing a GitShed Facebook post, he signs up and takes lessons using his

mobile device. He completes the first learning module and frequently posts on the community activity feed. As he starts Module 2, he has a question and posts it hoping to get a fast answer. Within about five minutes, he gets a reply that solves his problem. He awards the commenter points for providing assistance and continues to practice.

A few days later, he completes the lesson and earns his lesson badge. On the forums, he sees a post with a question that he can answer. He answers the question, but the poster still needs help. They arrange to meet in a videoconference to discuss the issue. During the discussion, Cameron suggests a solution that he found on the learning resources Pinterest board. He receives points for helping another member and for using the videoconferencing intervention. Cameron becomes very active on the MDBLE and acts as a facilitator whenever he is able.

This is another example that demonstrates how the interaction design of the MDBLE is designed to work: through a CoP and gamification learning theories. The learning environment was designed to encourage social learning interaction and reward users for supporting not only their learning, but also for supporting the learning of other community members. This LS aspect is optional, but highly encouraged.

What a MDBLE Does

A mobile learning environment delivers online learning using a mobile specific instructional model. Designed to be accessed using smartphones, phablets and tablet mobile devices, the GitShed.com MDBLE as shown in Figure 5 uses web-based instruction supported by a virtual learning community to teach basic guitar. Once accessed, users complete a registration process that enables the creation of a member profile and the ability to view the lesson modules of the site, the learning community, the learning resources and the videoconference support tool.

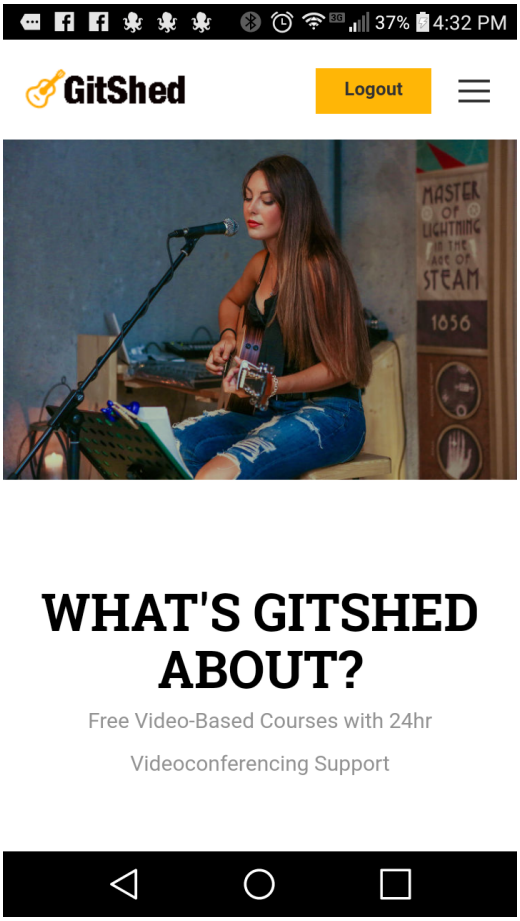


Figure 5. GitShed.com MDBLE viewed on a Smartphone

MDBLE Criteria for Learners

The learner aspect criteria for participation in MDBLE's are mobile device users who are receptive to using their devices for learning. This form of learning is advantageous for those that consider themselves visual learners, and are therefore receptive to video-based instruction. Learners can range from those new to technology to those with lots of experience. Learners may be self-motivated or motivated by outside circumstances, such as job requirements. A great term for this form of learning is: "Self-Directed Mobile Facilitated Collaborative learning," which consists of:

- Self-directed learners that use mobile devices to accomplish their learning goals.
- Learner customization through the selective use of site features.
- Independent use through highly collaborative mobile learning community members.
- Just-In-Time learning community support using mobile videoconferencing.

Learners can be “lurkers” (individuals who do not actively participate in interactive discussion) or “collaborative” members (individuals who *do* actively participate) of the learning community. The ideal learner is a self-directed visual learner willing to use their mobile device to accomplish their learning goals. Having a variety of options enables the learner to customize their learning experience and interact with the MDBLE in a way that supports their learning. The GitShed MDBLE provides the ability for users to customize their learning experience. Members have the flexibility to participate in the learning community, the guitar social media community or both. Learners also have the choice of using the video-based instruction without participating in the gamification aspects of the site. MDBLE instructors can engage in the posting of videos, hosting forums or, conversely, choose to limit their activity to answering student questions in the community feed, via SMS or through videoconference intervention. Having options provides for multiple ways to create unique learning experiences for each mobile learner and instructor.

Options alone should never be the main focus of the learner’s interest. Learners should also be receptive to mobile video-based instruction. Over time, receptive users will “eventually develop creative ways to take full advantage of the new medium” (Guo, Kim, & Rubin, 2014, p. 10). While the MDBLE design was applied to address the needs of independent online learners, it must be noted that MDBLEs can be deployed not only online, but also in educational institution-blended learning, corporate and government training programs (or a variation of these contexts).

Mobile Centric Video-Based Instruction

Mobile centric learning development entails the creation of appropriate multi-media learning materials and the consideration and implementation of content delivery. You may choose to have your learning objectives, lesson plans and course outlines available in digital form, or you may want to curate your content as you develop your MDBLE. A mobile centric approach requires developers to utilize a variety of teaching methods. For this development, “Mobile Flipped Video-Based Instruction” is the learning content delivery method.

Mobile devices have evolved from the small screen size of pioneering products to the current trend for larger screen sizes. Video-based instruction was selected because of the increased screen size as well as the video and videoconferencing affordances of current mobile devices. Another mobile device affordance is the “Digital video player,” which allows learners “to easily slow down, speed up, reverse, and replay video for review and closer analysis” (L. Bell

& Bull, 2010, p. 2). In their section titled, "The Special Issue on Digital Video," the following practices for science teachers were suggested:

- Identifying sources for effective motion pictures for instruction and analysis.
- Making best use of existing short videos.
- Providing instruction on how to shoot, edit, evaluate, and post science video explorations that can be used by the science education community.
- Involving students in the variety of inquiry methods to explore science using digital video. (L. Bell & Bull, 2010, p. 4)

These suggested practices were applied to the creation of the MDBLEs instructional design. YouTube was identified as a source for existing short instructional videos and the first module contains a lesson on how to use your mobile device to learn guitar. Links to instructions on how to shoot, edit, evaluate, and post mobile device videos are provided through site resources and the community is available for learner exploration and information sharing.

A study (and subsequent video recommendations) by Guo et al. (2014) suggest that "to maximize student engagement, instructors must plan their lessons specifically for an online video format" (p. 10). These Guo et al. (2014) findings helped to inform me of how to make the most of online videos for education. Two Guo et al. (2014) recommendations were taken into consideration in the selection of initial videos for GitShed.com video-based instruction. I found the recommendation to incorporate videos that are less than 6 minutes long very important to the development of MDBLE. Videos were selected following this and the recommendation to encourage learners to review the instruction as well as watch (and re-watch) videos as part of their learning experience. Length and the ability to easily review content is important in lesson creation and video lesson selection.

Lesson Selection Criteria

In this online video-based instruction model, the Flip Classroom Instruction (FCI) principle is modified for users of mobile devices. An important "goal is to provide enough information to understand the demonstration, but at the same time keep the video lively and interesting" (Chi et al., 2013, p. 3). With this in mind, when creating or curating videos "the less video-based verbal or written commentary/explanation around the core learning message, the

greater the engagement" (Thomson, Bridgstock, & Willems, 2014, p. 73). These suggestions from the literature were implemented in the curating of instructional videos used in the MDBLE.

Chi et al. (2013) reported that their participants discussed the importance of editing videos to a reasonable length. Thomson et al. (2014) used 2013 statistics to support the finding that 40% of YouTube videos are watched on mobile devices and the average length of these videos is 4 minutes and 12 seconds. They go on to suggest that the best length for videos viewed on mobile devices is less than five minutes. This importantly considers not only the cost of data usage incurred by mobile device users, but also the cognitive dissonance caused by poorly structured and designed videos. Thus, it was important to follow the advice of the literature for the study, as it aided in the selection of appropriately designed videos and shorter, more reasonable length videos to facilitate both data usage consideration and cognitive clarity.

In a non-controlled retrospective study, Guo et al. (2014) found that the highest learning engagement resulted from short videos ranging from 3 minutes (or less). L. Bell and Bull (2010) support this when discussing the affordances of video for classroom instruction by suggesting that teachers use short 30-second-to-3-minute segments that contain the most important learning content (p. 2). This is even more appropriate design consideration for users that view information and learning content on mobile devices. MDBLE developers should also consider the time it takes to script, record, and edit video-based lessons.

When discussing video production, Bright et al. (2015) reported the videos they produced averaged 1-2 minutes and took anywhere from 10 minutes to five hours to film. Their team members suggested that high-end equipment and skill is not necessary when producing learning videos. Going further, they encouraged learning and reflection through user engagement in the video production experience. With this in mind, learners using the GitShed MDBLE were asked to create self-assessment videos and post them to the community activity feed in order to reinforce their learning.

Chi et al. (2013) presented a semi-automatic video editing tool called DemoCut that helps users produce video tutorials. Use of this system resulted in clear and concise 2-5-minute long videos. This video length is an ideal target for creation or curating MDBLE flipped instruction videos. For the research site, existing basic guitar videos that met these criteria were selected from YouTube.com.

GitShed Lesson Selection

In 2012, it was reported that there was "currently much interest in online learning and the use of social media in music education as the mediums of connectivity increase" (Kruse & Veblen, 2012, p. 80). Kruse and Veblen (2012) reported that 73%, an overwhelming majority of content centered on technique and included bow holds, finger placement, posture, picking and strumming patterns, hammers-ons and pull-offs and scale patterns. The curriculum and learning content for the GitShed MDBLE were developed from basic guitar books and videos collected over a 20-year period of my personal learning coupled with a review of current online guitar instruction sites.

The development process included the investigation of existing online guitar learning websites and YouTube videos. Thaddeus Hogarth of Berklee.edu Online and Griff Hamlin of BluesGuitarUnleashed.com are two of the many online instructors reviewed for basic guitar learning content. Videos that fit this content were curated for use on GitShed.com. Three learning modules were developed using YouTube videos, basic guitar books and other online guitar instruction sites. The modules are: Learning Preparation, Basic Guitar and Skill Development. Beginners should start with Learning Preparation and complete modules in the order presented. Novice users can select modules based on their current skill level. See Appendix A for a structured list of modules and lessons.

Development Tools

While instructional design is an important aspect of any learning endeavor, the educational technology focus is the appropriate lens used when viewing the development of the MDBLE model. An important goal of the research project was to explore the potential of mobile devices as learning tools. This focus required the exploration and use of many learning technology tools. Content was prepared with a variety of free and commercial tools. The primary multi-media software programs and Web 2.0 services used to produce the GitShed.com site were:

- Gimp, a free Open Source photo, image and text editing package.
- Apple's Garage Band, for audio recording and unsplash.com for free images.
- Logomakr.com, for graphics.
- Gmail, for social media accounts, Google Hangout and Google Analytics.

- WordPress Content Management System (CMS).

Other image, audio and analytical tools were provided by a variety of software and Internet service developers. However, I found this combination suitable for MDBLE development. To accomplish the design goals, social media, and Gmail and shared server accounts were set up.

The linkage of internal and external social media enabled independent subject-related exploration outside of the main site on a variety of platforms. While both internal and external social media is used on other sites, those sites may not use a mobile-first design approach. The MDBLE mobile-first design approach sought to explore learning technology development from a mobile device perspective as opposed to a desktop or laptop perspective. The goal of the MDBLE model is to make information and learning content easier to view and utilize on mobile devices.

MDBLE Components

The initial development of the MDBLE platform focused on accomplishing all defined components and characteristics of the mobile learning environment design. Development tasks mainly focused on the prototyping of a functional MDBLE. Primary components of the MDBLE consist of: Registration, Course Management, Community Management, Videoconferencing Support and Gamification.

The following development tools were used to build these components in order to provide the desired functionality. The mobile learning environmental framework consisted of the WordPress Content Management System (CMS) portal, an internal Learning Management System (LearnPress LMS) and a Community of Practice (CoP). The BuddyPress Social Media Plugin was used for CoP and is linked to the following external social networking sites: Facebook, Google+, Pinterest, Twitter, and YouTube.

WordPress CMS

After the hosting server package was configured and connected to the Internet, a domain name and IP address were assigned using the Web Host Management (WHM) system. Next, the WordPress Open Source Software program, a content management system (CMS) was needed to manage the multi-media content of the MDBLE in order to be visible to users. WordPress was selected because it simplified the technical aspect of web development. Not only does WordPress

enable web development without extensive coding knowledge, it provides an easy to use dashboard for management of media and simple page creation functions, as seen in Figure 6.

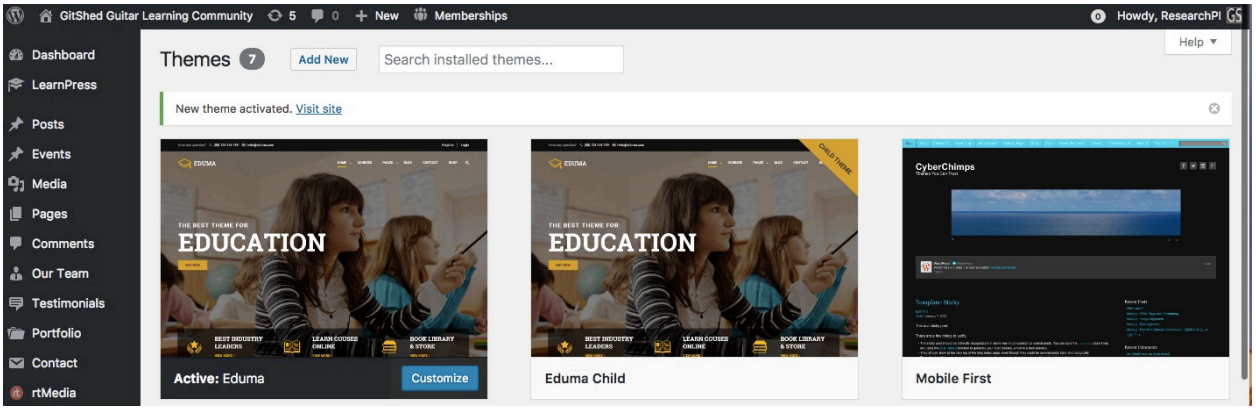


Figure 6. WordPress backend with activated EDUMA theme.

Additionally, WordPress provides a large repository of plugins and themes that can be configured for mobile learning. My novice coding knowledge was not a limitation when using WordPress for mobile learning development. Because WordPress provided the functionality and component affordances desired, it was the best choice for MDBLE development.

Learn Press Learning Management System

A "Theme" is special kind of application that adds visual layouts and specific functions to a WordPress site. These pre-designed templates are commonly used in WordPress development. Some users specifically develop their own themes for their needs or commercial use. Several WordPress themes were tested for customization over a two-year period on the GitShed.com site before I started to use the LearnPress Plugin on a theme.

LearnPress was the theme chosen for the site because it provides complete Learning Management System (LMS) functionality using a responsive visual design that adjusts to the user's mobile device. LearnPress enabled the creation and management of courses, quizzes, questions, lessons, orders, collections, certificates, statistics, events, portfolios and testimonials. Visually pleasing design and simple course management made this a practical theme to build upon, as seen on an Android device in Figure 7.

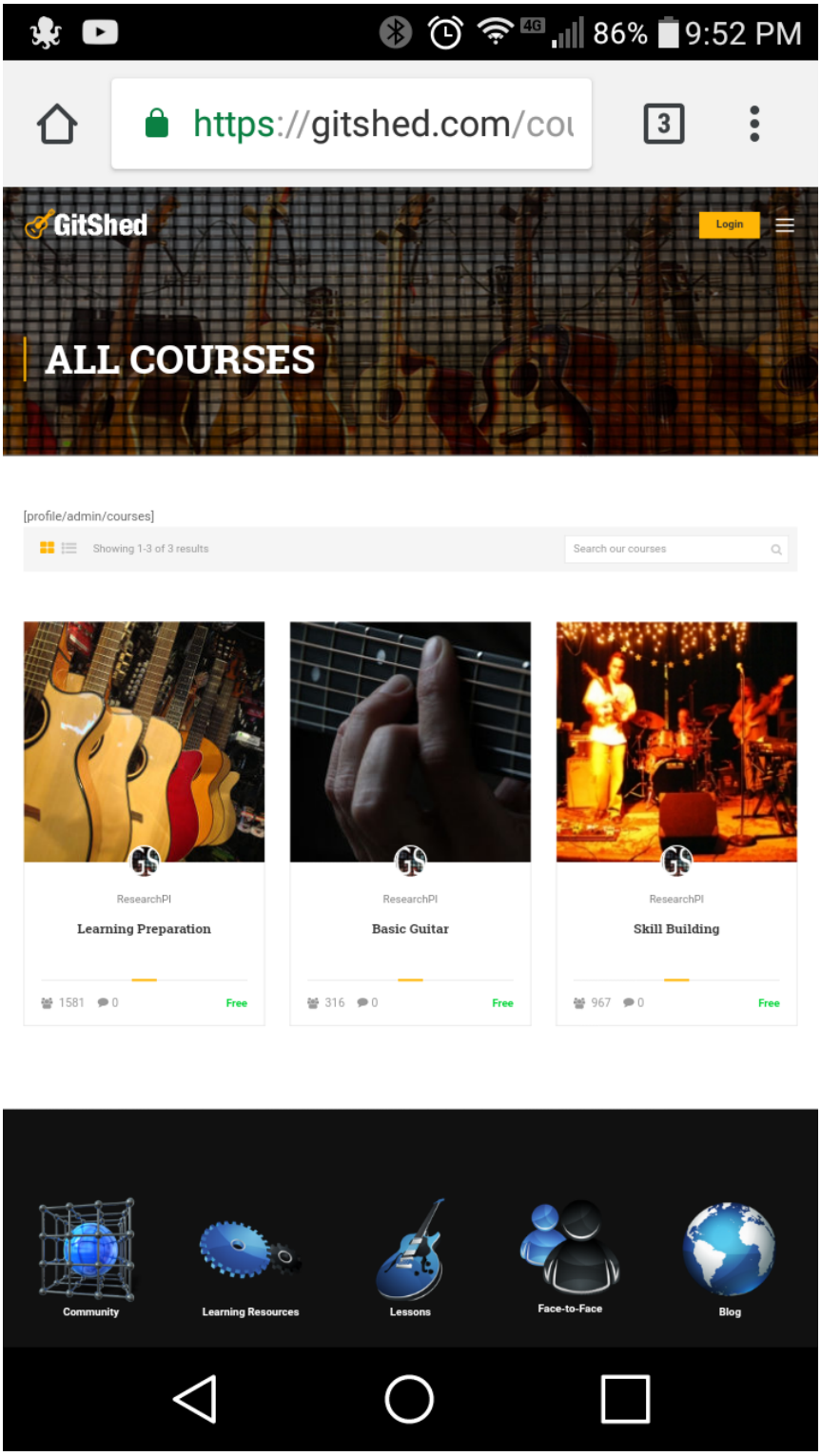


Figure 7. LearnPress Visual Display of GitShed.com

Figure 5. GitShed.com MDBLE viewed on a Smartphone. Figure 7 and Figure 8 show the visually appealing use of large images.

LearnPress provides customizable layouts that can be adjusted to fit the developer's needs. Large images are very useful and help identify the site, the learning modules and navigation icons. Images used for learning modules and site navigation icons are linked to lessons and site pages, making it easy for users to quickly access the desired content.

The theme was upgraded to the "EDUMA LearnPress" by ThimPress, as it offered course creation, course management, BuddyPress integration, improved navigation and an emphasis on prioritizing mobile-device page building flexibility (among other features). It was selected because it seemed most effected for visually presenting information in a simple way on mobile devices. A version of the front page or frontend is shown in Figure 8.

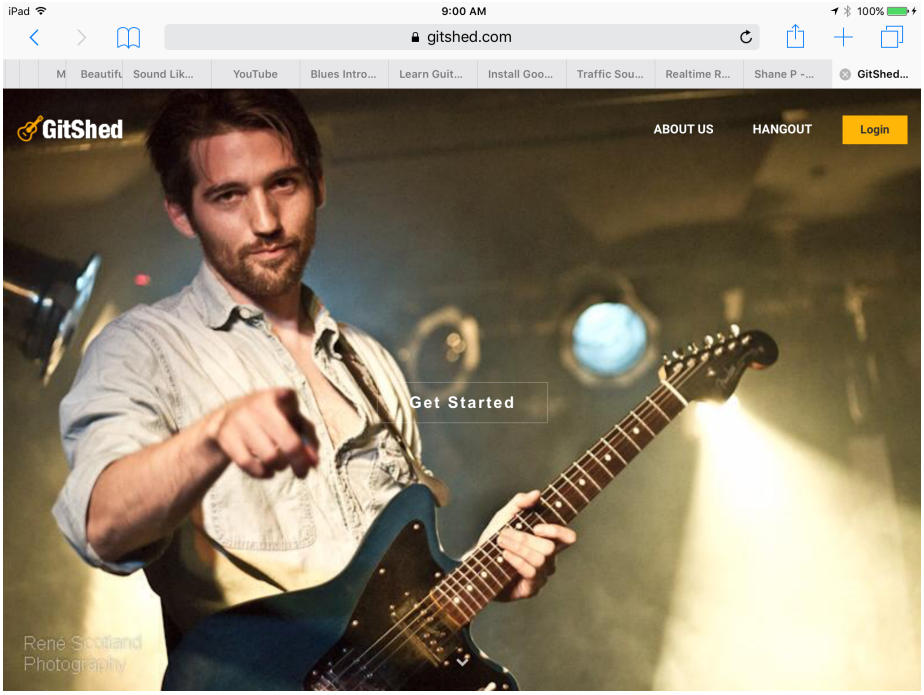


Figure 8. GitShed Front Page EDUMA Theme.

MDBLE Content Management System

Using GoDaddy web hosting, the WordPress Content Management System (CMS) application was installed on the server, followed by the "EDUMA LearnPress Theme," which was then customized and edited to meet the desired visual design and MDBLE functionality. The WordPress CMS and LearnPress theme helped to enable the desired mobile-first design approach. Responsive features of these products contributed to the environment's MD usability

design and helped to actualize and support the human interaction element outline in Tognazzini (2003b); see Appendix C.

There are many CMS applications to choose from, with some such as Moodle being specifically created for education. These CMS may provide mobile applications as a third user interface design option after desktop and laptop computers. They usually deploy "Responsive" applications that adjust their website content to fit desktop, laptop, tablets and smartphones. They can be visually complicated when viewed on a mobile device. For development simplification, the WordPress CMS was selected as the production and website platform.

Registration Paid Membership Pro

To accomplish registration, the Paid Membership Pro plugin was selected. Paid Membership Pro integrates with LearnPress and BuddyPress. It enables registration and the ability to limit access to member only areas of the MDBLE. It also provides custom integration between other plugins reducing potential conflicts while simultaneously improving the stability of the learning environment.

BuddyPress & bbPress

To actualize CoP, the GitShed site deployed an on-site learning community using the BuddyPress social media software plugin. Forum functionality was obtained with the addition of the bbPress plugin. *Figure 9* shows the community activity feed and gamification leaderboard viewed using an iPad. The educational theories presented in Etienne Wenger et al. (2011) and James Paul Gee (2005) are actualized in the community member interaction design and the automated point system. Incorporating these educational theories helped to actualize the design goals. Using CoP provided the ability to allow learners to contribute to the development of the learning environment. Gamification also provided users the opportunity to engage in motivational competition through the use of a point system and leaderboard.

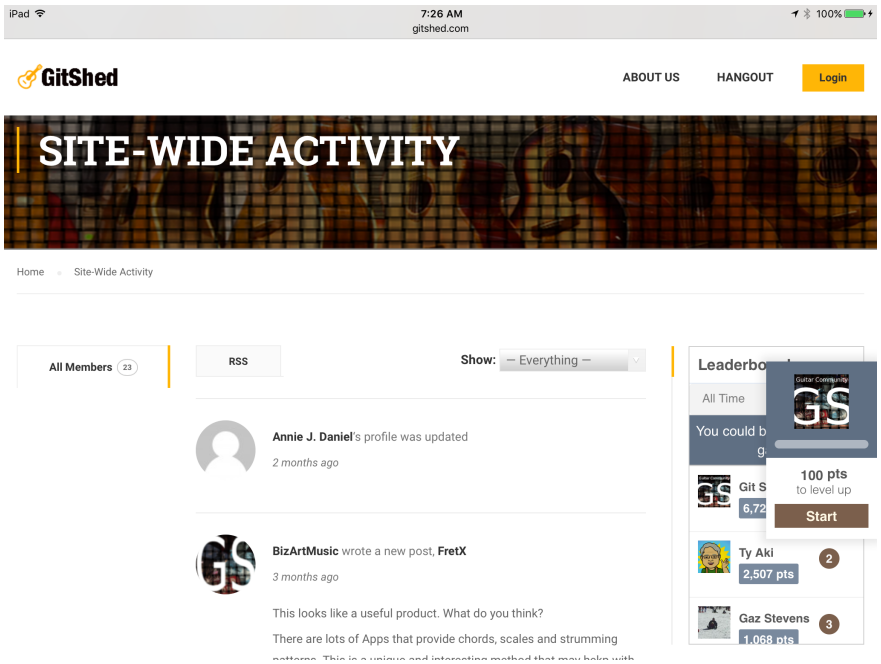


Figure 9. Social activity feed with Leaderboard.

Google Hangout Videoconferencing

A key feature of the MDBLE design is the ability to support learners through on demand videoconferencing. Learners are able to request a videoconference when they need lesson clarification or support with learning resources. Multiple services were tested before the Google Hangout service was added to the MDBLE. Skype and AppearIn are just two of the many services tested. Google Hangouts was chosen because it is free, easy to access via mobile devices and simple to add to the MDBLE. Menu and icon links were created so that users could access instant 24-hour support during the research project. While the original design vision for the MDBLE model consisted of videoconference support provided through a virtual help-center, Google Hangouts was sufficient for the research project and the testing of the GitShed.com prototype. During the research study, the researcher monitored the interaction of participants and elected videoconferencing.

MyCred – Gamification

To actualize the gamification theories provided by James Paul Gee (2005) in the MDBLE, the MyCred gamification plugin was added after the CaptainUp plugin was removed from the WordPress repository. The theories of James Paul Gee (2005) were incorporated for users that enjoy gaming leaderboard features. Learners can receive extra motivation from accomplishing

tasks and earning points. A point system was established to reward members for completing lessons, posting in forums and contributing to the site. Badges were also used for accomplishment recognition; these were posted on both internal and external social media sites.

Site Tour

Mobile device users are able to view the first learning module without joining the MDBLE. This exposes new learners to the learning environment and familiarizes them to the potential learning experience. In order to obtain complete access to the learning modules and member's only areas, users are required to register. The registration screen, shown in Figure 10, also provides fields for Instructors and opting into a newsletter signup. Lastly, a security feature is included that requires the user to answer a simple math question before submitting their registration. This security feature prevents Hackers from using automated software call bots from accessing the MDBLE.

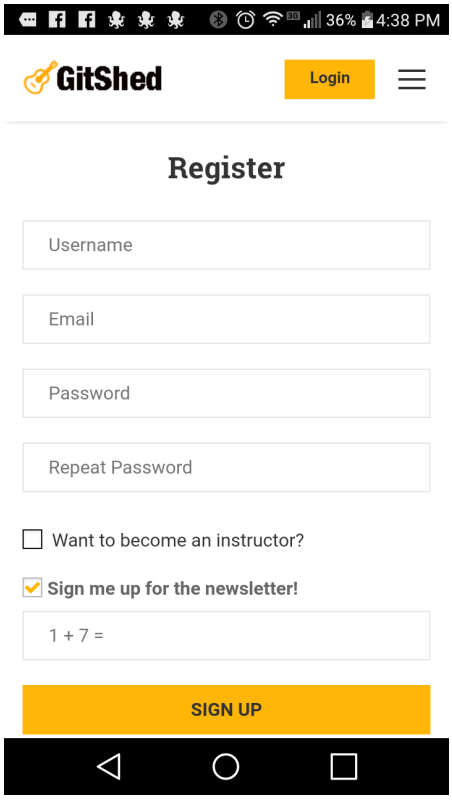


Figure 10. Registration Screen as seen on a Smartphone

Learn Press

Figure 11 shows the three Modules described earlier in this chapter. Modules were created for the GitShed.com MDBLE using the Eduma LearnPress theme and plugin. Also shown are the site navigation icons. Care was taken in the design of the navigation icons so that learners could quickly access the community, learning resources, lessons, videoconferencing and site blog using their mobile devices.

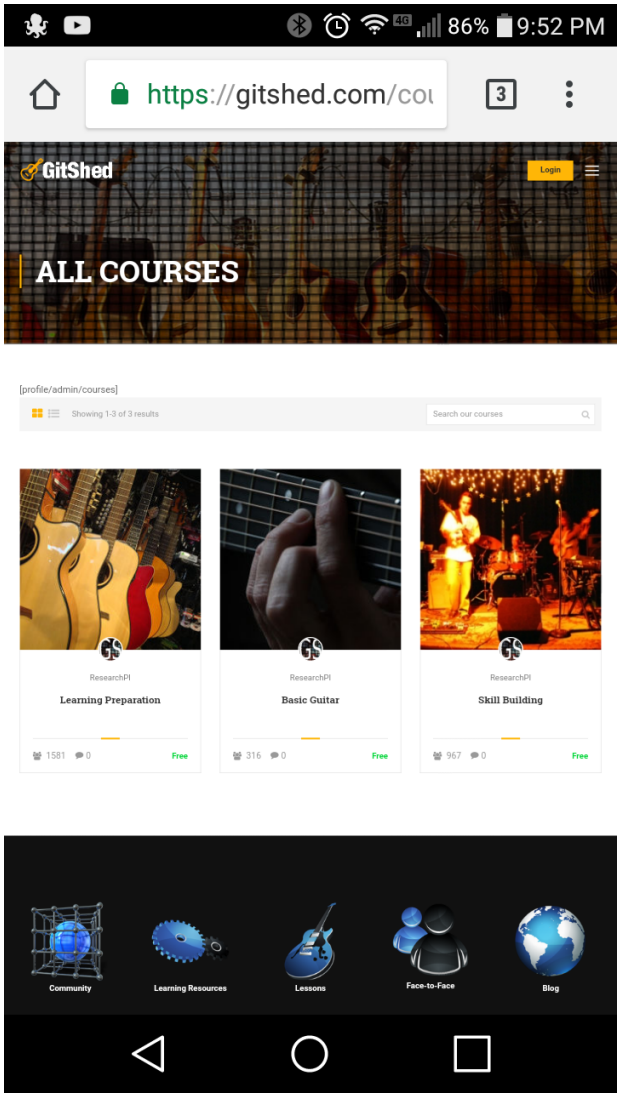


Figure 11. GitShed Learning Modules and Site Navigation Icons

Figure 12 provides a horizontal iPad view of the learning modules and one of the gamification plugins used.

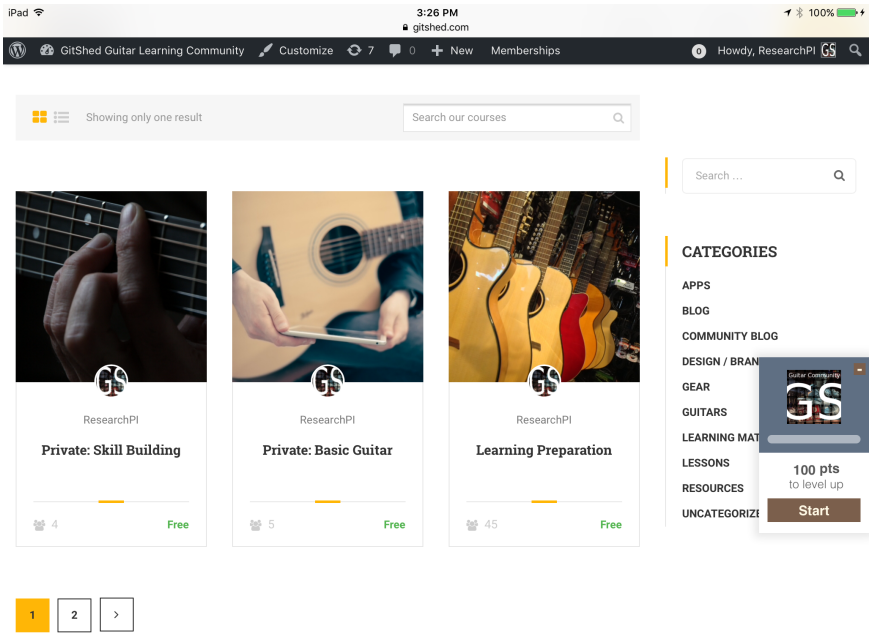


Figure 12. Lesson Modules with CaptainUp Gamification Hub

BuddyPress Social Media

Learners use the BuddyPress social media posting features as seen in Figure 13 to submit lesson assignments and communicate with the learning community.

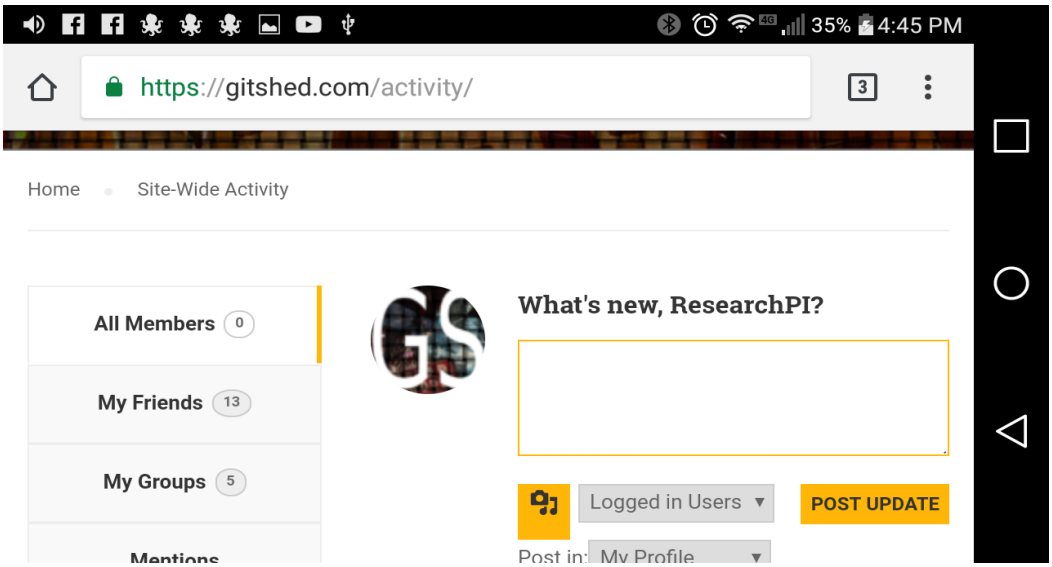


Figure 13. BuddyPress Posting Feature

The posting frame is similar to those found on the leading social media sites. Figure 14 shows how final post are seen after using the BuddyPress internal social media feature. This plugin

enables the functions that have become common in social media sites (as seen on the left side of the image and in the series of tabs above the activity feed). Community of Practice learning support can be actualized through the GitShed activity feed.

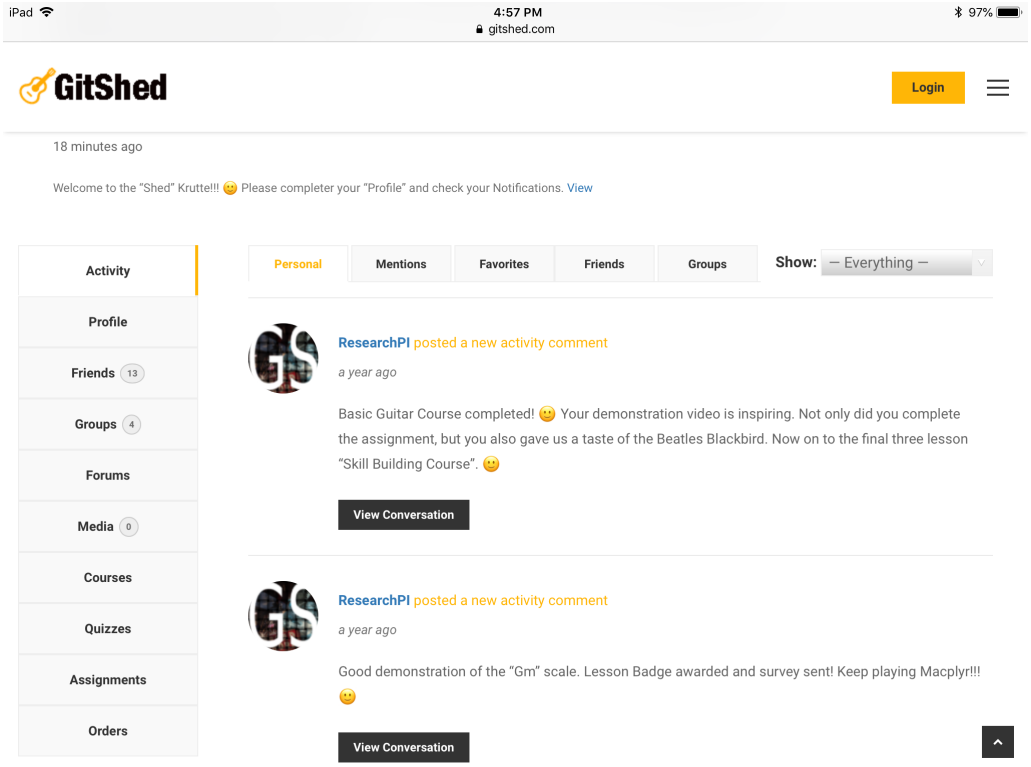


Figure 14. iPad View of the GitShed Activity Feed

External Social Networking Sites

Additionally, external social media pages, including Facebook, Twitter, Google+ Pinterest and YouTube were created and associated with the main GitShed learning community activity social media feed, as shown in Figure 15.

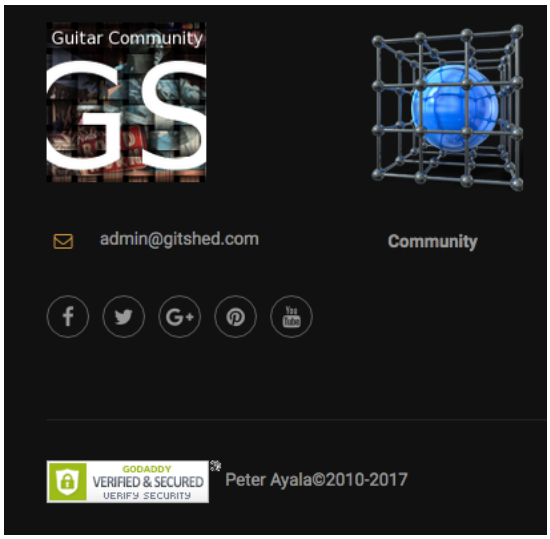


Figure 15. Community Navigation Icon with External Social Media Links.

Google Hangout Videoconferencing

Should a user need additional learning support, they are able to select the Hangout menu link or the videoconferencing icon at the bottom of each page. Figure 16 shows the Google Hangout portal as it looks when accessed by smartphone.

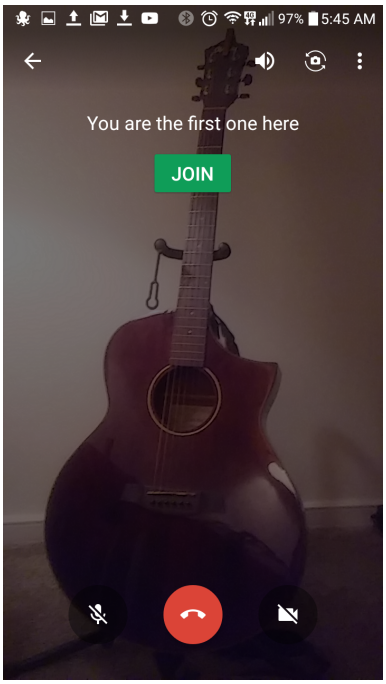


Figure 16. Google Hangout as seen on a Smartphone

MyCred – Gamification

CaptainUp was used for the majority of the research project. It was pulled from WordPress and MyCred was used to complete the project. Figure 17 shows the awarding of an accomplishment badge on the Facebook GitShed Page.

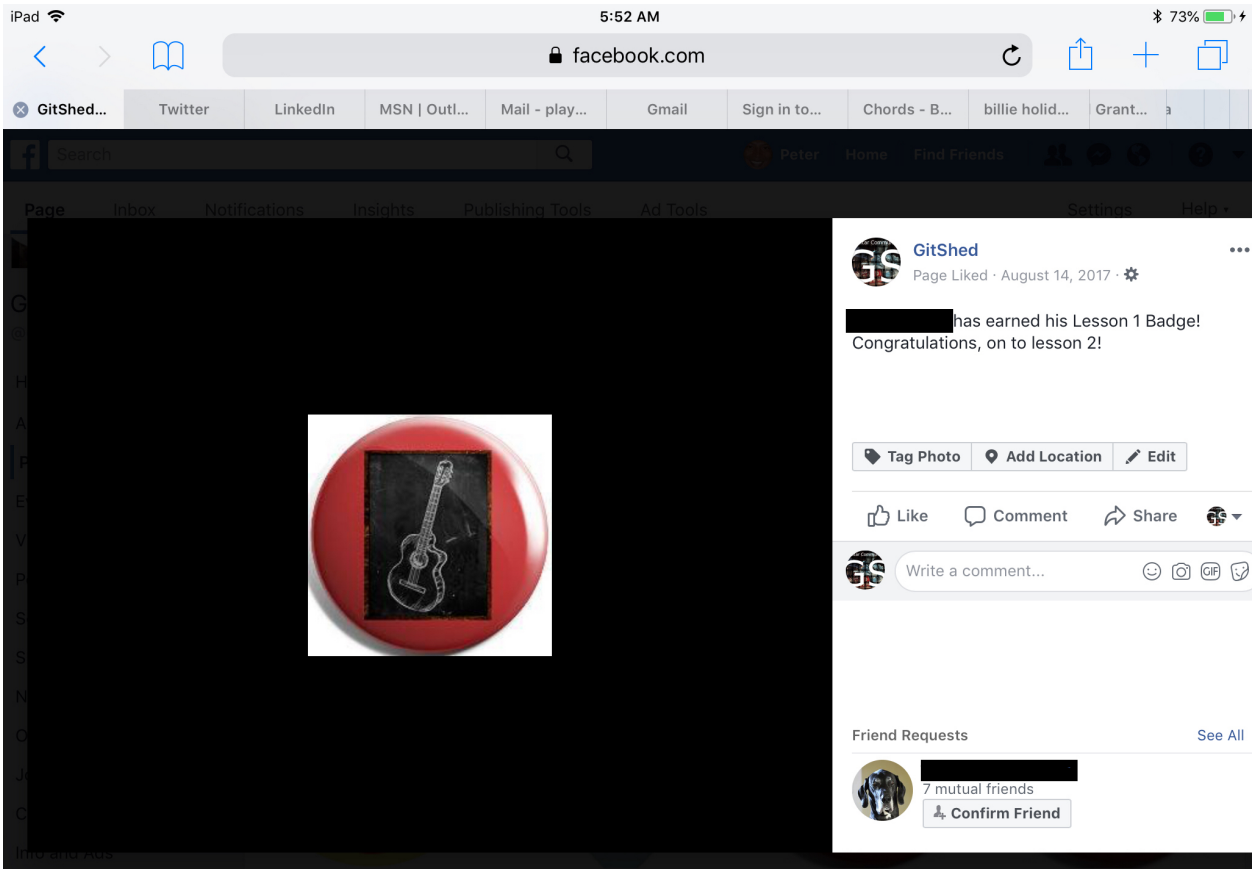


Figure 17 MyCred Badge award as seen on Facebook

Summary

This chapter presented the design approach used in the development of the MDBLE model. A description of what a MDBLE accomplishes, as well as the development tools used to build the prototype, were presented along with a site tour and three user scenarios. The software versions and services used in these examples are constantly changing. Some are updated regularly, and others are phased out. It deserves to be noted that it is the MDBLE model that should be explored, not the tools. Connectivism, discussed in the previous chapter along with the FRAME (Koole, 2009) theoretical Framework, contributed to the conceptualization and design

of the MDBLE model, which is situated in the Device, Learner, and Social aspects of the FRAME.

CHAPTER 4. METHODOLOGY

This chapter articulates the methodology selected to conduct this research study. Key topic sections include the research design, conceptual framework, participant selection, the role of the researcher, instrumentation, data collection and analysis procedures, the research timeline and ethical considerations. The study informed the researcher of the attitudes and opinions related to the participant experience in the researcher designed GitShed.com MDBLE via the Framework for the Rational Analysis of Mobile Education (FRAME).

The framework "describes mobile learning as a process resulting from the convergence of mobile technologies (D), human learning capacities (L), and social interaction (S)" (Ally, 2009, p. 25). The FRAME provides a structure for evaluating user attitudes toward the researcher designed instructional model. The unit of analysis is the researcher designed MDBLE. An investigation of usability, pedagogical perceptions and learner experiences of the GitShed environment as a whole – as well as specific aspects such as videoconferencing, collaborative learning and gamification – were conducted in collaboration with learner participants. How the videoconferencing intervention and the iterative aspects of the Community of Practice (CoP) inform the design evolution of the MDBLE was a key part of this study.

Research Design

To test this MDBLE concept, and direct the investigation, an exploratory and descriptive multiple method single-case study design was selected. Both qualitative and quantitative forms of data will help obtain a complete picture of participant attitudes, experiences and recommendations related to the MDBLE. Within the context of the study, the researcher followed and expanded on the multiple methods outlined in Koole et al. (2010) to investigate the MDBLE. Participant use, acceptance levels and potential benefits of various GitShed design aspects were examined using a single-case study design.

Qualitative case study research design was suitable for this inquiry because it focused on participant views (Creswell & Plano Clark, 2010, p. 235). The context that bounded this empirical case study is the online GitShed MDBLE setting. This mobile learning environment investigation utilizes a unique synthesis of emerging educational technologies in an innovative futuristic deployment. Case study is an appropriate method because it "has proven particularly

useful for studying educational innovations" (Merriam, 1998, p. 41). The disciplinary framework used in this research investigation is similar to the approach used in sociological case studies, in that there is an interest in the social interaction and the roles people play when learning with mobile technology in a community of practice.

The Qualitative and Quantitative Methods

In a related mobile learning study, Kukulska-Hulme and Pettit (2009) utilized a questionnaire that "contained both quantitative and qualitative questions relating to the use of different types of devices (namely, mobile phones, smartphones, PDAs, MP3 players)" (p. 139). Additionally, Rekkedal and Dye (2007) used an open qualitative questionnaire and a 5-point Likert scale survey for data collection. They determined that, for their mobile learning project, qualitative evaluation provided relevant data. These studies justified using multiple methods to study the online web based MDBLE setting.

Qualitative and quantitative data were collected from a group of Basic Guitar Learner participants in the GitShed.com MDBLE. An exploratory design that produced qualitative and quantitative data results was used. Working in tandem and interpreted together, the two types of data helped provide a better view of the research problem more so than a single method would have. Data sources used to gain a view of the learner experience included survey interviews using qualitative questions, demographic and Likert scale surveys with some open-ended questions and researcher site activity observations.

Qualitative and quantitative data collection began after the selection process with a demographic survey and continued with surveys, post-participation interviews and observation within the MDBLE environment. Quantitative surveys added a numeric view of the learner perspective. Multiple angles of investigation provided different pictures of the learning experience and user attitudes. Triangulation was ensured by incorporating data acquired from the different modes of data collection and the resulting datasets.

The Research Questions

Richards and Morse (2007) point out that the combination of the research question, data and the analysis is the power of qualitative inquiry. For this investigation the FRAME model – with its three aspects, device (D), learner (L), and social (S) (see Chapter 1, Figure 2.) –

provides the conceptual framework through which to examine the MDBLE. The FRAME model guided the search for answers to the two research questions:

1. **(RQ1)** How, if at all, do participants believe the MDBLE's design aspects (DL, DS, LS) facilitate learning?
2. **(RQ2)** What are the participants' attitudes toward mobile learning resulting from their experience with the FRAME design aspects (DL, DS, LS) of the GitShed.com MDBLE?

The use of 5-point Likert scale questions and open-ended comments as one source of data were replicated from the Koole, et. al study (2010). Instruments used by Chen and Chung (2008), Chin, Diehl, and Norman (1988), Kissinger (2011), Koole et al. (2010) and Wu (2006) were replicated and adapted to fit this investigation. Additionally, a researcher observation form derived from literature sources was used to supplement data collection and analysis. These are described in the instrumentation section.

Core constructs addressed in the instruments are clearly related to the research questions to align and provide background, context and reflect the participants' perceptions (McKenney & Reeves, 2012). Topic and analytic coding were used to explore concepts and pursue comparisons. The participant experiences, and development suggestions, provided the data for theme development within transcripts and detailed narratives. Analysis started with the initial investigation of the mobile learning literature and continued throughout the research project (Richards & Morse, 2007). The role of the researcher, participant selection and context, instruments and procedures and methods of analysis are covered in the following sections.

Researcher Role in Data Collection and Analysis

Chapter 1 provided a broad description of the role of the researcher in case study research. A case study multi-method approach suggests that the researcher take on multiple data collection and analysis roles. These roles enabled the researcher to act as interviewer, key instrument, evaluator and reporter. The researcher was responsible for the development of the MDBLE. Additionally, the researcher fulfilled the roles of content curator, community facilitator, social media manager and instructor when videoconference intervention support was

requested. The researcher selected participants for the research in a purposive way using a pre-selection interview process. The researcher gave an initial tour of the MDBLE research site during the selection interview and volunteers were observed for their ability to navigate the learning environment.

In this investigation, by gathering information through interaction and collaboration with learners, the researcher fulfilled the roles of the primary qualitative and quantitative data collector and analyzer. These roles presented the potential for researcher bias that is common in qualitative case studies. How the potential for bias was controlled is covered in the validity section later in this chapter.

Study Context and Participant Selection

This project was conducted completely at a distance. The setting of the study was the online GitShed.com MDBLE research website described in Chapter 3. In this study, participants were given control over the pace of learning activities during the research while the researcher encouraged their progress. The GitShed MDBLE environment was designed to function as a practical reflection of the end product. Chapter 3, *Figure 7* shows the GitShed home page. In the MDBLE, learners interact with others using a CoP developed with BuddyPress, a social networking WordPress plugin (see Chapter 3, *Figure 9*).

Potential participants were identified and selected based on their experience with collaboration, mobile devices, social media or the proposed intervention supports of interest to the study. Volunteer subjects for the learner participant group were recruited via word of mouth project promotion, email, flyers and posts in social media via Facebook, Google+, Pinterest, LinkedIn and Twitter Communities. An email, flyer and a social media post that explains the research are included in the appendices. Adults interested in participating in the research were directed to register as members on the GitShed.com research site and to contact the researcher for more information.

Research volunteers were invited to attend a participant selection videoconference interview (a pre-participation computer assisted interview). The research project was fully explained during the pre-participation computer assisted interview or during online Facebook and Google Hangout social media chats. The pre-selection process was designed to identify participants who are sufficiently skilled in the use of their mobile devices, willing to make a

commitment to complete the 10 lessons in the video-based instruction module, engage in collaborative learning and social media use, and complete all surveys and the post participation interview.

All participation requirements and consent elements were revealed in the pre-participation interview. Criteria for the sampling included: adult learners comfortable with Internet and mobile device usage (i.e. smartphones, phablets, and tablets). The interaction learning intersection (Chapter 1, *Figure 2*) takes into account the interaction between the individual learner and others in their learning and social environments. Participants were selected from the sample pool based on their willingness to use mobile devices in the MDBLE, their familiarity with the devices themselves and their intention to collaborate with other volunteers. Participant identifications are associated with ID codes based on participant selection and the CHS #23760 IRB designation. A range of mobile proficiency and collaboration levels were sought to strengthen the diversity of the sample.

The initial volunteer pool consisted of 14 adults of 18 years of age or older. These participants were purposefully selected to participate as learners and expert evaluators of the mobile device-based learning environment design and videoconference intervention. The purposefully selected participant sample for this study was a population of early adopters who were English-speaking, of all genders and ethnicities, technically skilled in mobile device use, located all over the United States and interested in learning to play basic guitar.

Social media sites connected to the MDBLE and associated participant personal information were revealed through the research activities. Participants recruited using social media were made aware that information might be shared while using the internal and external social networking websites through a consent form. Informed consent was obtained through the use of GitShed.com site membership and the completion of research participation agreements. Other site members were able to choose to use the research environment without participating in the study. Recruitment materials and copies of the online research consent form and GitShed.com membership agreement are included in the appendices.

Instrumentation and Procedures

The FRAME aspects guided the alignment of research questions and instruments. Instruments replicated, refined or adapted from other studies and/or developed by this researcher

were used to collect data. Surveys and interviews were intended to measure the participant attitudes related to the "Flipped Mobile Video-based" form of instruction, quality of the learning content, learning resources and support and other Learner (L) aspects of the FRAME. The Social (S) aspect was measured using instruments structured to obtain user feedback on theories related to CoP/Social Media, Collaboration, Communication and Gamification. An additional set of instruments focused on learner self-assessment and the community based participant generated video assessment experience. Of particular interest was the user Device (D) aspect, feedback on the mobile videoconferencing experience as well as mobile device content creation, which was used as an assessment tool. Obtaining data associated with participant attitudes related to these D, L, and S aspects of the FRAME assisted in answering the research questions. The various instruments used in the study are shown in Table 3, 4 and 5, along with their sources.

Pre-Participation Instruments

Four instruments, the *1.1 Pre-Participation Interview,* the *1.2 Pre-Survey*, the *1.3 Demographic Survey* and the 6*.0 Observation Form*, set a baseline for the respondents' mobile device comfort levels, experience with social media, course management, video-based instruction and attitudes toward online learning.

a. 1.1 Pre-Participation Interview

The Mobile Device Experience, Proficiency, Network & Connectivity survey, Replicated from Koole et al. (2010), was completed using a mobile videoconferencing interview and computer assisted interview techniques. This survey provided a view of the brands, models of mobile devices, operating systems and networks used by participants to connect to the GitShed.com learning community. The survey also contained comments related to connectivity and comfort with research site related *Device Usability* aspects. The respondents were asked to rate their mobile device proficiency as advanced, high intermediate, low intermediate, or beginner. The respondents' prior experiences using mobile devices, such as cellular telephones, PDAs, smartphones, MP3 players, digital cameras or other miscellaneous devices were also of interest in this research. The distribution of mobile devices used by the participants, their service provider's network and comments related to connectivity were investigated to determine if they were able to use the research site and the design features being tested.

Table 3

Pre-Participation Research Instruments

Pre-participation Data Collection Tools	How Gathered	Source/Authors
1.1 Pre-Selection Walkthrough Script	Interview tool used during the walkthrough screening process	Researcher Prepared
Interview Tool: Script		
1.01 Pre-Participation Interview	Web Embedded Google Forms Questionnaire and Computer assisted interview using 1.1 Pre-Selection Walkthrough Script	Koole et al. (2010)
Measuring: mobile device proficiency, experience using mobile devices, brand/model of mobile devices, operating system and network used to connect to GitShed, comments related to connectivity, comfort with research site related *Device Usability* aspects, social media use, and motivation to interact with others using site related *Social Interaction* aspects		
1.02 Pre-Survey A	Web Embedded Google Forms Questionnaire and Computer assisted interview	Wu (2006)
Measuring: Collaborative A attitudes toward mobile learning		
1.03 Pre-Survey B	Web Embedded Google Forms Questionnaire and Computer assisted interview	Wu (2006)
Measuring: Collaborative learning attitudes (3 subscales: attitude toward collaborative learning, interactions, attitudes toward mobile learning)		
1.04 Demographic Survey	Web Embedded Google Forms Questionnaire	Wu (2006)
Measuring: Participant demographics, including music learning background and willingness to complete surveys.		

b. 1.1 Screening Walkthrough Script

Interview Script - Developed by the researcher to support the interview process.

c. 1.2 Pre-Survey

Collaborative Learning (CL) Attitude Scale - Developed by Wu (2006) was revised to align with this investigation and was used in the participant selection process to assess participant receptiveness to collaboration. The respondents were asked to rate their willingness and intention to collaborate with other members in a community of practice.

d. 1.3 Demographic Survey

Learners chosen from the participant selection process completed a web-based demographic survey using their mobile devices. The questionnaire provided an

overview of the sample pool demographics, including music learning background and their commitment to inform the study through interview and survey completion.

Participation and Post-Participation Instruments

Instruments used to collect data during the participants' use of the MDBLE include 8 post-lesson satisfaction surveys. the data were consolidated in the researcher's site activity observation form as seen in Table 4.

Table 4

Participation Research Instruments

Participant Data Collection Tools	How Collected	Source/Authors
2.01-2.10 Post-Lesson Satisfaction Surveys	Web Embedded Google Forms Questionnaire	Researcher developed
Measuring: Learner satisfaction with lesson clarity, lesson quality *Collecting:* Learners lesson improvement recommendations		
3.0 Post-Participation Self-Assessment of Learning	Web Embedded Google Forms Questionnaire 2 Questions	Chen and Chung (2008)
Measuring: Participant's retrospective assessment of guitar abilities before & after using GitShed.com		
4.0 Post-Participation Interface Usability & Satisfaction Survey	Web Embedded Google Forms Questionnaire	Chin et al. (1988) & Koole et al. (2010)
Measuring: Post experience satisfaction with mobile device input and output, site access location, frequency of interactions, feelings of "connectedness," importance of flexible access and user satisfaction with mobile device network connection, ease of navigation and learnability		
5.0 Post-Participation Interview	Script & Computer Assisted Interview Questionnaire	Kissinger (2011)
Collecting: Participants were asked to explain how and where they are using the mobile learning environment and to provide Gamification, Video-based lessons, Social Media, and Videoconferencing improvement recommendations, along with details of unique experiences during their MDBLE basic guitar learning (p. 59).		

a. 2.1-2.10 Post-Lesson Satisfaction Surveys

After each lesson, participants were asked to complete brief post-lesson surveys providing feedback on learner satisfaction with lesson clarity, lesson quality and lesson improvement recommendations. Data collected was used to improve lesson clarity and quality.

These three instruments were used after the participants completed the two modules consisting of four learning preparation and four basic guitar lessons. They were used to measure participants' self-assessment of learning attainment, perceptions of the mobile learning

environment, interface usability and satisfaction levels, attitudes related to the video-based mobile flipped instruction pedagogy, community/social media interaction, videoconferencing intervention, site gamification and improvement recommendations (along with details of the respondents' unique experiences during their MDBLE basic guitar learning).

b. 3.0 Self-Assessment of Learning

This two-question survey measured retrospective self-assessment of the participant's guitar abilities before and after using GitShed.com. This survey was given after the eight lessons were completed and before the *4.0 Post-Participation Interface Usability & Satisfaction Survey* and *5.0 Post-Participation Interview survey*.

c. 4.0 Post-Participation Interface Usability & Satisfaction Survey

According to Koole et al. (2010), usability is impacted by navigation, learnability, memorability and portability. A FRAME related *Likert Scale* survey was used to provide a view of the following: where the research site was accessed from, participant perceptions of learner satisfaction with mobile device *Input and Output*, frequency of social and videoconference intervention interactions, feelings of connectedness, the importance of flexible access, user satisfaction with their mobile device network connection, the ease of navigation, attitudes associated with the GitShed CMS and learnability and intended future use. This survey provided a view of perceptions related to how usable the participants' found the system based on their experience.

d. 5.0 Post-Participation Interview

Using a Google forms survey, participants were asked to explain how, when and where they used the mobile learning environment and provide video-based lesson, social media, and videoconferencing and gamification improvement recommendations, along with details of their unique experiences during their use of the MDBLE for basic guitar learning Kissinger (2011, p. 59). Participants were asked for their final improvement recommendations and for their suggestions related to the implementation of videoconferencing technology in mobile learning environments.

e. 6.0 Researcher Site Activity Observation Form

A Microsoft Word file was used to document the decisions made during the sample selection process, including notes from computer-assisted interview and

surveys (1.1, 1.2 and 1.3) that describe how well volunteers navigate the learning environment and why the selected research participants were chosen. System activity reports, lesson improvement recommendations, videoconference intervention usage, social media/community usage, gamification points/badge distribution and any significant site observations (as seen in Table 5) were documented and utilized to explore the degree of exchange experienced by the learning participants in the MDBLE. This observation form was used throughout the study to document observations of participant interactions with the site. Any significant site observations were collected, documented and used to refine the learning environment.

Table 5

Research Observation Instrument

Research Study Observations & Reflections		
6.0 Researcher Site Activity Observation Form	From participant screening through final data analysis	Researcher developed
Measuring: Suitability for Research Participation, how well volunteers navigated the environment and whether they might make a good participant for the research process, researcher's observations of learner participant's site activity, gamification points and badges earned, use of videoconferencing as a learning support, learner created artifacts and social interaction. Researcher's reflections from interview, researcher's post data collection project reflections		

Research Question Alignment

The instruments were developed to align with the research questions, the FRAME aspects and to generate data related to the participant experience in the MDBLE, coupled with these specific topics:

- Learning Attainment Levels
- Course Management System & Video-based Instruction
- GitShed CoP/Social Media & Gamification Use
- Videoconferencing Intervention Acceptance
- Participant Development Recommendations

Within the context of the study, the researcher investigated the videoconferencing intervention as it relates to the controls, and constraints of the device usability (DL), interaction learning (LS), and social technology (DS) intersections of the FRAME Model (Koole, 2009). The videoconferencing intervention as shown in Chapter 1, Figure 3, is integrated into the

FRAME, and overlaps the DL, LS, and DS aspects of mobile learning. Instrument variables that replicated from Koole et al. (2010) were aligned with the research questions and analysis methods described in Table 6.

Table 6

Research Question Alignment

Question	Instrumentation	Analysis
(RQ1) How, if at all, do participants believe the MDBLE's design aspects (DL, DS, LS) facilitate learning?	3.0 Post-Participation Self-Assessment of Learning Survey: http://goo.gl/forms/cyNyKW6R0A 5.0 Post-Participation Interview: http://goo.gl/forms/dCWzInMf2P	Thematic Coding and Descriptive statistics
(RQ2) What are the participants' attitudes toward mobile learning resulting from their experience with the FRAME design aspects (DL, DS, LS) of the GitShed.com MDBLE?	2.1 Post-Lesson Satisfaction Surveys: http://goo.gl/forms/X7kaMoUpF0 (numbered from 2.1 through 2.10.) follow each lesson. 4.0 Post-Participation Interface Satisfaction Survey: http://goo.gl/forms/9TEMNPQqzS 5.0 Post-Participation Interview: http://goo.gl/forms/dCWzInMf2P	Thematic Coding and Descriptive statistics

The primary sources of data were derived from Likert scale questions (see Appendix H), open-ended interview comments, and researcher observation notes. The questions in the quantitative surveys and interview questionnaire were derived from the aspects and intersections of the FRAME model (Chapter 1, Figure 2).

The post-participation qualitative interviews, quantitative participant surveys, and researcher site observations provided multiple modes of data collection and multiple datasets. The first dataset consisted of qualitative data obtained from the guided interview. A second dataset consisting of quantitative participant surveys included post-lesson surveys, Likert scale site usability surveys and a post-participation satisfaction survey. The researcher identified participant generated artifacts from observing the research site activity and social media observations using field observation notes to create a third dataset. Datasets were compared, related, linked or synthesized during collection and combined in the interpretation of the results of the study. After the participants used their mobile devices to access the GitShed.com MDBLE

and completed the learning modules, they were asked to complete the two-question survey on the *3.0 Post-Participation Self-Assessment of Learning Survey* to rate their guitar playing ability before and after using the GitShed.com MDBLE on a 0 to 10 point scale.

The final quantitative participant instrument, the *4.0 Post-Participation Interface Satisfaction Survey* (see Appendix H), was a 0-to-9 point scale survey that measured MDBLE interface satisfaction. It was derived from Chin et al. (1988), combined with closed "Yes" or "No" recommendation questions from Koole et al. (2010). The survey provides a view of learner perspectives related to the intervention, satisfaction with mobile device input and output, site access location, frequency of interactions, feelings of "connectedness," the importance of flexible access and user satisfaction with mobile device network connection, ease of navigation and, finally, learnability. Data collected measured participant experience satisfaction with mobile device input and output, site access location, frequency of interactions, feelings of "connectedness," attitudes regarding the importance of flexible access, user satisfaction with mobile device network connection, usability, ease of navigation, learnability, overall UI experience satisfaction, overall evaluation of GitShed and intended future use recommendations for the continued use of gamification, social media and videoconferencing in the development of mobile learning environments.

The qualitative survey instrument used in the *5.0 Post-Participation Interview* was replicated from Kissinger (2011) (see Appendix H) and was revised to gain understanding regarding mobile learning environment usage. Participants were asked to explain how and where they used the mobile learning environment and provide their final gamification, video-based lesson, social media, videoconferencing intervention improvement and MDBLE development refinement recommendations, along with any additional details related to their unique experiences during their MDBLE use.

The *6.0 Researcher Site Activity Observation Form* was used to complete the data collection process and document the researcher's descriptive reflections related to the participants' site and videoconferencing intervention usage, the learner participant's site interaction activity patterns and the use of mobile videoconferencing as a point of both learning support and peer interaction. Data were collected, analyzed, interpreted and used to refine the learning environment design and functionality. Participant created artifacts were collected through the researcher site activity observation form.

Data analysis resulting from participant feedback via surveys, interviews and researcher observation data were analyzed, combined and interpreted. This data provided a view of the participant attitudes related to the videoconference intervention and their mobile learning experience in the GitShed.com MDBLE. An iterative development of the site occurred through obtaining the learner perspectives of the mobile learning environment design aspects, usability, course management, learning content, video-based mobile flip instruction method, CoP activities, constructivist and collaborative learning effectiveness and the usefulness of the proposed mobile videoconferencing intervention. Participants' experiential feedback and view of the environment enabled a final iterative refinement of the MDBLE research site based on the recommendations generated from the data.

As suggested in P. Bell (2004), the adaptation of the MDBLE design by the participants is first promoted both through the first user training module, *Learning Preparation* (see Chapter 3, *Figure 11*), and through encouraging learners to provide their participatory design contributions. Next, the participant learning activities within the community were analyzed and compared in order to understand how the activities can be better presented.

Data Collection

All interview and survey data were collected exclusively online, utilizing mobile devices. Electronic surveys and online computer assisted interview methods were implemented through the research site. After each lesson, participants were asked to complete brief post-lesson satisfaction surveys. The surveys included a variety of quantitative questions with a qualitative comment section at the end. Quantitative questions were analyzed using descriptive statistics and qualitative questions related to the learning experience; data were coded to identify themes.

Researcher field notes were used to develop a descriptive narrative. Demographic, post-lesson, and post-participation interface satisfaction data were collected using surveys created in Google Forms (GFs) and linked to the research site. Survey links were also embedded into social media chats and posts. Within the context of the study, the researcher investigated the controls and constraints of the device usability (DL), interaction learning (LS) and social technology (DS) intersections utilizing The FRAME Model (Figure 2*,* p.21*)*.

Some computer-assisted interviews were conducted using videoconferencing, recorded and securely stored on a protected server hosted by GoDaddy. Data were backed-up from

GoDaddy servers to hard drives maintained by the researcher. Below is a summary of data collection processes.

Those interested in participating in the research were directed to register as members on the GitShed.com research site and contact the researcher for more information.

- Information was sent out via email, flyers, and posts via social media; word of mouth was used to attract potential participants interested in learning guitar online through the GitShed MDBLE. Those interested were directed to register as members on the GitShed.com site and asked to contact the researcher via email or through GitShed.com for more information.
- Volunteers completed the registration membership agreement and created user profiles using online tools within GitShed.com.
- Via a computer assisted *pre-participation interview (1.1)* and an online *pre-survey (1.2)*, the researcher further described the intended research and consent process and assessed the potential participant on the criteria for selection. The two pre-participation instruments, *1.1 Pre-participation interview and 1.2 Pre-Survey,* provided prior knowledge information, mobile device comfort level and willingness to engage in collaborative learning. During the guided interview process, the potential participants explored the course management system's video-based lessons and visited the internal and external social media pages that were designed to facilitate social interaction. Researcher observations and notes taken (see *6.0 Researcher Site Activity Observation Form*) during this phase also informed participant selection.
- Respondents were asked to voluntarily participate in the further stages of research.
- Those who opted not to participate after going through this pre-participation phase were able to begin the lessons with no further data collection.
- Once selected, participants completed the online *1.3 Demographic Survey* and began the online lessons. Data from the *2.1-2.10 Post-Lesson Satisfaction Surveys* were collected online after the completion of each lesson. Each lesson ended with a post-lesson survey and comment section.
- Researcher observations of the selected participants using the *6.0 Researcher Site Activity Observation Form* continued during the study period. The researcher continued to

observe participant activities within the GitShed.com MDBLE using a variety of analytic tools.

- Following completion of all eight lessons, the participants were directed to instrument 3.0, a self-assessment of learning. This online instrument consisted of two questions asking for a retrospective self-assessment of the participant's guitar abilities before and after using GitShed.com
- At the completion of instrument 3.0, the participants were instructed to complete instrument 4.0, an online survey on interface usability and satisfaction.

The final component of participation was a Google Forms survey. Once all post-lesson instruments (3.0 and 4.0) were completed, the researcher contacted the participants via email, social media chat and texts or through GitShed.com and requested a time to review responses. Participants were asked to review the survey responses for member checking.

Confidentiality and Privacy:

Data collected for the purpose of research, from artifacts, audio recordings, surveys and researcher observation of internal and public social media behavior as well as personal information (name, email or IP address) were securely stored on a protected server hosted by GoDaddy and backed up to an external hard drive. Once the research and required holding period has been completed, all recordings from this study will be destroyed.

Data Analysis

Harland (2014) believes the process of data analysis begins with research question development and temporarily pauses at the time of publication. Research question formulation strongly contributes to the data analysis process that follows the strategy outlined in the data collection section of this chapter. Data gathered from interviews, surveys and researcher observations were analyzed to provide a rich description of the case. From the qualitative interview data and open-ended survey questions, significant statements made by the volunteer participants were identified. Qualitative observation data were also analyzed for themes. NVivo 11 for Mac was used to develop a codebook by first looking at indicators of system activity, then examining the post-participation interview and open-ended question responses for each intersection of the FRAME model: device usability, interaction learning and social technology as reflected in Koole et al. (2010). The researcher also developed additional codes that were then

grouped into themes appropriate for responding to the research questions. Quantitative survey data were analyzed using Excel and provided primarily descriptive statistics. Analysis of each instrument is further described next.

Pre-Participation Analysis of Data

After voluntarily logging into GitShed.com and creating an account, volunteers were asked about their experience with mobile devices and their willingness to engage in collaborative learning using the *1.1 pre-participation computer assisted interview* and *the 1.2 Pre-Survey*. Any significant statements and meaning about the registration process, the suitability of the volunteers, their ability and willingness to inform the study and any initial revisions suggested by the volunteer group were documented and addressed using data collected from the *6.0 Researcher Site Activity Observation Form*.

a. **1.1 Pre-participation computer assisted interview data**

   The pre-participation computer assisted interview contained both closed ended (quantitative) and open-ended (qualitative) questions. Quantitative data were analyzed using descriptive statistics and qualitative data were transcribed from volunteer interviews and coded into five organizational nodes based on their responses. The potential nodes were: 1) prior music background, 2) attitudes related to learning with mobile devices, 3) video-based mobile flip instruction receptiveness, 4) familiarity with videoconferencing as a learning support, 5) social media and collaboration receptiveness, 6) interview and survey completion receptiveness, and 7) membership signup process improvement recommendations.

b. **1.2 Pre-Survey Data**

   Questions seek to discover individual volunteers' attitudes related to collaboration and their willingness to engage with other mobile learning environment community members. The quantitative data were analyzed using descriptive statistics.

c. **1.3 Demographic Survey Data**

   Demographic data were presented using graphs and descriptive percentages generated by Google Forms.

d. **6.0 Researcher Site Activity Observation Form Data**

   During the pre-selection computer assisted interview process, the researcher took observation notes. These were qualitatively analyzed. All data collected in this pre-

phase (interview, survey, observation notes) were used to identify a potential participant sample based on a diversity of mobile device expertise and willingness to collaborate.

Participation Data Analysis

Data collected during the lesson-taking phase using eight post-lesson satisfaction surveys and the researcher site activity observation form was analyzed to assist in answering the research questions.

a. 2.1-2.10 Post-Lesson Satisfaction Survey Data

Each post-lesson satisfaction survey asks learners for feedback related to the learning objective, learner satisfaction with lesson clarity, lesson quality, videoconferencing intervention use, gamification badge attainment and lesson improvement recommendations. These include both a quantitative rating and an open-ended comment field. Quantitative data were analyzed using descriptive statistics. Open-ended comments were coded based on the coding nodes that were loaded into NVivo 11 for Mac.

b. 6.0 Researcher Site Activity Observation Form Data

The researcher continued to collect observation data during the lesson phase. Data collected were qualitatively analyzed using NVivo for significant statements and actions taken within GitShed.com by the participants. This included site usage statistics as well, which can be analyzed quantitatively.

Post-Participation Data Analysis

After the eight lessons were completed, post-participation data collection and data analysis began.

a. 3.0 Post-Participation Self-Assessment of Learning

A two-question self-assessment measuring the participant's retrospective assessment of guitar abilities before and after using GitShed.com. Data presented using descriptive statistics.

b. 4.0 Post-Participation Interface Usability & Satisfaction Survey Data

This quantitative Likert scale survey provided data that were analyzed using descriptive statistics, including percentages, means and graphs. The survey data related to the participants' MDBLE videoconference intervention and its device usability (D), learner interaction (L), and social technology (S) FRAME aspects were presented. The graphs provided a visual representation of participant attitudes related to the MDBLE usability.

c. 5.0 Post-Participation Interview Data

Due to the availability of the remaining learners, the post-participation Google Forms survey was conducted online. Interview data were collected and reviewed for important and meaningful statements (Creswell & Plano Clark, 2010, p. 239) related to the MDBLE model, videoconference intervention, participant experience and recommendations. NVivo was used to sort participant interviews into initial organizational categories. Survey comments were transcribed, re-read multiple times, and loaded into NVivo for coding. The survey focused mainly on the participant's perceptions of the videoconferencing intervention, their personal experience using the mobile device-based learning environment and their development recommendations.

Discrete nodes were developed from responses associated with: 1) overall learning and mobile learning environment satisfaction, 2) perceptions of the videoconferencing intervention, 3) perceptions of the videoconferencing intervention's helpfulness, 4) ways in which the videoconferencing intervention was used by participants, 5) perceptions of the mobile device-based learning environment, 6) perceptions of the mobile device based learning environment's helpfulness, 7) ways in which the mobile device-based learning environment was used by participants, 8) videoconferencing intervention development recommendations provided, 9) video-based mobile flip instruction development recommendations provided, and 10) social media development recommendations provided. Participant responses obtained were also coded for FRAME nodes and used to form and label each node/theme extracted from the interviews.

The surveys were used to determine what themes emerge within and among these nodes as participant data were consolidated and reduced. Overlaps and redundancies were collapsed into more meaningful, substantive nodes based on participants' words and expressions. These

second-stage categories, or free nodes, were expressed with substantive codes taken from participant quotes.

Topic and analytic coding were used to explore concepts and pursue comparisons which emerged from computer-assisted interviews and observations. The participant experiences and development suggestions provided the purpose for theme development and detailed narratives. Each participant survey was individually analyzed before responses were consolidated for broad themes.

a. 6.0 Researcher Site Activity Observation Form Data

Richards and Morse (2007) indicate that researchers must choose, maintain and negotiate not only the relationship they have with study participants, but also how the relationships should be discussed throughout the report. The qualitative aspects of this study support this position. Researcher notes were maintained and analyzed throughout the study and included site use statistics as well as researcher reflections. The notes were analyzed qualitatively in NVivo 11 for Mac to determine what themes emerged. Narratives that describe the participant experience are presented in Chapter 5.

Trustworthiness

One of the values of case study research is that it can reveal areas of interest and inform the development of future study. When discussing the subject of case study validity, Yin (2000) stated, "the distinctiveness of the design, especially with the number of potentially relevant variables far exceeding the number of data points forces investigators to use different strategies for establishing internal, external, and construct validity" (p. 187). Instruments used for qualitative and quantitative data collection were replicated from existing studies to enhance credibility. The construct validity was tested to ensure that the constructs used were appropriate and could help to answer the research questions.

According to Merriam (1998), there are six basic strategies that can be used in qualitative research to enhance internal validity: *triangulation*, *member checks*, *long-term observation, peer examination, participatory or collaborative modes of research* and *control of researcher's biases*. To support the internal validity of this study, I discussed my worldview as it related to my assumptions of the importance of mobile learning and MDBLE development in Chapters 1

and 3, revealing my potential *Researcher's Bias* at the outset of the study. The *Role of the Researcher* sections in this chapter also reveal the potential for *Researcher's biases*.

Several strategies were used to mitigate the potential for researcher's bias and its influence on data gathering, analysis and interpretation. Strategies implemented to enhance internal validity are *member checks, peer examination* and *triangulation.* Member checks are used to ensure validity/trustworthiness by providing participants access to transcripts of their interviews to assure accuracy.

Peer examination, to assist in the refinement of the quantitative instruments, to review and verify the qualitative codebook of the study, and to examine findings can assist in developing trustworthiness. The researcher logged each significant decision and the interpretation of each discovery (Richards & Morse, 2007) using qualitative software. A data audit strategy was implemented to enhance credibility, dependability, and insure confirmability. An audit trail was created, and external auditors were recruited to inspect the data collection and analysis procedures and provide judgment concerning the potential for bias or distortion.

Online interviews, surveys and researcher field notes provide *triangulation* from three data sources. To address issues of trustworthiness common in qualitative case studies, a description of the results was drafted, and data audit strategies implemented. In addition to supporting the development of the information patterns or themes that emerge about the case (Creswell & Plano Clark, 2010) rich description supports case study validity. Providing a "rich, thick description" (Merriam, 1998) of the results facilitates transferability to other mobile learning environments. The rich description of the context of the study supports external validity through the enablement of the reader to compare the research with their contexts (Merriam, 1998). Given the accepted challenges with generalizability in qualitative research, the internal, external and construct validity strategies used in this study were intended to establish and ensure a reasonable argument for research validity, trustworthiness and transferability.

Product

This research study produced themes, narratives and a potential modification of the FRAME that reflects the participant experiences and perceptions in a MDBLE that includes videoconferencing. Participant development and refinement recommendations were used to improve the research site. Finally, the research revealed how the participants felt about the

MDBLEs effectiveness and its impact on their learning while providing information to improve GitShed.com and future MDBLE environments.

Summary

As mobile devices change the computing landscape, it is necessary to see how they can be implemented in new learning environments. This exploratory and descriptive multiple method single-case study tested the instructional model design and provided a view of user attitudes toward learning in a MDBLE. The videoconferencing intervention and community aspects of the study have sociological implications, the outcome of which may inform the fields of education, computer information science and business.

CHAPTER 5. FINDINGS

The purpose of this descriptive case study was to explore the mobile device-based learning environment GitShed.com, a learning environment developed by this researcher. A combination of quantitative and qualitative data was collected using Google forms, electronic chats, email, face-to-face interaction and videoconferences. The main focus of the qualitative inquiry focused on mobile use and perceptions of the MDBLE. A specific focus on learning environment usability, experiential perceptions and participant recommendations established the initial framework for the investigation. This chapter is a report of the analysis of the data and findings viewed through the theoretical lens identified in Chapter 2 (Figure 2). Results are aligned with the research questions and findings are discussed along with implemented researcher actions for the purpose of addressing participant recommendations. The chapter concludes with the restatement of the research questions and a discussion of how the data analysis findings impacted development of the MDBLE.

Demographics

MDBLE Participant Descriptions

The following section presents data collected from respondents. A total of fourteen (n=14) completed the research consent process and thirteen (n=13) completed the demographic survey (1.01). Ten (n=10) completed the pre-survey on mobile device proficiency and nine (n=9) completed the pre-survey on collaborative learning attitudes. Several respondents opted not to continue the research study, but provided consent to use the data they had already provided. Those who decided not to continue with the study could still use the MDBLE, as could others who did not volunteer to be part of the study but wanted to use the site.

MDBLE Participant Demographics

Demographic information from the participants was collected using Google Forms. The majority of respondents were male; one participant chose not to respond to the gender question. Participant ages ranged from 28 to 61. Table 7 provides a closer view of the respondent population as a whole.

Table 7

Participant Demographics (n=10)

Participant	Gender	Age	Educational Attainment	Location
Francie	Female	50-59	Doctoral Degree	Louisiana
Allen	Male	60-69	Master Degree	Hawaii
James	Male	30-39	Bachelor Degree	Virginia
Van	Male	51-59	Bachelor Degree	Florida
Kevin	Male	40-49	Professional Degree	Michigan
Dan	Male	60-69	Professional Degree	Oregon
Kurt	Male	60-69	Master Degree	Hawaii
Lilly	Female	20-29	Master Degree	New York
Rose	N/R	30-39	Master Degree	California
Joe	Male	51-59	Associates Degree	Michigan

All members were from the United States of America, representing 8 of the 50 States, with two respondents from the state of Hawaii and two respondents from the state of Michigan. The range of the respondent's educational attainment indicate a high level of education among the majority of the participants. Additionally, 9 of the 13 had previous experience with online or mobile learning courses, as seen in Figure 18.

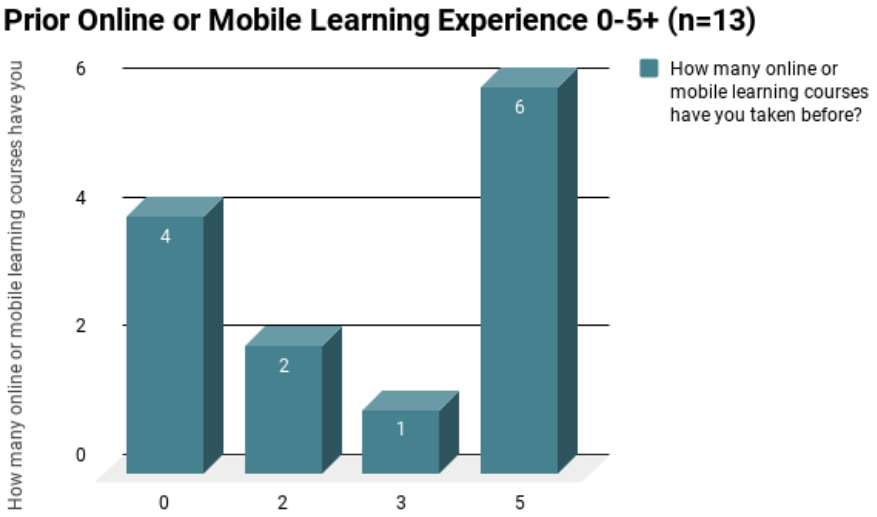


Figure 18. Prior Online Learning Experience

The majority of respondents (8 of 13 or 61.5%) had some prior music experience. Respondents had a variety of music preferences. Pop music was the most popular preference (10 of 13); rock, jazz and blues were the second most popular, chosen by 9 of 13 respondents. One respondent indicated a preference for metal and two selected country music. Three respondents reported never having owned a guitar while 7 of the 13 owned acoustic guitars. Nine respondents had made prior attempts to learn the instrument, while four had never attempted to learn guitar, as shown in Figure 19.

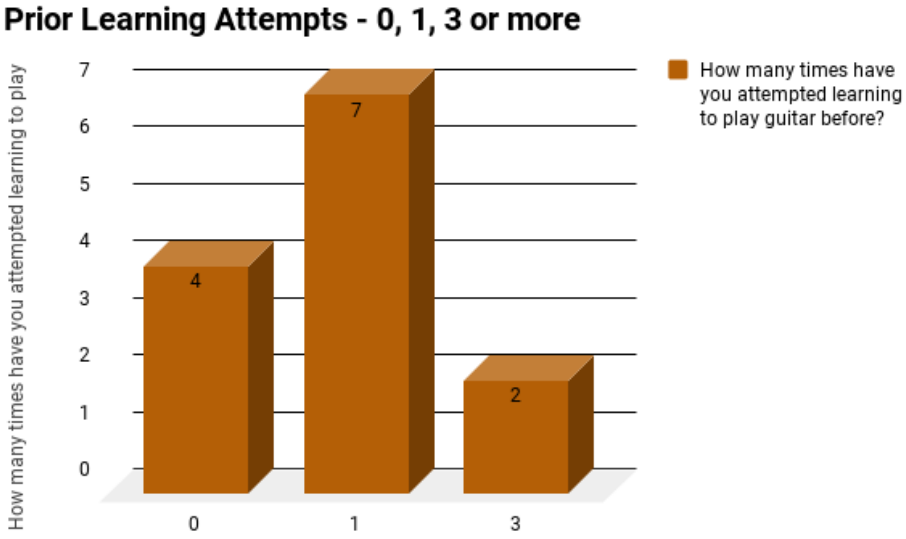


Figure 19. Prior Guitar Learning Attempts

Five respondents planned to devote one hour a week for the use of GitShed; 3 of the 13 indicated two hours per week; two indicated three hours and one each indicated four, five, and nine hours respectively. Respondents were asked about their comfort level with completing surveys. One a scale which rated comfort (with 1 being “not at all comfortable” and 4 being “very comfortable”), the majority (9 of 13 or 69.2%) expressed a high level of comfort. Two each selected ratings of two and three.

Mobile Device Proficiency and Experience (Pre-survey)

One of the pre-surveys assessed MDBLE participant proficiency with mobile devices through 27 questions related to mobile device experience, ownership and access. Ten individuals

(n=10) completed this survey. All ten of the respondents had experience using smartphones, while nine were also experienced with tablets, MP3 players and digital cameras. Seven participants reported experience with personal data assistant devices (PDAs) and five reported using some other type of mobile device.

The ten respondents reported their comfort with using mobile devices for the MDBLE assignment task by rating their mobile device proficiency, as shown in Figure 20. Six respondents rated themselves as having advanced proficiency, indicating they were comfortable with using their mobile devices as a tool for videoconferencing, creating and posting social media, making videos, recording audio tracks, sharing content and managing web sites. Two respondents rated themselves as having high intermediate proficiency with these tasks, while one each rated themselves as low proficient and beginner level.

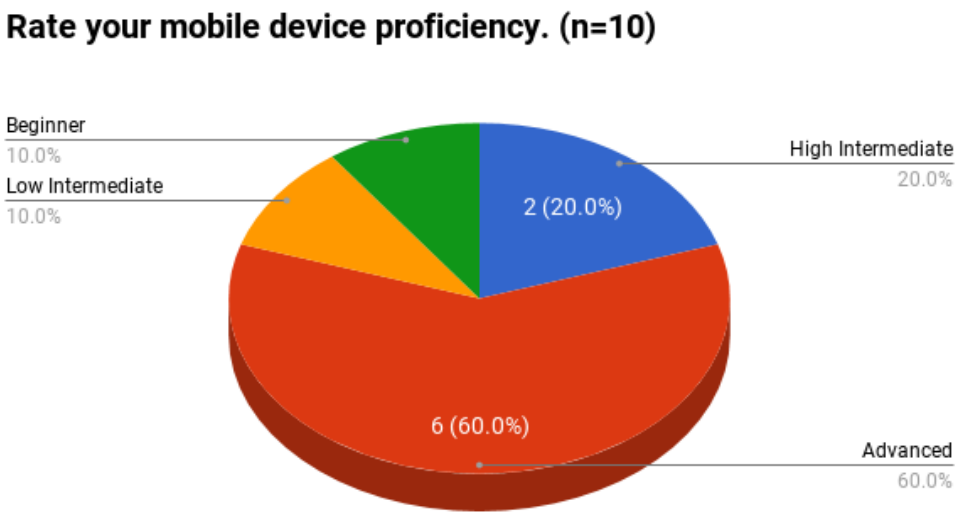


Figure 20. Mobile device proficiency of respondents

When asked what brand and model of mobile device was used to connect to the MDBLE site, 60% reported using Apple products, 30% used Android devices and 10% used a Windows brand tablet. Fifty percent connected to the research site through the AT&T mobile network, 20% used Verizon, another 20% used T-Mobile and 10% used Sprint. Respondents were asked about the ease of connection to the GitShed site with (where 0 was “not easy at all” and 4 was

"extremely easy"). Some experienced challenges, but 70% reported that it was extremely easy to connect (Figure 21).

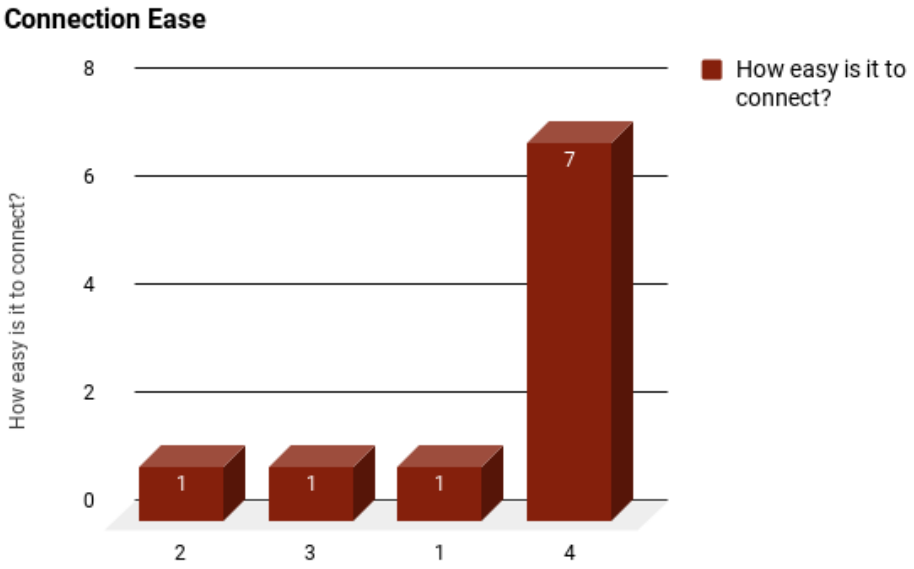


Figure 21. Initial Ease of Site Connectivity

It was important to assess the respondent's comfort with the mobile device features of the MDBLE. They were asked about their comfort with watching videos, playing games, using videoconferencing and accessing their social media accounts on a 0-to-4 Likert scale, where 0 was "not comfortable at all" and 4 was "extremely comfortable" (Figure 22). The majority of respondents reported high comfort levels. Eight of ten indicated high comfort with watching instructional videos and accessing social media (rating of 4), while two rated provided ratings of moderate comfort (rating of 3). Five reported high comfort with videoconferencing, four with playing games. One denoted low comfort with videoconferencing (rating of 1, or "slightly comfortable") and one was somewhat comfortable with playing games (rating of 2).

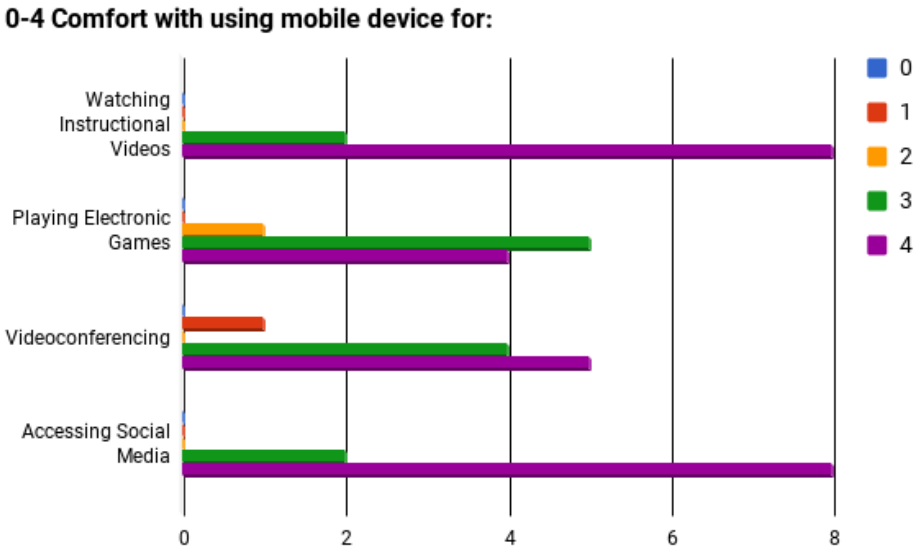


Figure 22. Respondent Comfort with Mobile Device Usage

The design of the MDBLE incorporated the most popular social media tools in use at the time of creation. The respondents reported high levels of social media use on their mobile device. Nine of ten used their device for Facebook, Instagram and YouTube; eight of ten used their device for Google+; seven of ten used their device for Pinterest, Twitter and miscellaneous other uses.

To gain insight on how motivated respondents were to interact with others in particular ways with their mobile devices, a 0-to-4 Likert scale was used, where 0 indicated “not at all motivated” and 4 indicated “extremely motivated.” Six of ten indicated they were extremely motivated to interact with others via social media or other learning communities (Figure 23). Four were extremely motivated to interact with others through videoconferencing, and three where extremely motivated to interact through games.

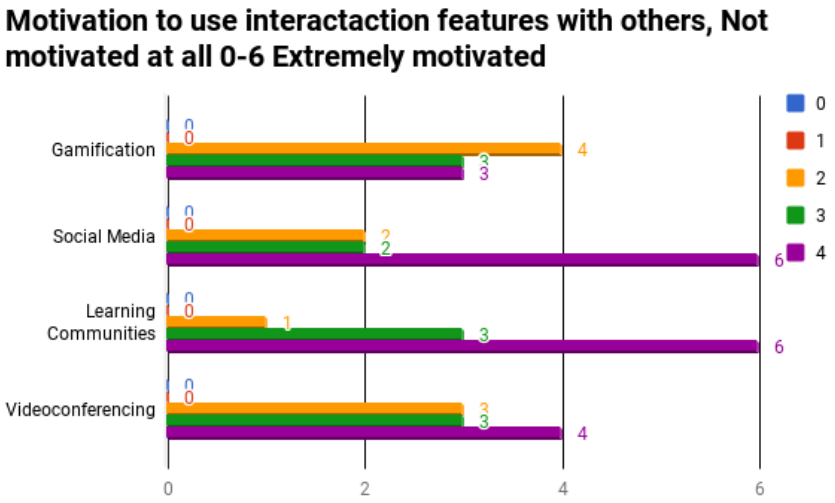


Figure 23. Feature Motivation

Collaborative Learning Attitudes Pre-Survey

Nine individuals (n=9) completed a pre-survey Collaborative Learning Attitude Scale (adapted from Wu, 2006). The twenty-eight questions employed 1-to-6 Likert scale, where 1 was "strongly disagree" and 6 was "strongly agree." There were three different scales on the instrument which included: (1) Attitude toward Collaborative Learning, (2) Interactions, and (3) Attitudes toward Asynchronous Mobile Learning. A discussion of each follows.

Attitude toward Collaborative Learning

Respondent attitude toward collaborative learning was measured via 6 items with 2 sub-scales, positive interdependence (items 2, 4, 5) and individual accountability (items 1, 3, 6). Items 1, 5 and 6 were reverse coded to calculate the subscales. Table 8 shows the individual items without the reverse coding. A review of the items associated with individual accountability shows that two-thirds (66.7%) agreed – or slightly agreed – that they would rather work independently (item 1); 100% of respondents indicated they felt motivated by a sense of responsibility to the group when working on group projects (item 3), while two-thirds disagreed or slightly disagreed that they preferred to work on projects alone (item 6). This would suggest that, while they might want to approach tasks independently, they did not necessarily want to work alone on a project and were motivated by working in a group.

Table 8

Responses on Collaborative Learning Attitude Scale (n=9)

Attitude Toward Collaborative Learning, n=9	1	2	3	4	5	6	Mean	SD
*1. Rather work independently		2	1	3	3		3.78	1.20
2. Working with others helpful			1	4	3	1	4.44	0.88
3. Motivated by responsibility to group					4	5	5.56	0.53
4. Enjoys teamwork				1	6	2	5.11	0.60
*5. Not useful to relate work to others	4	3	1		1		2.00	1.32
*6. Prefer to work alone		3	3	2		1	3.32	1.30

1=strongly disagree, 2=disagree, 3=somewhat disagree, 4=somewhat agree, 5=agree, 6=strongly agree. * negative items.

For the items associated with positive interdependence, 89% agreed, to some degree, that working with others was helpful (item 2), while 89% disagreed at some level that collaboration was not useful (item 5), while 100% of respondents indicated that they enjoyed teamwork (item 4). Thus, it is apparent that working in teams was overall seen as positive.

Once recoded to calculate the subscales, the mean score for the subscale of individual accountability was 4.19 (SD 0.78) and the mean score for the subscale of positive interdependence was 4.85 (SD 0.71). The overall mean for the attitude toward collaborative learning scale was 4.52 (SD 0.71), indicating that the participants “somewhat agreed” to “agreed” that they had a positive attitude toward collaborative learning. Data from this set of questions suggest that respondents are less interested in learning independently and have a willingness to collaborate with others to achieve their learning goals. Figure 24 shows the scale and subscale means for respondent attitude toward collaborative learning.

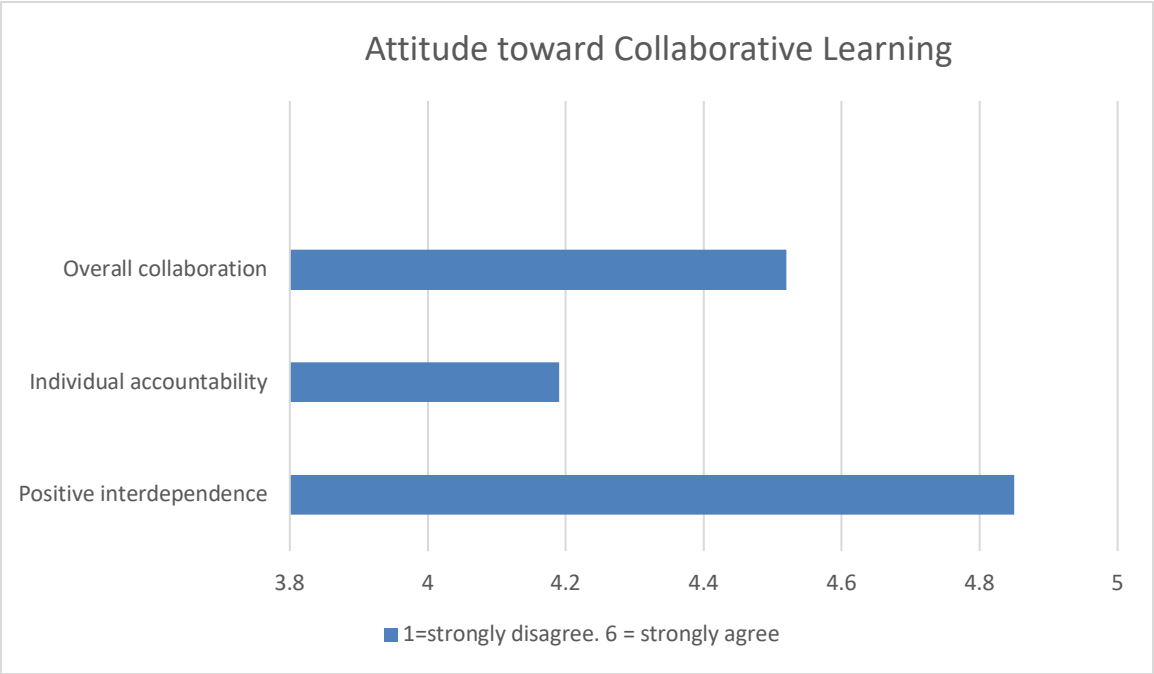


Figure 24. Attitude Toward Collaborative Learning

Interactions

The second scale, Interactions, was composed of twelve questions and four subscales: peer collaboration (items 1, 2 and 6), peer independence (items 3, 4 and 5), instructor collaboration (items 7, 10 and 12) and instructor independence (items 8, 9 and 11). Table 9 shows the results by item. In terms of peer collaboration, 100% agreed at some level that they preferred seeking help from peers (item 1), learning was more pleasant with peers (item 2) and they enjoyed interacting with peers. In terms of instructor collaboration, 100% agreed at some level that they enjoyed interacting with the instructor (item 7) while 89% agreed to some degree that access to the instructor was motivating (item 10) and that they prefer interacting in a face-to-face environment (item 12). In terms of learning independently from peers, two-thirds (66.7%) disagreed that discussing coursework with peers would not help (item 3) and 89% disagreed that they either did not care to interact with peers (item 4) or that socializing with peers was a waste of time (item 5). Independence from the instructor items indicated that two-thirds agreed that they enjoyed working without supervision (item 8). Two-thirds disagreed that they did not like the instructor monitoring their work (item 9) and that they preferred controlling their own pace (item 11).

Table 9

Interactions

Interactions, n=9	1	2	3	4	5	6	Mean	SD
1. Prefer to seek help from peers				3	3	3	5.00	0.87
2. Peers make learning more pleasant					4	5	5.56	0.53
*3. Discussing with peers will not help	2	3	1	1	2		2.78	1.56
*4. Do not care to interact with peers	1	6	1	1			2.22	0.83
*5. Socializing with peers a waste of time	3	3	2	1			2.11	1.05
6. Enjoy interacting with peers					5	4	5.44	0.53
7. Enjoy interacting with instructor				1	4	4	5.33	0.71
*8. Like working without supervision	1		2	5		1	3.67	1.32
*9. Do not like instructor monitoring me	1	1	1	2	3	1	3.89	1.62
10. Access to instructor motivates me			1	2	4	2	4.78	0.97
*11. Prefer controlling my own pace		1	3	2	2	1	3.89	1.27
12. Prefer interacting as in face-to-face			1	4	2	2	4.56	1.01

1=strongly disagree, 2=disagree, 3=somewhat disagree, 4=somewhat agree, 5=agree, 6=strongly agree. * negative items.

When looking at the subscales, peer interaction had a mean of 5.33 (SD 0.53) while instructor interaction had a mean of 4.89 (SD 0.83), indicating agreement that peer and instructor interactions are perceived positively. Peer independence had a mean of 2.37 (SD 0.89) and instructor independence had a mean of 3.81 (SD 1.26). This difference was significant in that learning independently from peers was seen as negative (disagree) while learning independently from the instructor was seen more positively (slightly agree). Data from this scale suggest that respondents had a strong interest and willingness to collaborate with others to achieve their learning goals. Interaction preferences are shown in Figure 25.

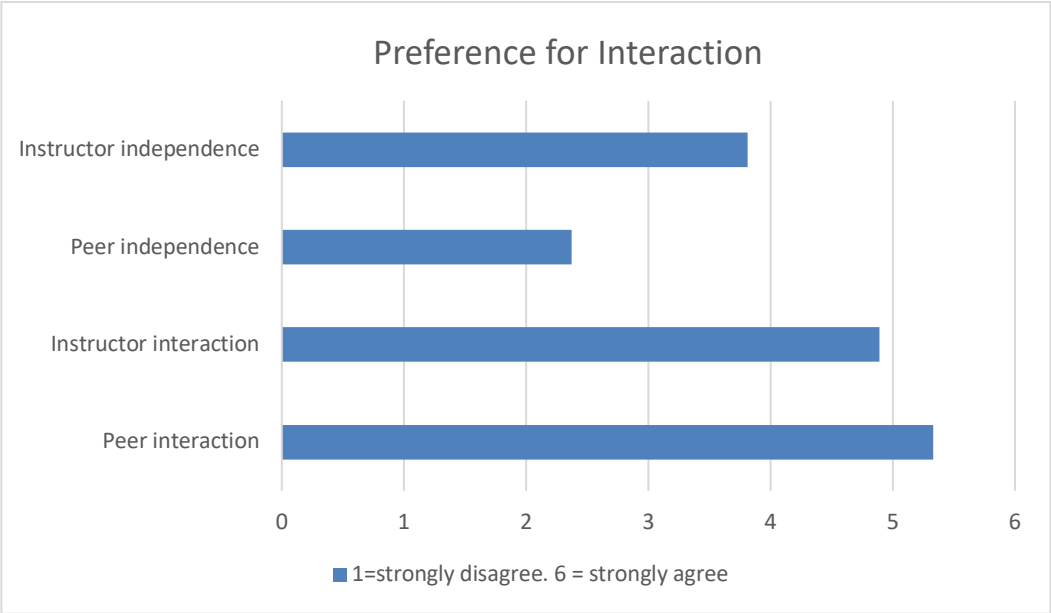


Figure 25. Preference for Peer and Instructor Interaction

Attitudes toward Asynchronous Mobile Learning

Attitudes toward asynchronous mobile learning were measured with ten items, each with four subscales: access (items 5, 9 and 10), flexibility (item 2), interactivity (item 6) and learners' perceived usefulness (items 1, 3, 4, 7 and 8). Items 4, 5, 7, and 8 were reverse coded when calculating subscale scores. How respondents rated these items can be seen in Table 10.

Table 10

Asynchronous Mobile Learning

Attitude Toward Asynchronous, n=9	1	2	3	4	5	6	Mean	SD
1. Online classes help me learn		2	1	3	1	2	4.00	1.50
2. Online allows learning at own pace				2		7	5.22	0.83
3. I prefer online courses	2		1	3		3	4.00	1.50
*4. Online makes me uncomfortable	8			1			1.78	0.97
*5. Take online only for convenience	3		1	2		3	3.44	1.81
6. Online provides peer interactions				2		7	5.44	0.88
*7. Online is not for me	8			1			1.44	1.01
*8. Only take online if no other choice	6		1			2	2.11	1.76
9. Not considering technical issues, would like online				2		7	5.22	0.83

10. Without considering convenience would consider online				2		7	5.22	0.83

1=strongly disagree, 2=disagree, 3=somewhat disagree, 4=somewhat agree, 5=agree, 6=strongly agree. * negative items.

For access items, there was a 55% (agree) to 45% (disagree) split regarding online courses only for convenience (item 5). All respondents agreed that without considering technical issues (item 9) or convenience (item 10), they would still consider taking an online course. In terms of flexibility, all agreed at some level that taking online courses allowed them to learn at their own pace (item 2). Eighty-nine percent disagreed that online courses provided opportunities to interact with peers in a variety of ways (item 6).

In terms of perceived usefulness, two-thirds (66.7%) disagreed that taking classes online would better help them learn (item 1). Two-thirds agreed that, given the choice, they would prefer to take courses online (item 3). Eighty-nine percent disagreed that online course environments were uncomfortable or confusing (item 4). Only 1 person (11%) slightly agreed that "online courses are not for me" (item 7), while two agreed that they would only take online courses when there was no other choice (item 8).

In looking at the constructs (using reverse scoring for negatively worded items), the mean score for access was 4.67 (SD 1.05), flexibility was 5.22 (SD 0.83), interaction was 5.44 (SD 0.88) and perceived usefulness was 4.73 (SD 1.07). These are shown in Figure 26. The means would indicate that the participants found the online learning environment to be flexible, accessible, provided interactivity and was ultimately perceived as useful.

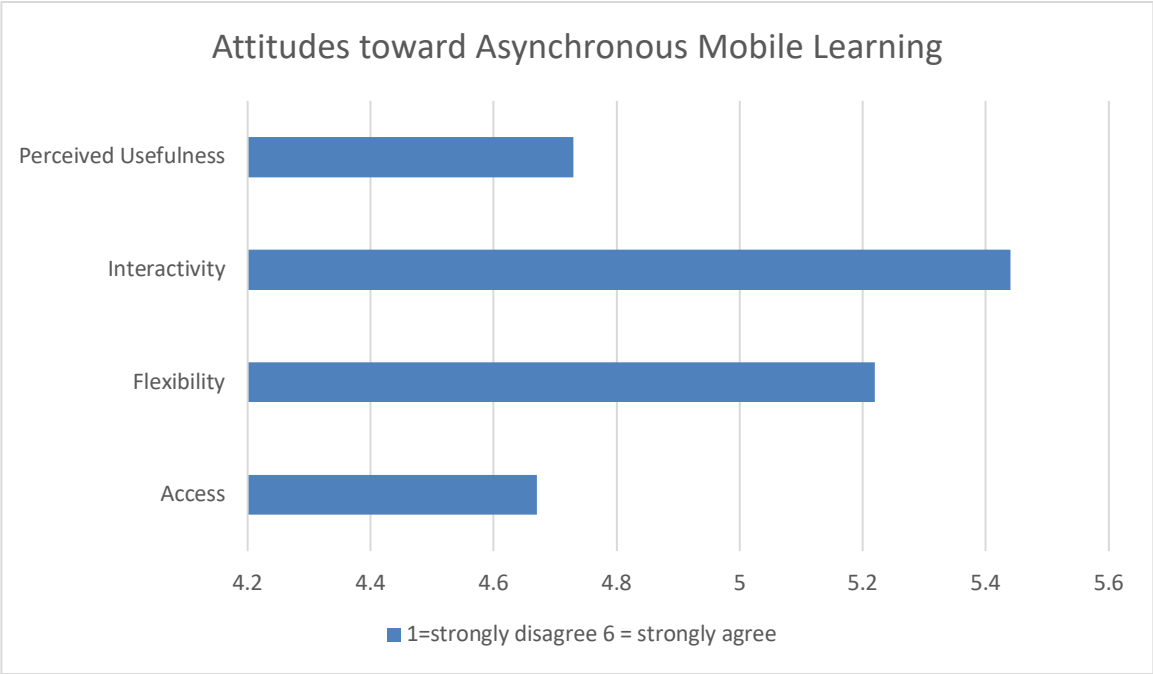


Figure 26. Attitudes toward Asynchronous Mobile Learning

Summary of Collaboration Data

Results indicate that the respondents were overall self-directed learners. However, data from the Independent category of questions suggest that respondents were less interested in learning alone and had a willingness to collaborate with others to achieve their learning goals. This is further supported by data from the Collaborative category, where respondents showed a strong interest and willingness to collaborate with others to achieve their learning goals. Attitudes associated with the student-teacher relationship reflected a preference for self-directed learning and show that the majority were flexible about working on their own without instructor supervision. Responses from the Self-Directed category of questions reveal a preference for a learning environment in which learners can control their learning pace without teacher interference.

The answers to the questions in the Online Course categories show receptiveness to online learning. Positive attitudes supported the belief that online courses provide opportunities for learners to interact with their peers via different channels, indicating a favorable desire for collaboration when taking an online course. Respondents did not feel that online course environments make them uncomfortable and confused. They rejected the idea that they would only take online courses when they have no other choice and prefer a learning environment in

which they can interact with their teacher in the same way that a face-to-face classroom setting would afford them.

The data provide a picture of those users choosing to participate in the MDBLE learning environment. Not all initial participants completed all of the remaining data collection instruments. Eight participated in at least some of the activities, completed lessons, and provided feedback online. The majority of the qualitative data comes from these learners. A summary of their activity is provided in Table 11 and is taken from online records and researcher observations.

Table 11

Learner Participation

Learner	Contribute Resources	Points/Badges Earned	Social media posts/comments	Videoconference with instructor	Videoconference with other learners
Kevin	2	81/8	27/5	Frequent	No
Al	0	64/8	16/2	Frequent	No
Ben	2	76/4	4/0	Once	No
Francie	0	19/2	0/0	Once	No
Bob	0	18/1	3/0	Three times	No
Lilly	0	8/1	1/2	Once	No
Rose	1	47/8	10/3	Once	No
James	0	43/3	2/0	Twice	No

Three of the eight learners added resources to the site and all earned points for activities and earned badges for completing tasks. Seven of the eight had at least some social media activity with three of the eight posting ten or more times. Videoconferencing interactions were restricted to those with the instructor and only two had frequent videoconference interactions. None used the videoconferencing tool to interact with other learners, even though that was the intent of the instructor when including the tool in GitShed.

In the next sections, the data gathered during and after lesson completion from these eight participants will be used to address the research questions.

Research Question 1: Learning Facilitation

The first research question asked: **"How, if at all, do participants believe the design aspects of the MDBLE facilitated learning?"** Several data sources were used to answer this question, including a participant post-assessment of learning, post-lesson ratings and comments, a post-lesson satisfaction survey and participant feedback that was collected online (e.g. postings and interactions with the researcher).

Self-Assessment of Learning

The learning environment consisted of three modules with the four lessons in the second module, Basic Guitar, as the main learning research focus. Learners were asked to indicate if they completed all of the lessons in the modules and to provide before and after perceptions of their ability to play guitar. Only two participants completed all lessons. Even though both had basic guitar experience before the study, they indicated that they benefitted from the experience using the MDBLE.

Post-lesson Comments, Survey Open-Ended Responses and Online Comments

Participants provided post-lesson ratings and comments using Google Forms. The number of participants providing post-lesson comments on each lesson varied from two to eight. Eight participants provided feedback via online interactions with the instructor. Only two participants completed the satisfaction survey with its open-ended responses. The qualitative data from the lesson comments, the open-ended survey responses and the comments to the instructor were analyzed qualitatively using NVivo 11 for Mac. Units of data were coded, then codes combined to form categories before finally developing themes. The complete list of comments can be found in Appendix H. Four themes related to design aspects which participants felt facilitated their learning emerged. These were: (1) instructional videos, (2) interaction with and accountability to others, (3) clear goals and directions, and (4) badges.

Theme 1: Instructional videos. In this set of data, there were fifteen comments related to videos used in the lessons. In general, the videos were perceived as useful, with two participants indicating that the videos were the most used feature for learning. Other comments related to the usefulness of the videos included:

- "I thought the learning videos in this module was easy to follow and understand what these methods are. I never knew the name of what I took for granted because of my ability to play. The technique was called arppegiate. Now I know what to call my style of playing."
- "I wanted to gain some new tricks to teaching and learning and having instruction videos embedded in one place made it easy."
- "This information is reviewed in the videos, but may be good to have them written … very nice instructional videos."

While the videos were well received, users also provided some recommendations, such providing lesson information in both video and written (form as noted in the third quote). Other suggestions included adding more videos, both from the instructor and the learners. Some of these ideas are reflected in comments below:

- "I had particular trouble with my hand placement on the frets. I understood the information conceptually, but I had trouble doing it. This was something I probably needed individual help with - maybe a specific video on this topic."
- "…Also a new video of a 'technique of the week' or application with the prompt would cause people to try new ideas and share."
- "Ask people to offer a video lesson source per month originated from themselves or another source like megachords.com, for example."

Some also recommended slowing down the videos or finding some slower examples.

- "Slow down that arpeggiation video course."
- "Find a couple of examples that slow the chord shifts a little, and makes the videos longer."
- "More samples at slower tempos would make it better."

Theme 2: Interaction with and accountability to others. One of the goals of the MDBLE was to encourage interaction among learners as well as between the learners and the instructor. Social networking and videoconferencing, messaging and other tools were embedded to support these interactions. There were ten comments related to the usefulness of interactions in the MDBLE and, as one participant indicated, these tools "made the community feel real." Examples of comments included:

- "The learning environment breeds accountability and inspiration from others while providing clarity or guidance at times."
- "I'd have to say, again, the thought on accountability to or for others helped me stay focused."
- "It is of great value and empowering to know I have a tutor at my fingertips. As the content increases, the more I will use it. Also, it is good to have others to relay with."
- "There were a couple texts from the few friends I had in this community commenting on my video and encouraging me to post the next one."
- "I appreciated the comments left by others."
- "It was shared that I was leading in progress and it made me feel a bit more responsible to use the lessons wisely."

Theme 3: Clear goals and directions. The third feature respondents found helpful in their learning was to have clear goals and directions. Seven comments were related to this aspect, with some noting where it was done well in the course and others noting where it could be improved. The comments below reflect this.

- "Clear goal and description." (Learning preparation module)
- "Clear course features."

- "The objectives match up well with their respective sections." (Basic Guitar 1.4)
- "The lesson is well organized with objectives, pictures where needed to emphasize information."
- "Lesson 1.1 clearly defines learning objectives. However, it needs more information on WHERE to create a post."
- "(Basic Guitar 1.3) Same thing here, where lesson objectives do not match up with their respective sections. If there are subsections, would be good to indent these in, so that they're not confused as the lesson objectives. Just a suggestion for better organization and flow!"

Theme 4: Badges. There were five comments related to the use of badges, a gamification element, to motivate learners. All but one of the comments were positive (the participant wrote that "Badges don't work and it is not a good motivator). Those who felt it *helped* motivate their learning indicated:

- "I got badges. That was cool."
- "I liked earning badges. I was indifferent to the competition but the badges let me know when it was time to shift focus."
- "It was shared that I was leading in progress [in earning badges] and it made me feel a bit more responsible to use the lessons wisely."

Post-participation Survey Ratings

Two learners (n=2) completed the usability and experience post-participation survey. The dramatic drops in participation over the course of data collection could be due to two factors. First, technical glitches were frustrated users, as was evident in reading the transcripts of interactions between the researcher and participants. These will be discussed later in this Chapter. The second factor could simply be the amount of data requested from participants. For example, the following comments were made by participants on the surveys:

- “Frankly, I thought I was done after the first lesson. When I found out there were three, I had a negative response to wanting to move on to the other two lessons. The "staff" had to convince me to do one more lesson. In fact, I thought I was done after I posted the last survey (8) only to get an email saying I had to complete 2 more short surveys. Well, it was NOT short at all. This particular survey does not have a completion "bar" at the bottom so I know when the survey ends. I am at responder's burden at this point.”
- “Make this survey shorter!!! It is way too long and you requiring open-ended questions on every page is tiresome.”

However, the two respondents did provide information on the usefulness of different site features. These two learners accessed the GitShed site between 3 and 5 times a week; one of them contributed to the site at least three times a week.

Table 12 provides a view of learner satisfaction with the MDBLE interface. The ratings indicate that the visual design and navigation were generally appealing to the users with ratings between 6 and 9 on a 9-point scale, where one indicated “low satisfaction” and 9 indicated “high satisfaction.” Overall, these two learners felt that color was used well, that the system was easy to use, that they knew what to do and that the sequence was easy to understand. One rating related to ease of navigating between pages was slightly lower.

Table 12

Interface Satisfaction

Question	Scale 0-9	Kevin	Al
The use of color was clear.	disagree – agree	9	7
The system was:	difficult to use - easy to use	7	8
I easily knew what to do.	not at all - very much	7	8
The sequence of screens was easy to understand.	disagree – agree	9	8
It was easy to navigate between pages.	disagree – agree	8	6

Learners reported that video lessons were the most used features on the site. Their responses to the quantitative questions support the theme that came from the qualitative data reported earlier. On the 9-point scale, both learners indicated the video lessons were clearly

organized and that they simplified learning, as seen in Table 13. One learner indicated he replayed and paused the video lessons to practice and reinforce learning content, while the other did less so. The ratings were lower for the ease of using the video lessons on mobile devices.

Table 13

Video-based MFI

Question	Scale 0-9	Kevin	Al
Using video lessons on my mobile device was:	hard – easy	6	4
Videos lessons were clearly organized.	disagree – agree	9	7
Using video lessons simplifies learning.	not at all - very much	7	7
I replayed or paused video lessons to practice and reinforce learning content.	not at all - very much	8	3

Table 14 shows results that support the use of gamification in the MDBLE. The ratings support the findings in the qualitative analysis related to the use of badges.

Table 14

Gamification

Question	Scale 0-9	Kevin	Al
Please indicate approximately how many times per week you earned gamification points?	1-3, 4-6, 7-9, 10 or More	4 to 6	1 to 3
Please indicate approximately how many times per week you earned gamification badges?	1-3, 4-6, 7-9, 10 or More	4 to 6	1 to 3
How satisfied are you with the gamification aspect of the GitShed learning environment?	not at all - very much	8	7
I enjoyed having the gamification connection to the community as part of the learning experience.	not at all - very much	5	7

Summary of Research Question 1 Findings

Research question 1 asked learners how, if at all, they believed the FRAME design aspects (DL, DS, LS) of the MBDLE facilitated their learning. Qualitative findings suggest that learning was facilitated through the use of videos coupled with clear goals and directions in written content. Interactions with community members and the instructor were seen as useful for facilitating learning; quantitative findings indicate that the use of social media and videoconferencing supported these interactions. There was a mixed reaction in terms of the use of gamification (i.e. badging). Overall, data suggest mobile learning was positively seen and the participants felt the MDBLE's FRAME aspects and many of its features did contribute to their learning.

Research Question 2: Attitudes and Opinions Toward Mobile Learning

The second research question asked: "**What are the participants' attitudes and opinions toward mobile learning based on their experience with the D, L, and S aspects and their intersections (DL, DS, LS aspects) of the GitShed.com MDBLE?"** Several data sources were used to answer this question, including post-lesson ratings and comments, a post-lesson satisfaction survey and participant feedback which was collected online (e.g. postings and interactions with the researcher).

Post-participation Survey Ratings

The post participation survey asked participants to rate their satisfaction with different aspects of the MDBLE environment. Survey ratings showed that some aspects were viewed more favorably than others. Videoconferencing was rated lower than other aspects of the environment. The social media tools in the MDBLE received slightly higher ratings. Usability was overall satisfactory, and participants indicated they were satisfied overall with learning using a mobile device and would do it again.

Videoconferencing. Results were not favorable in regard to mobile device videoconferencing satisfaction using a mobile device, as shown in Table 15. The learners were not satisfied with either the input or output when using videoconferencing on the mobile device

and tended not to use the videoconferencing feature to communicate with other community members, although there was moderate use with the instructor.

Table 15

Mobile Videoconferencing Satisfaction

Question	Likert Scale	Kevin	Al
How satisfied are you with your mobile device INPUT when using GitShed Videoconferencing?	Likert Scale 0-4 not at all – extremely	0	2
How satisfied are you with your mobile device OUTPUT when using GitShed Videoconferencing?	Likert Scale 0-4 not at all – extremely	0	2

Participants also indicated low use of mobile device videoconferencing, as shown in

Table 16. One participant only used it to communicate with the instructor.

Table 16

Mobile Videoconferencing Use

Question	Scale	Kevin	Al
Please indicate approximately how many times per week you videoconferenced with other Students or community members?	0, 1-3, 4-6, 7-9, 10 or More	0	1 to 3
Please indicate approximately how many times per week you videoconferenced with Instructors?	0, 1-3, 4-6, 7-9, 10 or More	4 to 6	1 to 3

Table 17 shows that there were moderate ratings for the ease of use of the videoconferencing feature and moderate feelings that texting might be better for distributing

information. However, both learners seemed to feel that videoconferencing was good for face-to-face interactions and learner support.

Table 17

Mobile Videoconferencing Ease of Use

Question	Scale	Kevin	Al
Using videoconferencing on my mobile device was	Likert Scale 0-9 hard – easy	7	5
The ability to seek videoconferencing help if and when it was needed was useful.	Likert Scale 0-9 not at all - very much	2	6
Videoconferencing is a good tool for providing face-to-face interaction.	Likert Scale 0-9 Strongly disagree-Strongly Agree	8	7
Videoconferencing is an effective method of providing face-to-face learning support.	Likert Scale 0-9 Strongly disagree-Strongly Agree	8	7
Videoconferencing was useful for the existing course and added value to my mobile learning experience.	Likert Scale 0-9 Strongly disagree-Strongly Agree	7	6
Videoconferencing contributed to my overall satisfaction with the learning environment.	Likert Scale 0-9 Strongly disagree-Strongly Agree	8	7
Overall, a learning environment that sends the information via text messages may be better.	Likert Scale 0-9 Strongly disagree-Strongly Agree	6	7

While the technology is becoming ubiquitous on mobile devices, there did not appear to be a strong desire by learners to take advantage of mobile videoconferencing.

Social media. Several participants used the internal social media aspect of the site as well as Facebook and YouTube posts as part of the project. Table 18 shows participant perceptions of

the social media aspects of the MDBLE. Learners expressed slightly below average satisfaction with mobile device social media input and output, but rated it higher than the videoconferencing. They felt that using social media was easy, supported their learning and contributed to the learning community. These ratings suggest that the role of social media as a learning support may be useful.

Table 18

Social Media

Question	Likert Scale	Kevin	Al
Please indicate approximately how many times per week you made social media comments?	1-3, 4-6, 7-9, 10 or More	4 to 6	1 to 3
Please indicate approximately how many times per week you created a social media post?	1-3, 4-6, 7-9, 10 or More	4 to 6	1 to 3
How satisfied were you with your mobile device INPUT when using GitShed Social Media?	Likert Scale 0-4 not at all - extremely	3	2
How satisfied were you with your mobile device OUTPUT when using GitShed Social Media?	Likert Scale 0-4 not at all - extremely	3	2
Using GitShed social media & Facebook, Google+, etc. on my mobile device was:	Likert Scale 0-9 hard - easy	7	7
Using internal and external social media helped to support my learning.	Likert Scale 0-9 not at all - very much	8	6
I feel that I contributed to the guitar learning community.	not at all - very much	7	7

Usability. Overall design usability ratings are shown in Table 19. The usability of the MDBLE was viewed in the mid-to-high range on a four-point scale. Higher rated items (both rated 3 or 4) included flexible access, ease of navigation, sense of control and sense of organization. Items where ratings were mixed (one rating of 3 and another of 2) included

network connectivity, learnability and using mobile devices to learn. The lowest rated item (ratings of 2) regarded the strength of feeling connected to others on GitShed.com.

Table 19

Overall Usability

Question	Likert Scale 0-4	Kevin	Al
Using the scale below, indicate how connected you felt to others in the GitShed.com learning community	not at all connected-extremely connected	2	2
Using the scale below, indicate the importance of flexible access to GitShed.com	not at all important-extremely important	4	3
Using the scale below, indicate your satisfaction with your network connection to GitShed.com	not at all satisfied-extremely satisfied	2	3
Please rate your satisfaction with ease of navigation using your device in the GitShed.com environment.	hard to navigate-easy to navigate	3	3
Please rate your satisfaction with learnability ease when using your device in the GitShed.com	hard to learn not satisfied-easy to learn extremely satisfied	2	3
Using the scale below, indicate how satisfied you felt with your sense of control when using the GitShed.com learning community.	not at all satisfied-extremely satisfied	4	3

Using the scale below, indicate how satisfied you felt with your sense of being organized when using the GitShed.com learning community.	not at all satisfied-extremely satisfied	3	3
Using the scale below, indicate how much you "Like" to study using mobile devices and the GitShed.com learning community.	did not "like" to study using GitShed-I really liked to study using GitShed	3	2

While overall usability was in the mid-to-high range, overall experience, as shown in Table 20, was rated fairly high. In general, the learners felt that the experience of using GitShed.com was "satisfying," "interesting," "flexible" and "wonderful."

Table 20

Overall Experience

	Scale 0-9	Kevin	Al
Overall, my experience using the Gitshed.com Learning Community was:	Frustrating-Satisfying	8	7
	Dull-Interesting	9	7
	Rigid-Flexible	7	7
	Terrible-Wonderful	7	7

The results, shown in Table 21, demonstrate that learners felt mobile devices were good for watching video lessons, practicing, collaborating and learning.

Table 21

MDs Are Good For

Question	Scale 0-9	Kevin	Al
Watching video lessons.	not at all - very much	9	8
Practicing guitar.	not at all - very much	9	6
Collaborating with others in mobile learning communities.	not at all - very much	7	8
Learning.	not at all - very much	9	8

Participants indicated they would not only continue to use mobile videoconferencing to support personal learning, but would also continue to access mobile device-based learning environments, as shown in Table 22. There was a slightly mixed reaction to the incorporation of gaming elements, but positive support for incorporating social media and videoconferencing in mobile learning environments.

Table 22

Intended Future Use

Yes/No	Kevin	Al
Will you continue to use mobile Videoconferencing personally?	Yes	Yes
Will you continue to use mobile Videoconferencing to support learning?	Yes	Yes
Will you continue accessing mobile device-based learning environments that provide Videoconferencing?	Yes	Yes
Would you recommend that mobile learning environment developers continue to incorporate Gamification?	Maybe	Yes
Would you recommend that mobile learning environment developers continue to incorporate Social Media?	Yes	Yes
Would you recommend that mobile learning environment developers continue to incorporate Videoconferencing?	Yes	Yes

Post-lesson Comments, Open-Ended Survey Responses and Online Comments

While the quantitative data suggested general satisfaction with the MDBLE environment, analysis of the qualitative data from post-lesson comments, open-ended survey responses and online comments to the instructor revealed a number of issues. This discrepancy between the quantitative and qualitative findings related to satisfaction is likely due to the fact that the quantitative date was only collected from the two participants who actually completed the study. The other participants who provided post-lesson comments and interacted online with the instructors dropped out during the study.

Six themes were identified where participants expressed frustration and a need for improvement. These included (1) site access issues, (2) navigation struggles, (3) page loading issues, (4) posting to forums, (5) videos and videoconferencing, and (6) time requirements. Other comments from participants appeared to be suggestions to improve instructional design, site security and provide apps and demos for different mobile operating systems.

Theme 1: Site access issues. Several participants experienced access issues. The quotes and exchanges below demonstrate some of these issues.

- "Hey Pete. I was having trouble navigating the site via my mobile device and now trying to access the site via my work PC and I'm blocked".
- "Hey, Pete. I'm on Anna Maria Island right now and the service sucks, not to mention our crap WiFi".
- Someone logged in from Canada with your ID. Are you in Toronto now?
  "Yes on vacation WiFi sux though".
- "Internet sux kept getting disconnected. I'll try again later".

Theme 2: Site navigation struggles. The MDBLE site was designed to be aesthetically attractive and functional. However, participants identified issues that impacted site navigation. Quotes below demonstrate some of the issues with site navigation.

- "The site was difficult to navigate at first. I went straight to gitshed.com first - it wasn't clear how to sign up immediately".
- "The Icons for the Index is not really outstanding (i.e. the icons did not stand out)"

Theme 3: Page loading speeds. Another visual design change was the elimination of slider images, which was deemed to be the primary cause of loading lag. User frustration with page loading speed is demonstrated by the following example and researcher observation:

- "Hit complete on first lesson. It's taking a really long time to load. It's been doing that for two minutes now".
- Researcher observation of initial site visits, traffic and membership conversions were also an indication of the negative impact created by poor page load speeds.

Theme 4: Posting support. User frustration with posting is demonstrated by the following examples:

- "To be clear, is this comment the post you're talking about? Or is it a separate post in a different section? Sorry. It's been a while".
- "Hey Pete. Didn't know if you knew, but the allowed file media formats for the posts are only JPEG, GIF, PNG, MP3, MP4. Can't upload MOV. Now I'm going to have to create a YouTube channel and upload there. Then, share the URL in the learning community".

- “Ok, tried to load my video, but had some issues. The media button did not recognize my video in mp4”.

- “Wow. Why do you have to do this in order to post”?

In an effort to diagnose and resolve these frustrations, I responded:

- “I haven't figured that out, but I think it has to do with file upload size limits. It is probably a good thing because using YouTube links save disk space and does not negatively impact page load time as much. I'm learning a lot”!

Theme 5: Videos and videoconferencing. The quotes below show some of the participant attitudes, opinions and comments related to this theme.

- “Videoconferencing is useful if you are conducting a class that is scheduled in a synchronous fashion”.
- “I need to do more of it. Synchronizing time with others can be difficult but valuable if it works out”.
- “Text messages may be better.”

Theme 6: Time requirements. The following quotes reveal that some simply did not have the time to commit to the project, while others experienced personal issues that prevented them from continuing:

- “Sorry I couldn't do more. This was just a bad time to do all of this. It does look good, though.”

- “Now some changes have taken place in my world that I want to fill you in. I just late last week accepted a part time job as a computer teacher for high school and for a special needs class.”

- “Sorry I missed class this week. Recovering from a motorcycle accident.”

- “You're killing me here. I'm trying to do this. Worked 8 hours yesterday. I'll do the best I can.”

Other Suggestions and Recommendations. The following quotes show site navigation suggestions, instructional design suggestions and other recommendations that resulted from the participant's MDBLE experience:

Site Navigation Suggestions

- "I think it (The registration button) should be right at the top of the page, dead center, rather than scrolling to the bottom of the website."
- "Placing a login/registration button at the top of the page provides easier access for new visitors and existing users."
- "Make a link or a video that helps you walk through the site."
- "The activity icon should take you to the community."
- "It needs more information on WHERE to create a post. Perhaps adding a direct link to the "Site-Wide Activity section"?

Instructional Design Suggestions

- "I would post daily or weekly prompts of theory questions to engage the community."
- "A new video of a technique of the week or application with the prompt would cause people to try new ideas and share."
- "I would suggest to include an explanation or list of definitions of the terms used in the lessons (for example, Lesson 1.2). This information is reviewed in the videos, but may be good to have them written."
- "I recommend using line breaks only to indicate the various learning objectives. In the lesson, there are three objects; therefore, there should only be three line breaks, so that it's clear learners are in a different section of the lesson."
- "In lesson 1.4, I wanted to be sure of what was exactly asked regarding the recording of our progress. Was there a request to make a video recording of all of the sample exercises? I could see choosing one to three of them as a wise option."
- "If, in some way, the video recording, metronome, and all required elements were embedded into the lesson on the site that would be helpful."
- "The slide lesson and bending was informative but I think these could be in separate modules."

- “Ask people to offer a video lesson source per month originated from themselves or another source like megachords.com for example.”

- “I only wonder how to get a group chat going. Having it written out by steps (very similar to how the diagrams are written out for chords and other exercises. The media directions could be in writing.”

- “The lesson is compartmentalized therefore a student cannot go to make a post without leaving the lesson page to do that post. Can you create a link in the lesson to move back and forth”?

- “Find a couple of examples that slows the chord shifts a little, and makes them longer.”

- “Slow down that arpeggiating video course.”

- “More samples at slower tempos would make it better.”

- “The video window is too small—needs to enlarged.”

Site Security Recommendations

- “My firewall blocks it (page on Gitshed.com). You need to get it categorized.”

- “Fix site page security issues.”

- “Make sure all links work correctly without SSL errors.”

Mobile Device Based Demo Variety

- “I also would like to see more specific (app) demos from the place of android.”

- “Include demos for Android and Windows devices.”

Mobile Usability. The following comment is an example of Mobile Aspect usability:

- “I used my cell to watch videos, read chords and fingering patterns on the neck, keeping the beat via metronome and to record video footage and share it.”

This comment is in line with the design of the MDBLE and reflects its successful implementation.

Learning Management. These user quotes provide a view of participant learning management perspectives:

- "The set up of the lessons give you everything you need and when I do give this my all, I'm sure I will find success due to the work put in to the program and the resources available to the community, including the community itself."

- "Well organized with objectives, pictures where needed to emphasize information and very nice instructional videos."

- "Overall, I like the progression, or "bread crumbs," that you lay out within the individual course. It's easy to go back and review information that was previously learned."

- "GitShed was easy to use and a less complicated than another LMS that I have experienced."

Community of Practice. The following comments demonstrate that users created lesson assignment posts, replied to each other's posts, shared outside resources by providing links to other sites and shared mobile app suggestions.

- "There was a couple of texts from the few friends I had in this community commenting on my video and encouraging me to post the next one."

- "The learning environment breeds accountability and inspiration from others while providing clarity or guidance at times."

Summary of Research Question 2 Findings

Research question 2 pertained to the participant's attitudes toward mobile learning that resulted from their experience with the FRAME design aspects DL, DS, LS) of the GitShed.com MDBLE. Learners expressed general satisfaction with the FRAME's device social (DS) aspect as experienced through social media. They felt that using social media was easy, supported their learning and contributed to their learning community.

The FRAME's device learner (DL) aspect was not favorable in regard to mobile device videoconferencing satisfaction. However, learners felt that using videoconferencing on their mobile device was easy. They liked the ability to seek videoconferencing help when needed and believed it to be a good tool and an effective method of providing face-to-face learning support. They also felt videoconferencing added value to the learning experience and contributed to an

overall satisfaction with the learning environment. However, they did not use the videoconferencing tool as much as they used social media.

There were mixed reactions in terms of the use of the FRAME's learner social (LS) aspect as experienced through the gamification of the site (i.e. badging). Overall, findings suggest mobile learning is seen positively and the participants felt the MDBLE and many of its features did contribute to their learning. However, there were frustrations related both to the design of the site as well as specific features. As stated earlier, learners reported that the mobile video-based lessons were the most useful MDBLE feature. Participants felt that the MDBLE was beneficial and they supported the continued development of mobile learning environments. Overall, learner participants showed favorable attitudes and opinions related to the GitShed.com MDBLE, but data also revealed ways to improve it. One participant also shared a perspective that is important to consider when developing community-learning environments.

- "Please don't forget that there are three types of people who join a community: (1) those who want to be actively engaged, (2) those who want to be slightly engaged and (3) those who just want to be there but not participate."

Conclusion

This summary of the data analysis aligned the research questions of the study with participant feedback. It discussed how the learners felt about the design aspect of the MDBLE, their attitudes related to mobile learning as a result of their participation and their recommendations for refining the MDBLE based on the final usability and learner experience surveys and qualitative data. Insight into these recommendations and development consideration suggestions for educators engaged in mobile learning research are discussed further in Chapter 6.

CHAPTER 6. DISCUSSION AND CONCLUSIONS

The FRAME Model (Koole, 2009) provided the conceptual framework for this case study investigation of the GitShed.com MDBLE. The conceptual framework suggests that the convergence of the Device (D), Social (S) and Learner (L) aspects (DLS) is recommended in order to produce positive mobile learning outcomes. An interesting outcome of the research was the unexpectedly minimal use of the videoconferencing intervention. While participants utilized videoconferencing, actual learning interaction took place using Facebook social media and the GitShed.com BuddyPress CoP. The shared relationship between the DLS aspects of the FRAME model and the practical design variables of the MDBLE are the mobile device usability and videoconferencing support aspect (D), the video-based instruction learner aspect (L) and the CoP/social media interaction aspect (S), as seen in Figure 27.

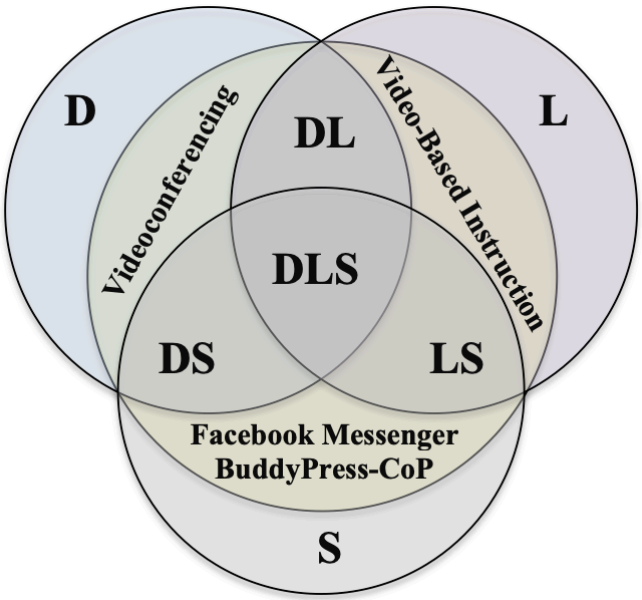


Figure 27. The FRAME Model with MDBLE Aspects

This final chapter builds upon evidence presented in the previous chapter. Important conclusions that inform and answer the research questions are provided with findings related back to the literature. My contribution to theory, implications for practice, research limitations and recommendations for future research along with the conclusion and summary are also presented in this final chapter. I begin with the research questions.

Research Questions

The two main research questions of the investigations examined the participants' beliefs, attitudes and opinions related to the MDBLE model and videoconferencing intervention learning support. Related participant experience feedback from using the DL, DS and LS aspect of the GitShed.com MDBLE as they intersect with the FRAME model are emphasized. Question 1 sought to determine acceptance of the MDBLE model and mobile learning effectiveness:

RQ1: How, if at all, do participants believe the design aspects (DL, DS, LS) of the MDBLE facilitate learning?

Data to address the first research question came from several data sources, including a participant post-assessment of learning, post-lesson ratings and comments, a post-lesson satisfaction survey, and participant feedback that was collected online. It was found that participants identified the use of video lessons as the feature that primarily facilitated their learning. The usefulness of video lessons falls into the Device Learner (DL) aspect of the theoretical framework of the MDBLE. Maniar (2008) reported historical research evidence that suggested video can help learners see how something functions through visual demonstrations, a quality not afford to text or still images. He also presented the benefits of video as a motivational tool that engages and reifies learning content for both visual learners and those that prefer other learning styles.

This finding is important to my study because it articulates a twenty-year academic history of the literature supporting the use of video-based instruction. It is a rational justification for the use of video-based instruction in mobile device-based learning environments and supports my initial motivation to investigate the use of video capable mobile devices as educational tools.

The results from my study found video instruction to be most beneficial to the participants. The videos selected were perceived as useful, with two participants indicating that the videos were the most used (and useful) feature for learning. While the users found the videos helpful, they also had some recommendations, including providing information in both video and written form. Finally, other suggestions were to add more community member-produced videos as well as an instructor-selected video of the week.

Participants reported that clear goals and directions were an additional design aspect which facilitated learning in the MDBLE. When discussing the Learner aspect (L) of the FRAME, Koole (2009) suggests that "providing instructions for storing and retrieving files" and "using schemas, anchoring ideas, advancing organizers or other instructional techniques" are important considerations for mobile learning environments. Another outcome related to how participants believed their learning was facilitated was through the implementation of the Social aspect (S) of the MDBLE. Learners found that their interactions with community members and the instructor useful and that they facilitated their learning. This finding is supported in the literature by Ally (2009), Merriam (1998) and Wenger (2009).

Interaction with and Accountability to Others

An initial objective of the project was to identify the interactions between the researcher as the facilitator and the participant as the learner. The sub-theme of Activity Encouragement received the highest number of references when coding. A lot of effort was made to keep learning participants on task so that the research project could be completed. Participants often had to be encouraged to complete learning environment lesson tasks. Many of the participant comments related to the usefulness of learning facilitator interactions in the MDBLE. It is interesting to note that participants expressed favorable and unfavorable attitudes regarding researcher facilitation. One of the potential drawbacks of providing a free and open educational resource is that users have nothing to lose by not participating, aside from delaying their learning objective. Very evident in this study was the extra effort required to keep participants active in the learning environment.

The significance of this observation is the heightened awareness that users may need to have some "skin in the game," in addition to an implied learning desire. OxfordDictionaries.com (2018) defines the phrase, "skin in the game" as: "To have a personal investment in an organization or undertaking, and therefore a vested interest in its success." To this end, charging a fee or tying the learning accomplishment to some other personal benefit may prove helpful.

As mentioned in the literature review of Burgess (2009), "facilitators should carefully design what goes on inside the course by incorporating and acknowledging the contextual realities of what is happening outside of the course" (p. 67). Several participants experience personal issues that prohibited them from participation. For the Learner Social (LS) aspect of the

study, it is important to acknowledge the important activities outside of the research project which impacted participation.

Overall, participants believed the LS interaction design of the MDBLE encouraged interaction with and accountability to others. They reported positive feelings related to the facilitation of learning of the interaction design. Comments made by participants indicated that social interaction provided inspiration from others; accountability to or for others helped them stay focused. They felt that it was good to have others to relate with and they appreciated the comments left by others. It was reported that interaction with and accountability to others made the community "feel real."

Clear Goals and Directions

Important to the study was the fact that respondents found having clear goals and directions to help facilitate their learning. They felt the initial Learning Preparation module provided clear goals and direction. Respondents reported that lessons were well organized with objectives and pictures, where appropriate, in order to emphasize information. Clear course and lesson objectives matched up well with their respective sections providing clarity or guidance at times. Participant comments noted where course and lesson instructional design was done well and where it could be improved for better organization and flow.

Badges

Mixed views were shared in regard to the MDBLE LS gamification design intended to motivate learners. Most of the comments were positive. While one participant felt that badges helped to facilitate his learning, another participant was indifferent to the competition, yet felt that the badges let them know when it was time to shift focus. A participant shared that leading in points and earning badges made him feel a bit more responsible to "use the lessons wisely." Some felt it helped motivate their learning and suggested that "getting badges was cool." However, one participant said: "Badges don't work and it is not a good motivator."

RQ2: What are the participants' attitudes toward mobile learning resulting from their experience with the design aspects (DL, DS, LS) of the GitShed.com MDBLE?

The second question in this research addressed the mobile learning experience related to all aspects of the theoretical framework. Keskin and Metcalf (2011) identified current mobile learning theories as: "Behaviorism, Cognitivism, Constructivism, Situated Learning, Problem-Based Learning, Context Awareness Learning, Socio-Cultural Theory, Collaborative Learning, Conversational Learning, Lifelong Learning, Informal Learning as well as Activity Theory, Connectivism, Navigationism and Location-based learning" (Keskin & Metcalf, 2011, p. 202). Traxler (2007) suggested that developers and instructional designers must recognize that mobile learning is both hard to define and evaluate because it is personal and changes as the context of the learning changes.

The FRAME was used as the theoretical framework for this study. According to Koole et al. (2010), a broad view of mobile learning environments which enables educators to better understand their management and difficulties can be obtained through the use of the framework. Question two sought to determine the participant's experiential attitudes related to mobile learning associated with the MDBLE model.

An important aspect of this research focused on researcher observations of site activity as reported in the chapter 5 research question 2 findings. Observation of site usage and participant recommendations led to the development revisions that were implemented. Participants provided a number of suggestions which, while not directly indicating satisfaction or dissatisfaction, seemed intended to help the developer improve the site. Suggestions included instructional design tips, recommendations for improving site security and requests for apps and demos for different operating systems. These recommendations and suggestions were useful in improving the site.

Six themes were identified where participants expressed frustration and a need for improvement. These included: (1) Site access issues, (2) navigation struggles, (3) page loading issues, (4) posting, (5) videos and videoconferencing, and (6) time requirements. These themes and comments from participants reflect their specific MDBLE experiential attitudes related to the

Device Learner (DS) aspects of the theoretical framework. They also contain design suggestions to improve the mobile learning environment experience.

Site Access Issues

Wi-Fi access and connectivity seemed to be a primary issue that impacted the learning experience. Access issues were also related to multiple login attempts leading to being blocked due to site security or user-password confusion. Password support became an ongoing issue due to the infrequent site access by several participants. Those that started, stopped and started again often needed password support. One participant often had difficulty logging in and problems viewing the site using his Galaxy 7 smartphone. This particular participant's difficulties were not system or site related, but were caused by his confusion regarding his user ID and password.

Many sites enable the generation of secure passwords. These passwords are often long and contain numbers and special characters. Providing mobile users with system-generated passwords is not effective when chatting, texting or emailing, as the length and difficulty of the passwords often leads to confusion. It was often very difficult for mobile users to copy and paste or manually input the passwords. Users were instructed to immediately reset their simple password once they gained access.

Site Navigation Struggles

The MDBLE site was designed to be visibly attractive and functional. However, participants identified issues that impacted site navigation. Visual design changes were required in order to improve site navigation. Initially, new visitors had to view the home page and access the registration button after scrolling down. Scrolling was also required to find introduction and learning environment information. Placing the registration in the top right corner and creating a separate "About" page made the registration process and site navigation easier for mobile users. Another concern was the use of graphic icons without labels. Labels identifying the icons were later added. This finding is important to the study because it demonstrates the impact that site navigation design has on the mobile user experience.

Page Loading Speeds

Another important finding was the impact of page loading speeds on the mobile user experience. During the research project, the site experienced remote bot and hacker attacks. Bots are programmed to probe websites for data, vulnerabilities and slowdown access by denying the

ability for other visitors to connect. These attacks were addressed when discovered, but may have impacted the page load speeds. Another concern that impacted page loading speed was the use of image sliders.

Sliders present images in the form of a slide show and serve the purpose of a visually attractive presentation for viewers. While aesthetically attractive, slider images slowed down the loading of the GitShed.com front-page. Further, several other issues were recognized as having a negative impact on page loading speed, such as: Large images that needed to be reduced in size and resolution (a process known as optimization), as well as excessive Java script processes that controlled the rotation of images on the front page "Slider." Based on this research project, I learned that all aspects of the MDBLE can be negatively impacted when visual design considerations are not balanced with the devise usability aspects (DL and DS) of the FRAME.

Posting Support

Participants were given a tour of the site at the beginning of the study. Those that completed the first learning module received instruction related to both how and when to post. Some had difficulty posting due to frequent inactivity. Other difficulties were due to Wi-Fi issues. Several comments presented in chapter 5 revealed user frustration with posting on the site and brought the need for awareness of this issue to light. Server settings and plugin updates may cause difficulties when users attempt to post assignments and other social media content. Designers should consider the technical issues that relate to posting with mobile devices when creating MDBLEs.

Videos and Videoconferencing

Participants also expressed some dissatisfaction with the videos. Some indicated the video needed to be adjustable or slower; others indicated the video window was too small, while others just wanted additional videos. YouTube added the ability to slowdown video playback and jump backward and forward in 5, 10 and 20 second increments, resolving the speed concerns. Participants also expressed some frustration with the videoconferencing, seeing it as less useful when in an asynchronous learning environment. Some participants felt that texting would be a better tool.

Time Requirements

Participants dropped out of the study or were unable to complete the lesson modules for myriad reasons. The pressure of completing the research study data collection may have caused me to overly intrude on the participant's normal routines. This learner social (LS) aspect was somewhat expected, but not to the extent that the research project revealed. The adult population had busy lives that caused participants to not complete their commitment to participate.

Other Suggestions and Recommendations

In chapter 5, other suggestions and recommendations related to site navigation, instructional design, site security and mobile device app and demos variety were presented. Key to this research and future MDBLE development is the learner perceived successfulness of overall mobile usability, learning management and the CoP. The participant perspectives that emerged in relation to the mobile usability experience were positive. Participants felt that the MDBLE was beneficial and they supported the continued development of mobile learning environments. While there were some issues that needed to be resolved, supportive mobile usability perspectives dominated the analysis of the data.

After experimenting with several WordPress themes during the development phase of the project, the EDUMA LearnPress theme was selected as the final learning management system. The well-structured simple course module and lesson navigation, along with the responsive design feature that enabled content to display on mobile devices, contributed to the positive device learner (DL) aspect of the environment. The learner and device social (LS, DS) design aspects actualized using the CoP learning theory proved to be effective for participants. This was an important finding in that the learner experience reified the E. Wenger (2009) learning theory and the Koole (2009) theoretical framework used in the study.

The literature and theoretical framework are linked to the findings in chapter 5. The findings revealed that participants had a favorable view of their learning experience. Positive intent for their future uses of personal videoconferencing to support learning in mobile device-based learning environments was acknowledged. Learners also recommend the continued development of gamification, social media and videoconferencing by mobile learning developers. Overall, the results of this study help to support my considerations of the utility of mobile devices as learning tools, as well as my understanding of the FRAME theoretical

framework. Yet, most revealing from the findings was that the FRAME and its Device, Learner and Social aspects can be used not only for evaluation, but also as a mobile development framework.

Mobile, Learner and Social Implications to the Field of Knowledge/Recommendations for Practice

The FRAME Model (Koole, 2009) is used in this investigation to provide a theoretical framework, clarify the MDBLE concept and guide the investigation. The FRAME, as described in the literature review, suggests that "mobile learning is a process resulting from the convergence of mobile technologies (D), human learning capacities (L) and social interaction (S)" (Ally, 2009, p. 25). This MDBLE was designed for users of smartphone, phablet and tablet mobile technologies. Learning management and social interaction through the use of both a Community of Practice (CoP) and social media assisted in producing positive perspectives related to the mobile learning environment.

The social technology intersection (DS) of the FRAME "describes how mobile devices enable communication and collaboration amongst multiple individuals and systems" (Koole, 2009, p. 34). Etienne Wenger et al. (2011) discusses CoP Learning Theory and suggests the ways in which communities form, develop and evolve intersect with the importance of community management in order to promote contribution. As the literature suggests, the learner social intersection (LS) of the FRAME has an important role in community management and was an essential aspect that aided in member interaction and the promotion of user contributions. The results of this study demonstrated that participants appreciated the mobile learning community environment.

Mobile First Design

According to Traxler (2007), the educational utility of mobile device technology is gradually increasing on a global scale in small, large and blended learning situations. This research suggests the validity of a mobile-first design approach in producing future learning environments. A greater emphasis on mobile learning development specifically encourages educational technologists and learning designers to maximize the potential established by the presence of mobile devices in the hands of billions of users.

Carney (2010) used an integrative research methodology for defining, designing and implementing a curriculum that includes web-based Instruction. The obvious relationship of (Carney, 2010) to this study is web-based music instruction and an integrative research methodology for defining, designing and implementing curriculums in a mobile learning environment. Mobile-first as an educational research development methodology was presented in this study. Although this study focuses on basic guitar instruction, the findings may well have a bearing on all learning domains. This direct participant quote supports a belief that mobile learning is a relevant research and development concern:

> "Mobile learning is the way of the future and attention should be given to understand how it can be used to improve individual lives."

The major points that emerge from this study are the presentation of a potential MDBLE solution and the development process undertaken to produce it. Mobile development, when done well, can support the FRAME (Koole, 2009) theoretical framework and its potential use as a development methodology. The inclusion of the Community of Practice learning theory, game application and videoconferencing to supplement face-to-face interaction adds to the FRAME and strengthens what is already known from the prior studies of (Koole et al., 2010) and (Kenny et al., 2009) .

Potential Applications of the Research

Mobile technologies continue to be enhanced with new features, such as augmented virtual reality. As the educational landscape continues to change, this research may impact the newly discovered needs of learners, teachers and educational institutions. Currently, several states have approved and begun to implement free college education programs. This research is well-situated for deployment to meet and address the needs of the swelling student populations resulting from these college initiatives.

Topolewski (2013) posited, "with billions of mobile devices in the hands of ordinary citizens worldwide, the question becomes how best to utilize this incredible opportunity to improve education for so many" (p. 157). The adoption of mobile devices worldwide suggests a mobile-first instructional design and distance-learning focus is not only appropriate, but in high demand. Many cultures are bypassing desktops and laptops with their citizens and opting to

purchase smartphones, phablets and tablets instead (Ally & Samaka, 2013). The ubiquitous adoption of mobile technologies suggests a greater need for educators and educational systems to adapt their content for the mobile learning environment.

A strong relationship between mobile devices as learning tools via constructivist learning has been reported in literature (Wenger, 2009). Because of the adoption of mobile devices by the masses, bring your own device (BYOD) workplace and organizational learning opportunities are becoming more available. This research can be applied to both blended and independent learning situations. Mobile learning as a service may also support the current micro-credentialing movement. Where there is value for education, the potential for the application of this research exists. Additionally, that value has an impact on the learning experience over time instead of immediately because mobile learning is different than other mobile device related services (Liu et al., 2010, p. 221). Ongoing learning situations, such as entrepreneurship, executive training, non-profit organization training and sustainability education are prime for the potential application of mobile device-based learning environments.

Furthermore, the field of medical education could possibly use mobile learning environments to address the national and international shortage of medical professionals in remote areas. Nurse practitioners are becoming primary caregivers in areas where there are no doctors. They are primarily supervised remotely by a board-certified medical doctor. Wherever connectivity exists, the mobile, learner and social aspects of MDBLEs have the potential to solve the needs of a variety of learners.

Limitations

The purpose of this descriptive case study was to explore the mobile device-based learning environment GitShed.com, a learning environment developed by this researcher. The main focus of the qualitative inquiry was on mobile use and perceptions of the MDBLE. A specific focus on learning environment usability, experiential perceptions and participant recommendations established the initial thematic framework for the investigation. This case study of GitShed.com was implemented to expand the understanding of the potential for mobile learning environment development and the future role of mobile devices in online education. Findings are not intended to be generalizable to other populations.

The qualitative purpose was to expand the understanding of the effectiveness of the mobile device-based learning environment design based upon the participant experience and recommendations for improvement. The study was the inspiration and motivation for the creation of the MDBLE research and development non-profit organization. The organization will investigate additional mobile learning research possibilities while expanding the awareness of significant areas of concern for educational technology developers.

The age range of the participants in the study was between 29 to the mid-60s. Although they were highly educated and comfortable with mobile technologies, the majority were not as experienced as emerging digital natives, which may have restricted their use of the mobile technologies available in the study. The sample size was small, with a dominant majority of well-educated participants. They worked in the field of education and were graduate degree holders, had acquired professional certifications, were in doctoral programs or had received their doctorate. They were actively employed and engaged in the responsibilities of adulthood. The dropout rate of initial participants and the inability to conduct interviews as designed limited data collection. Overall, ending the study with a small two-member sample due to the high dropout rate was a large methodological limitation that impacted generalizability and qualitative case study trustworthiness.

Adjustments were made to accommodate the participants. However, these adjustments impacted the original design of the study. This was most evident in the participant selection process and the post-participation interview design. A participant selection rubric was created in anticipation of a larger population sample, but it was not needed due to the small number of respondents. Finally, the busy schedules of the adult participants required the post-participation interview to be conducted using a computer assisted interview technique instead of videoconferencing as designed. Future studies may benefit from a younger population with fewer responsibilities and a greater level of familiarity regarding the use of their mobile devices for the purpose of video production and videoconferencing.

Recommendations for Future Research

While the so-called ‘early adopters’ are willing to use new technologies for pedagogical purposes, it is not yet clear that there are sound theoretical reasons for the use of mobile devices in learning (J. Herrington, 2009). This sentiment set the stage for current mobile learning

environment research. There are still many who are resistant to change the brick and mortar education paradigm of our institutions. This resistance signals the need for future mobile learning environment research. While this research focused on basic guitar instruction with a population of older, well-educated adults, it is important to replicate the MDBLE design and research methods with younger populations and other learning domains. Research should also investigate commercial versions of the mobile learning environment.

The continued introduction of new mobile technologies and features, such as augmented reality, provide exciting research opportunities. While this study was conducted with a small population by an individual researcher, a larger research project utilizing content experts, instructional designers, server managers, multimedia producers and a call center that provides 24-hour learning support could prove pivotal to the advancement of this research. A crowd-sourced learning support network, along with a mobile-first learning design organization, would be an important subject for a longitudinal research investigation. One such project of interest would be the identification of high school students interested in joining the teaching profession. A 10-year study culminating with Master of Education degrees and teacher certification may produce a view of the future of education.

Conclusions and Summary

What is really important about this research is that it attempted to explore the dynamic, "if you build, it will they come"? Are mobile device users ready for mobile learning environments? Similar to the Kenny et al. (2009) participants, learners in the study benefited from information retrieval and found mobile device affordance helpful, but they did not consider mobile devices as useful for videoconferencing communication.

In addition to the findings associated with implementing mobile device videoconferencing in online instruction, I learned that while the technology is effective, its use is dependent on personal considerations. For example, mobile users may consider their personal appearance before using videoconferencing to seek help. Most of the direct communication during the project took place using Facebook messenger. Those chats sometimes led to videoconferences to resolve questions. Because of this, the 'Help Chat' feature was added to the research site. While videoconferencing proved to be accepted by the participants, providing options for users to communicate in comfortable ways that fit their needs was a big lesson learned.

Other important outcomes from this research were the importance of curation and measured facilitation in mobile environments. Curating attractive and well-displayed learning content is essential for adding value to the online learning experience. Diverse subject matter content and curated activities assist and support user engagement. Facilitation, as mentioned in chapter 2, is crucial in communities of practice. When facilitating online learning I found that facilitation should be measured by the interaction style of each individual user. The time constraints of the research project caused me to be more intrusive than is desirable. Measured facilitation, or taking a responsive customer service-type role is much more effective than assuming a telemarketer facilitation stance. What users' value is knowing that the instructor is there for them; that, just as in the classroom, they will raise their hand when needed.

I have profoundly grown as an educational technologist, instructional designer and researcher during this research project. As a researcher, I have benefited from newfound knowledge and the reification of ideas. The research process and my experience with multiple research approaches has broadened my competency as a social scientist. This experience also taught me important lessons about conducting research with minimal financial and technical support: Firstly, that it can be done. Second, it is sometimes more beneficial to learn and solve issues than it is to seek help. This was the case in this experience. I learned things that I had no interest in learning, but found they were needed in order to complete the project. I learned Server Management, PHP and other coding to avoid the negative impacts of a budget that did not enable the purchase of support services.

Another benefit of this experience is a new appreciation for struggle and sacrifice. I was told long ago, "To prolong sacrifice is to delay the gratification of achievement." This statement, made years ago by a fraternity brother, proved true during my dissertation journey. The personal sacrifices and demonstrated commitment made toward completing this process are of great value to me. At times, the experience was like climbing the face of a mountain without ropes or safety gear. Now that I have reached the mountaintop, I am gratified.

This gratification of achievement is motivating and helpful as I approach the next chapter in my professional life. The experience has prepared me as a specialist in mobile learning research at a time of increasing innovation. As education continues to evolve, I am positioned to build upon this research experience in several ways. One direct step is the continuation of MDBLE research by developing more mobile learning environments and implementing them

into online and blended settings. Mobile learning is not a fad, as demonstrated by the number of emerging initiatives being made by Facebook, LinkedIn, Fender and many universities that are delivering content that has been optimized for mobile users.

This research is still innovative and my commitment to this form of learning investigation has been documented over the last eight years through coursework, presentations, conference roundtables and interactions with other educators. My quasi-pilot study conducted in the spring of 2010 was structured around the primes, "what if Eric Clapton were to teach a guitar lesson online using videoconferencing"? To demonstrate how such a lesson would take place, I had a classmate remotely teach a ukulele lesson to a student in a different location. My educational psychology class viewed the lesson along with viewers in Michigan and Texas. Today, this form of online learning is referred to as Master Classes. As universities expand their mobile learning initiatives, there may be opportunities to teach what I have learned from the MDBLE dissertation research experience. I feel that I am poised to continue making a contribution to the fields of education, corporate and organizational training.

Another step is to increase publishing activities. Notwithstanding the relatively limited sample, this work offers valuable insights into the future direction of mobile learning. My focus has been more focused upon design and development and I have sacrificed publishing in favor of learning the things needed to complete the project. The publishing aspects of my research in professional journals is a strong desire at this time, one I fully intend to pursue.

This study set out to explore mobile learning environment development, to identify participant perspectives and development recommendations for the presented mobile device-based learning environment GitShed.com. Overall, this study strengthens the idea that the time is now for mobile-first learning technology development. The present study should prove to be particularly valuable to educational technologists, instructional designers, corporate and organizational training developers, teachers and government officials interested in maximizing the learning potential of mobile devices. I seek collaborative research opportunities and I have started to develop a non-profit organization to support and continue my research. This closing quote reifies the potential of this mobile learning development research:

According to a Cisco White Paper, "by the end of 2013, the number of mobile-connected devices will exceed the number of people on earth, and by 2017 there will be nearly 1.4 mobile devices per capita"(Cisco, 2013).

APPENDIX A

The Full List of Learning Modules & Lessons

1. Learning Preparation

1. Identifying your musical Interest and Choosing a Guitar
2. Learning to play the Guitar using Your Mobile Device
3. The Parts of the Guitar, Fingers, Holding & Tuning the Instrument

2. Basic Guitar

1. First Position Chords & Arpeggiating
2. Changing Chords & Strumming
3. Scales & Soloing
4. String Bending, Hammer-On/Pull-Offs and Slides

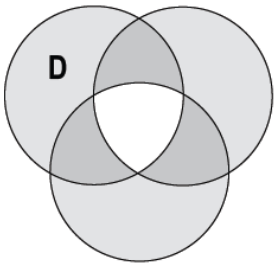
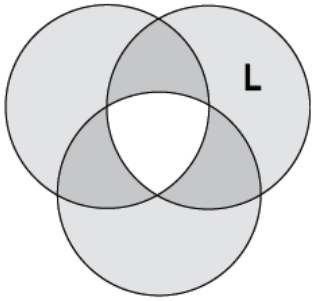
3. Skill Building

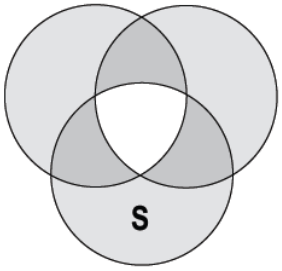
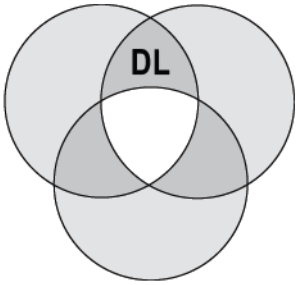
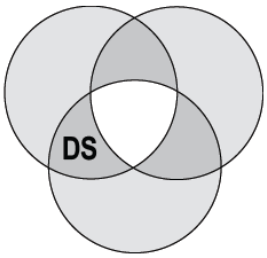
1. First Position 3-Chord Songs
2. 7^{th} Chords: E7, A7, B7 & First Position 12-Bar Blues
3. Barre Chords & Chord Boxes

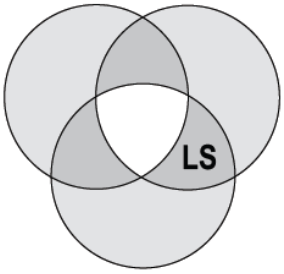
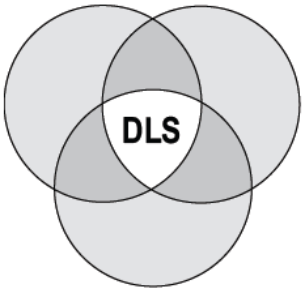
APPENDIX B

F.R.A.M.E. Planning and Analysis Checklist

Marguerite L. Koole (Koole, 2009)

Device Aspect 	**In the selection and use of mobile devices, have you considered** ☐ selecting a device with comfortable physical characteristics? ☐ allowing users to adjust input and output settings (i.e., font sizes, addition of peripherals)? ☐ selecting devices with processing speeds and input and output capabilities that complement user tasks? ☐ providing instructions for storing and retrieving files? ☐ taking measures to identify and limit perceived and real error rates of the mobile hardware and software?
Learner Aspect 	**In designing mobile learning activities, have you considered** ☐ assessing the learners' current level of knowledge (if possible)? ☐ using schemas, anchoring ideas, advance organizers, or other instructional techniques? ☐ using contextual cues and multimedia to provide a variety of stimuli to assist comprehension and memory? ☐ structuring learning activities around authentic contexts and audiences? ☐ designing learning situations to stimulate active transfer of concepts and procedures to different contexts? ☐ allowing learners to explore, discover, select information relevant to their own unique problems?
Social Aspect	**In terms of culture and society, have you considered** ☐ clarifying definitions, cultural behaviours (etiquette), or symbols that participants might require while interacting? ☐ providing methods or guidance for ensuring sufficient, accurate, and relevant communications among participants in the mobile

	media space?
Device Usability Intersection 	**While using mobile devices in learning activities, have you considered** ☐ the locations and climates in which the learner may wish to carry a device? ☐ if the learner's device will permit access to information whenever and wherever needed (just-in-time learning)? ☐ reducing cognitive load by chunking content, reducing the number of required actions to complete tasks, using mnemonic devices, and simplifying displays? ☐ making the device aesthetically pleasing and functional for learners by allowing them to choose themes and adjust preferences?
Social Technology Intersection 	**In accessing or providing networks for interaction, have you considered** ☐ selecting appropriate wireless standards in light of the amount of data, speed, and security with which the data must be transferred? ☐ selecting appropriate collaboration software to meet the needs of the learning or social tasks?
Interaction Learning Intersection	**With regard to interaction, have you considered** ☐ the learner's relationships with other learners, experts, and systems? ☐ the learner's preferences for social interaction and for learning information and/or skills? ☐ providing mobile media spaces for the development of

	communities of practice, apprenticeships, and mentorship between learners and experts?
Mobile Learning 	**In a mobile learning system, have you considered** ☐ how use of mobile devices might change the process of interaction between learners, communities, and systems? ☐ how learners may most effectively use mobile access to other learners, systems, and devices to recognize and evaluate information and processes to achieve their goals? ☐ how learners can become more independent in navigating through and filtering information? ☐ how the roles of teachers and learners will change and how to prepare them for that change?

APPENDIX C

Explorable Interfaces

Give users well-marked roads and landmarks, then let them shift into four-wheel drive. Mimic the safety, smoothness, and consistency of the natural landscape. Don't trap users into a single path through a service, but do offer them a line of least resistance. This lets the new user and the user who just wants to get the job done in the quickest way possible and "no-brainer" way through, while still enabling those who want to explore and play what-if a means to wander farther afield.

- Sometimes, however, you have to provide deep ruts.

The closer you get to the naive end of the experience curve, the more you have to rein in your users. A single-use application for accomplishing an unknown task requires a far more directive interface than a habitual-use interface for experts.

- Offer users stable perceptual cues for a sense of "home."

Stable visual elements not only enable people to navigate fast, they act as dependable landmarks, giving people a sense of "home."

- Make Actions reversible

People explore in ways beyond navigation. Sometimes they want to find out what would happen if they carried out some potentially dangerous action. Sometimes they don't want to find out, but they do anyway by accident.

By making actions reversible, users can both explore and can "get sloppy" with their work.

- Always allow, "Undo."

The unavoidable result of not supporting undo is that you must then support a bunch of dialogs that say the equivalent of, "Are you really, really sure?" Needless to say, this slows people down.

In the absence of such dialogs, people slow down even further. A study a few years back showed

that people in a hazardous environment make no more mistakes than people in a supportive and more visually obvious environment, but they worked a lot slower and a lot more carefully to avoid making errors.

- Always allow a way out.

Users should never feel trapped. They should have a clear path out.

1) However, make it easier to stay in.

Early software tended to make it difficult to leave. With the advent of the web, we've seen the advent of software that makes it difficult to stay. Web browsers still festoon their windows with objects and options that have nothing to do with our applications and services running within. Our task can become akin to designing a word process, which, oh, by the way, were using Photoshop's menu bar. Having 49 options on the screen that lead directly to destruction of the user's work, along with one or two that just might help is not an explorable interface, it is the interface from hell. If you are working with complex transactions using a standard web browser, turn off the menu bar and all of the other irrelevant options, then supply our own landmarks and options. ***(F. Martin, Pastore, & Snider, 2012)***

APPENDIX D

Gee's 36 Learning Principles

1. ***Active, Critical Learning Principle***

   All aspects of the learning environment (including ways in which the semiotic domain is designed and presented) are set up to encourage active and critical, not passive, learning

2. ***Design Principle***

   Learning about and coming to appreciate design and design principles is core to the leaning experience

3. ***Semiotic Principle***

   Learning about and coming to appreciate interrelations within and across multiple sign systems (images, words, actions, symbols, artifacts, etc.) as a complex system is core to the learning experience

4. ***Semiotic Domains Principle***

   Leaning involves mastering, at some level, semiotic domains, and being able to participate, at some level, in the affinity group or groups connected to them.

5. ***Meta-level thinking about Semiotic Domain Principle***

   Learning involves active and critical thinking about the relationships of the semiotic domain being learned to other semiotic domains

6. ***"Psychosocial Moratorium" Principle***

   Learners can take risks in a space where real-world consequences are lowered

7. ***Committed Learning Principle***

   Learners participate in an extended engagement (lots of effort and practice) as an extension of their real-world identities in relation to a virtual identity to which they feel some commitment and a virtual world that they find compelling

8. ***Identity Principle***

   Learning involves taking on and playing with identities in such a way that the learner has real choices (in developing the virtual identity) and ample opportunity to meditate on the relationship between new identities and old ones. There is a tripartite play of

identities as learners relate, and reflect on, their multiple real-world identities, a virtual identity, and a projective identity

9. Self-Knowledge Principle

The virtual world is constructed in such a way that learners learn not only about the domain but also about themselves and their current and potential capacities

10. Amplification of Input Principle

For a little input, learners get a lot of output

11. Achievement Principle

For learners of all levels of skill there are intrinsic rewards from the beginning, customized to each learner's level, effort, and growing mastery and signaling the learner's ongoing achievements.

12. Practice Principle

Learners get lots and lots of practice in a context where the practice is not boring (i.e. in a virtual world that is compelling to learners on their own terms and where the learners experience ongoing success). They spend lots of time on task.

13. Ongoing Learning Principle

The distinction between the learner and the master is vague, since learners, thanks to the operation of the "regime of competency" principle listed next, must, at higher and higher levels, undo their routinized mastery to adapt to new or changed conditions. There are cycles of new learning, automatization, undoing automatization, and new re-organized automatization

14. "Regime of Competence" Principle

The learner gets ample opportunity to operate within, but at the outer edge of, his or her resources, so that at those points things are felt as challenging but not "Undoable"

15. Probing Principle

Learning is a cycle of probing the world (doing something); reflecting in and on this action and, on this basis, forming a hypothesis; reprobing the world to test this hypothesis; and then accepting or rethinking the hypothesis

16. Multiple Routes Principle

There are multiple ways to make progress or move ahead. This allows learners to make choices, rely on their own strengths and styles of learning and problem solving, while also exploring alternative styles

17. Situated Meaning Principle

The meanings of signs (words, actions, objects, artifacts, symbols, texts, etc.) are situated in embodied experience. Meanings are not general or decontextualized. Whatever generality meanings come to have is discovered bottom up via embodied experience

18. Text Principle

Texts are not understood purely verbally (i.e. only in terms of the definitions of the words in the text and their text-internal relationships to each other) but are understood in terms of embodied experience. Learners move back and forth between texts and embodied experiences. More purely verbal understanding (reading texts apart from embodied action) comes only when learners have enough embodied experience in the domain and ample experiences with similar texts

19. Intertextual Principle

The learner understands texts as a family ("genre") of related texts and understands any one text in relation to others in the family, but only after having achieved embodied understandings of some texts. Understanding a group of texts as a family ("genre") of texts is a large part of what helps the learner to make sense of texts

20. Multimodal Principle

Meaning and knowledge ate built up through various modalities (images, texts, symbols, interactions, abstract design, sound, etc.), not just words

21. "Material Intelligence" Principle

Thinking, problem-solving and knowledge are "stored" in material objects and the environment. This frees learners to engage their minds with other things while combining the results of their own thinking with the knowledge stored in material objects and the environment to achieve yet more powerful effects

22. Intuitive Knowledge Principle

Intuitive or tacit knowledge built up in repeated practice and experience, often in association with an affinity group, counts a good deal and is honored. Not just verbal and conscious knowledge is rewarded

23. Subset Principle

Learning even at its start takes place in a (simplified) subset of the real domain

24. Incremental Principle

Learning situations are ordered in the early stages so that earlier cases lead to generalizations that are fruitful for later cases. When learners face more complex cases later, the learning space (the number and type of guess the learner can make) is constrained by the sorts of fruitful patterns or generalizations the learned has founded earlier

25. Concentrated Sample Principle

The learner sees, especially early on, many more instances of the fundamental signs and actions than should be the case in a less controlled sample. Fundamental signs and actions are concentrated in the early stages so that learners get to practice them often and learn them well

26. Bottom-up Basic Skills Principle

Basic skills are not learned in isolation or out of context; rather, what counts as a basic skill is discovered bottom up by engaging in more and more of the game/domain or games/domains like it. Basic skills are genre elements of a given type of game/domain

27. Explicit Information On-Demand and Just-in-Time Principle

The learner is given explicit information both on-demand and just-in-time, when the learner needs it or just at the point where the information can best be understood and used in practice

28. Discovery Principle

Overt telling is kept to a well-thought-out minimum, allowing ample opportunities for the learner to experiment and make discoveries

29. Transfer Principle

Learners are given ample opportunity to practice, and support for, transferring what they have learned earlier to later problems, including problems that require adapting and transforming that earlier learning

30. Cultural Models about the World Principle

Learning is set up in such a way that learners come to think consciously and reflectively about some of their cultural models regarding the world, without denigration of their identities, abilities or social affiliations, and juxtapose them to new models that may conflict with or otherwise relate to them in various ways

31. Cultural Models about Learning Principle

Learning is set up in such a way that learners come to think consciously and reflectively about their cultural models about learning and themselves as learners, without denigration of their identities, abilities, or social affiliations, and juxtapose them to new models of learning and themselves as learners

32. Cultural Models about Semiotic Domains

Principle about their cultural models about a particular semiotic domain they are learning, without denigration of their identities, abilities, or social affiliations, and juxtapose them to new models about this domain

33. Distributed Principle

Meaning/knowledge is distributed across the learner, objects, tools, symbols, technologies, and the environment

34. Dispersed Principle

Meaning/knowledge is dispersed in the sense that the learner shares it with others outside the domain/game, some of whom the learner may rarely or never see face-to-face

35. Affinity Group Principle

Learners constitute an "affinity group," that is, a group that is bonded primarily through shared en devours, goals, and practices and not shared race, gender, nation, ethnicity, or culture

36. Insider Principle

The learner is an "insider," "teacher," and "producer" (not just a consumer) able to customize the learning experience and the domain/game from the beginning and throughout the experience.

Drawn from Gee, James Paul, What Video Games Have to Teach Us about Learning and Literacy, Palgrave Macmillan: New York, 2007 Retrieved from: http://mason.gmu.edu/~lsmithg/jamespaulgee2

APPENDIX E

Actions to Cultivate A Successful Community Of Practice

(E. Wenger et al., 2002)

What makes a community of practice succeed depends on the purpose and objective of the community as well as the interests and resources of the members of that community. Wenger identified seven actions that could be taken in order to cultivate communities of practice:

1. Design the community to evolve naturally - Because the nature of a Community of Practice is dynamic, in that the interests, goals, and members are subject to change, CoP forums should be designed to support shifts in focus.
2. Create opportunities for open dialog within and with outside perspectives - While the members and their knowledge are the CoP's most valuable resource, it is also beneficial to look outside of the CoP to understand the different possibilities for achieving their learning goals.
3. Welcome and allow different levels of participation - Wenger identifies 3 main levels of participation. 1) The core group who participate intensely in the community through discussions and projects. This group typically takes on leadership roles in guiding the group 2) The active group who attend and participate regularly, but not to the level of the leaders. 3) The peripheral group who, while they are passive participants in the community, still learn from their level of involvement. Wenger notes the third group typically represents the majority of the community.
4. Develop both public and private community spaces - While CoP's typically operate in public spaces where all members share, discuss and explore ideas, they should also offer private exchanges. Different members of the CoP could coordinate relationships among members and resources in an individualized approach based on specific needs.
5. Focus on the value of the community - CoP's should create opportunities for participants to explicitly discuss the value and productivity of their participation in the group.
6. Combine familiarity and excitement - CoP's should offer the expected learning opportunities as part of their structure, and opportunities for members to shape their learning experience together by brainstorming and examining the conventional and radical wisdom related to their topic.
7. Find and nurture a regular rhythm for the community - CoP's should coordinate a thriving cycle of activities and events that allow for the members to regularly meet, reflect, and evolve. The rhythm, or pace, should maintain an anticipated level of engagement to sustain the vibrancy of the community, yet not be so fast-paced that it becomes unwieldy and overwhelming in its intensity.

APPENDIX F

Active Wordpress Plugins

List of Wordpress Plugins used in the GitShed.com MDBLE development.

Akismet
Autoptimize
bbPress
Black-studio-tinymce-widget
Broken-link-checker
BuddyPress
Contact-form-7
EnvatoToolkit
Insert-headers-and-footers
Learnpress-announcements
Learnpress-assignments
Learnpress-authorizenet-payment
Learnpress-bbpress
Learnpress-buddypress
Learnpress-certificates
Learnpress-course-review
Learnpress-fill-in-blank
Learnpress-import-export
Learnpress myCred
Learnpress-paid-memberships-pro
Learnpress-prerequisites-courses
Learnpress-students-list
Loco-translate
Mailchimp-for-wp
Miniorange-login-openid
myCred
P3-profiler
Paid-memberships-pro
Permalink-manager
pmpro-bbpress
pmpro-buddypress
pmpro-mailchimp
pmpro-register-helper
pmpro-woocommerce
SiteOrigin-panels
SiteOrigin -widgets-bundle
Spacer
Thim-core
Thim-portfolio
Velvet-blues-update-urls
Widget-logic
Woocommerce
Wordfence
Wordpress-importer
Wp-events-manager-woo-payment
wp-events-manager
Wp-super-cache
YouTube-embed-plus

APPENDIX G

URL & Listing of External Social Media Linked to Research Site

WordPress Portal:	https://gitshed.com
Facebook Page:	https://www.facebook.com/GitShed
Google+:	https://plus.google.com/communities/116774263129147291808
Twitter:	https://twitter.com/GitShed
YouTube:	https://www.youtube.com/channel/UCKXpdHqwjiOI8HyqB7SLiyw
Pinterest:	http://www.pinterest.com/playala/guitar-learning-resources/
PalTalk:	http://express.paltalk.com/?refc=109740&advc=1&gid=1497153235
SoundCloud:	https://soundcloud.com/gitshed-guitar

APPENDIX H

IRB Approval & Instruments

Office of Research Compliance
Human Studies Program

UNIVERSITY of HAWAI'I® MĀNOA

March 4, 2016

TO: Peter Luvert Ayala
Curtis P. Ho
Principal Investigators
Educational Technology/Learning Design & Technology

FROM: Denise A. Lin-DeShetler, MPH, MA
Director

SUBJECT: CHS #23760- "Learning to Play Guitar Using Mobile Devices" Participant Perceptions of Mobile Learning Supported Videoconferencing in a Mobile Device Based Learning Environment"

This letter is your record of the Human Studies Program approval of this study as exempt.

On March 04, 2016, the University of Hawai'i (UH) Human Studies Program approved this study as exempt from federal regulations pertaining to the protection of human research participants. The authority for the exemption applicable to your study is documented in the Code of Federal Regulations at 45CFR 46.101(b)(Exempt Category 2).

Exempt studies are subject to the ethical principles articulated in The Belmont Report, found at http://www.hawaii.edu/irb/html/manual/appendices/A/belmont.html.

Exempt studies do not require regular continuing review by the Human Studies Program. However, if you propose to modify your study, you must receive approval from the Human Studies Program prior to implementing any changes. You can submit your proposed changes via email at uhirb@hawaii.edu. (The subject line should read: Exempt Study Modification,) The Human Studies Program may review the exempt status at that time and request an application for approval as non-exempt research.

In order to protect the confidentiality of research participants, we encourage you to destroy private information which can be linked to the identities of individuals as soon as it is reasonable to do so. Signed consent forms, as applicable to your study, should be maintained for at least the duration of your project.

This approval does not expire. However, please notify the Human Studies Program when your study is complete. Upon notification, we will close our files pertaining to your study.

If you have any questions relating to the protection of human research participants, please contact the Human Studies Program at 956-5007 or uhirb@hawaii.edu. We wish you success in carrying out your research project.

1960 East-West Road
Biomedical Sciences Building B104
Honolulu, Hawai'i 96822
Telephone: (808) 956-5007
Fax: (808) 956-8683

1.1 Screening Process Walk-through Script

(Researcher developed)

Hi, _____. Thank you for joining me in this Google Hangout today.

My name is Pete**.** I know we've talked a little about what we'll do today, but let me go over it again briefly. Okay?

Great. We're going to do two things. First, we will complete your user profile if you have not done so already. You will need your social media profile and cover photos to create your profile page, so make sure you have them ready on your mobile device.

I'll be prompting you with some tasks as you complete your profile, and I ask that you think out loud as much as possible: to say what you're looking at, what you're trying to do, and what you're thinking. Say anything at all that comes to mind.

I will record the audio from this interview so that I can transcribe your verbal comments made during the session. After transcription I will email your comments to you so that you can review them to make sure that your comments and responses are as you intended them.

And for the second thing, I will guide you through the completion of the online pre-participation interview surveys. This will enable you to ask questions, and provide information to help us select participants for the testing of the GitShed.com research site and its social media and videoconferencing learning supports. It will also give you a chance to experience how mobile videoconferencing were used in this project. Please feel free to stop me at any time if you have questions.

Perfect. I'm also going to use a screen recorder to record your actions on your mobile device screen and verbal comments made during our session today.

Because we are linking to public social media pages you were identifiable to me. Otherwise your participation will be kept completely confidential. None of your public information will be used or shared with others.

Please remember that your participation is completely voluntary. You can stop this interview at any time and you can still participate in the learning community without participating in the research project. If you are not selected or choose not to participate in the research, your membership in the community and lessons will continue to be "FREE".

Let's get started!

Using your mobile device browser click on the link to open the Hangout OnAir that I have posted in the chat box in the bottom right hand corner.

[LINK]

Next, go back to your mobile device browser and open GitShed.com. I have posted a link that you can copy and paste from the chat box in the bottom right hand corner.

[LINK]

"Please Login, open your profile and add your social media profile and cover photos". "Please let me know when you are done".

Great! You will now complete the two pre-participation surveys that I mentioned earlier. I will remain silent while you complete the surveys, but I were here to assist you if you have questions. I will not provide answers, but I will explain the questions if needed. There are no right or wrong answers, so please be honest with your responses to the questions, as it will help us in our research.

Ready? Ok! In the URL type GitShed.com/surveys. You should see a carousel with images that will take you to Pre-Survey A and Pre-Survey B

[LINK]

“Please click on the Pre-Survey A link and answer the survey.”
“Please let me know when you are done.”
Ok! Navigate back to the Surveys.

[LINK]

“Please click on the Pre-Survey B link and answer the survey.”
“Please let me know when you are done.”

#####

[The following continues after the Pre-Survey B is completed.]

Mahalo!

[That concludes the Pre-Participation Process.]

I just want to say thank you very much for your time today. Your contributions to this research are very valuable and will help us improve the GitShed.com web site and future mobile learning environments even if you are not selected to participate in the research project.
Your social media identity and image will not be included in the results of our study. Your name will not be included on any of our documents and were kept confidential.

If selected to participate, you will receive an email notifying you of the course start date and instructions for completing the short after lesson 5-star rankings, comments and the online

surveys that are part of this research.

If you do have any questions about the study moving forward, please feel free to email me at: **ayalap@hawaii.edu**. If you don't have any more questions right now, I'm going to go ahead and conclude our research today.

Mahalo for your participation!

1.02 Pre-Survey A

Mobile Device Proficiency (Koole et al., 2010)

Rate your mobile device proficiency based on the descriptions by selecting one box.

Proficiency	(Select one)	Description
Advanced		Comfortable with videoconferencing and with creating and editing social media post, videos, recording multiple audio tracks, sharing content and managing web sites with your Mobile Device.
High Intermediate		Able to use videoconferencing, Web 2.0 apps such as Google docs, graphics programs and creating and posting videos, audio tracks, and images content to my social media pages.
Low Intermediate		Comfortable with SMS texting, email, browsers and social media.
Beginner		Able to use basic communication features, email, SMS texting, but frustrated at times and requiring assistance for set up and troubleshooting.

Experience Using Mobile Devices

Indicate the types of mobile devices that you have experience using

Device	Yes	No
Smartphones		
Phablets		

Tablets		
PDAs		
MP3 Players		
Digital Cameras		
Other		

What brand, model of mobile devices, operating system and network are you using to connect to GitShed, and do you have any comments related to connectivity?
(OS = Android, Apple iOS, Blackberry, Windows Phone etc., - Network = AT&T, Sprint, Verizon etc.)

Mobile Device	OS	Network	Comments

Device Usability
*When using your mobile device how **comfortable** are you with:*

(Scale: 0 = not at all, 1 = slightly, 2= somewhat, 3 = moderately, 4 = extremely)	
Watching Instructional Videos	
Playing Electronic Games	
Using Social Media	
Videoconferencing	

Social Media
What Social Media accounts do you use on your mobile device?

Device	**Yes**	**No**
Facebook		
Google+		
Instagram		
Pinterest		
Twitter		
YouTube		
Other (list)		

Interaction Learning
Using the scale below how **motivated** are you to interact with others using

(Scale: 0 = not at all, 1 = slightly, 2= somewhat, 3 = moderately, 4 = extremely)	
Gamification	
Social Media	
Learning Communities	
Videoconferencing	

1.3 Pre-Survey B

Collaborative Learning Attitude Scale Developed by Wu (2006)

Instructions: Please read the following statement and mark the one response that best reflects your situation.
1=strongly disagree, **2**=disagree, **3**=slightly disagree, **4**=slightly agree, **5**=agree, **6**=strongly agree,

Attitude Toward Collaborative Learning	1	2	3	4	5	6
1. I would rather work independently on assignments than in groups or teams.						
2. I feel working with others on assignments is more helpful than working alone.						
3. When working on team projects, I feel motivated by my sense of responsibility to the group.						
4. I like doing teamwork.						
5. I do NOT find it useful to relate my work to that of others.						
6. I prefer to work on projects alone.						

Interactions	1	2	3	4	5	6
7. When I have a problem understanding lessons, I prefer seeking help from my peers, if possible.						
8. Having good interactions with my peers makes my learning experience more pleasant.						
9. I believe in my own ability to learn; discussing problems with my peers will not help me to learn better.						
10. I do NOT care much about interacting with my peers as long as I get a good grade in the course.						
11. I just want to work hard to achieve my goal of learning, socializing with my peers would be a waste of time for me.						
12. I enjoy interacting with my peers.						
13. I enjoy interacting with my instructors.						
14. I like working on my own without instructor supervision.						

15. I do NOT like the idea of instructors that monitor my activities all the time.						
16. Having access to an instructor would motivate me in an online course.						
17. If I have to take a course online (again), I prefer a learning environment in which I can totally control my own learning pace without the teacher's interference.						
18. If I have to take a course online (again), I prefer a learning environment in which I can interact with my teacher like I do in the face-to-face classroom setting.						

Attitudes toward Asynchronous Mobile Learning	1	2	3	4	5	6
19. Taking classes online would better help me to learn.						
20. Online courses allow me to learn at my own pace.						
21. Given the choice, I would prefer to take courses online.						
22. Online course environments make me feel uncomfortable and confused.						
23. I am inclined to take online courses only because of the convenience.						
24. Online courses provide opportunities for learners to interact with their peers via different channels, such as e-mail, chat rooms, videoconferencing, discussion forums, etc.						
25. Online courses are NOT for me.						
26. I would only take online courses when I have no other choice.						
27. Without considering the technical issues (such as proficiency in using mobile devices), I would like to take online courses.						
28. Without considering the convenience issues (such as having a fulltime job), I would consider taking online courses.						

Participant Selection Matrix

(Researcher developed)

	Collaboration (Wu, 2006)		
Mobile Proficiency (Koole et al., 2010)	**High**	**Medium**	**Low**
Advanced			
High Intermediate			
Low Intermediate			
Beginner			

1.4 Demographic Instrument

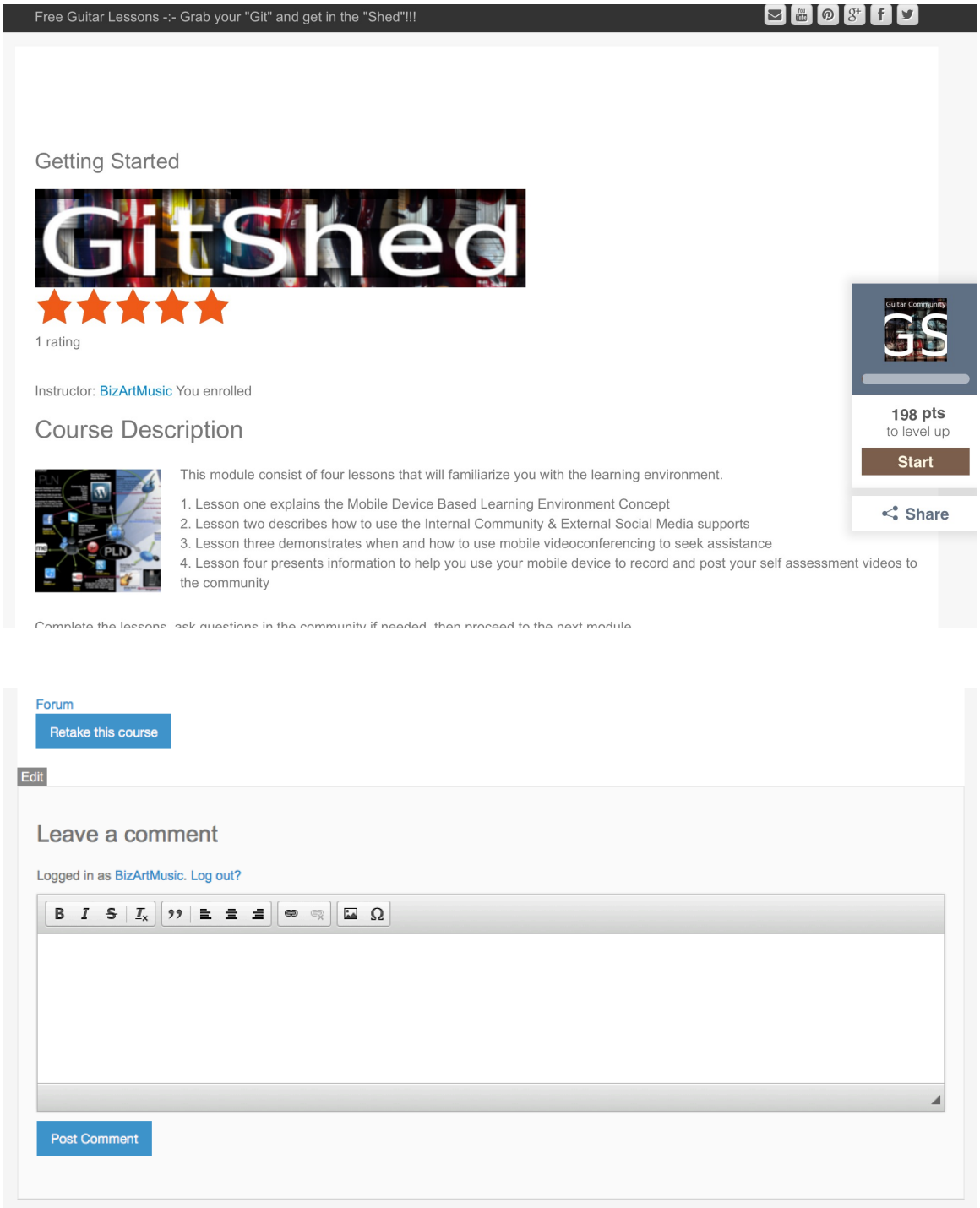
Adapted from Wu (2006)

Instructions: Please fill in the demographic information, read the following statements and mark the response that best reflects your situation.

Questions							
Gender	**Age**	**State**		**Country**			
□ Female □ Male □ Transgender or Other □ I choose not to respond.							
	Cellphone:		**FaceTime, Skype or Other**				
	eMail:		**Website:**				
Educational Attainment Check the box that shows the highest level of education that you have completed.							
Les than high school graduate ☐							
High school graduate ☐	Some college no degree ☐	Associate's degree, ☐	Bachelor's degree ☐	Master's degree ☐	Professional degree ☐	Doctoral Degree ☐	
How many online or mobile learning courses have you taken before? #_____							
Music Background							
Do you play any instruments other than guitar? (Example: I played clarinet in grade school)_____							
What kind of music do you like? (Select all that apply)							
Blues ☐	Classical ☐	Country ☐	Folk ☐	Jazz ☐	Metal ☐	Pop ☐	Rock ☐
What kind of guitar do you have? Acoustic □ Electric □ Acoustic Electric □							
How many times have you attempted learning to play guitar before? #_____							
Commitment to Research Participation							
What is your comfort level with completing surveys with 0 being not at all comfortable and 4 being very comfortable?					How many hours per week do you plan to devote to using the GitShed guitar learning lessons & community?		
0	**1**	**2**	**3**	**4**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**

2.1 Post-lesson Satisfaction Survey (Example)

(LearnPress WordPress Plugin)



3.0 Post-Participation Retrospective Self-Assessment of Learning

Derived from: Self assessment of learning Chen and Chung (2008)

This question enables you to self-assess your basic guitar playing ability.

Please use the following ability scales to indicate your guitar abilities before and after using GitShed.com. 0 indicates no guitar playing ability and 10 indicates expert ability.

Indicate your guitar abilities before using GitShed.com										
0	1	2	3	4	5	6	7	8	9	10

Indicate your guitar abilities after using GitShed.com										
0	1	2	3	4	5	6	7	8	9	10

Semi-Structured Student Interview Questions

(Kissinger, 2011)

Background Questions:

1. What is your pseudonym and age?
2. Did you take the online course or classroom-based course?
3. Which e-book did you use?
4. Do you own or have any previous experience with electronic books?
5. Which features did you use? [text to speech, highlighting, bookmarking, notes, sharing notes]

Learning-Related Question Prompts

1. Take me on an average day as you were using the e-book. Describe what you did, how you did it, and how you felt.
   -Was it difficult to use?
   -Did you expect to be successful using it?
   -What value did you place on using the e-book for your learning?
   -Were you afraid of using the device for your learning?
2. What were some of the places you used the e-book? Were these places you have gone before to read or study?
3. How do you think the location of where you used the e-book influenced your learning? -In general describe how your reading or study environment helps or hinders your learning.
   -How did using the e-book change how you read or studied based on your location?
4. How confident were you using the e-book? Why do you feel this way?
   -Did you feel in control of your learning using the e-book?
   -What motivated your use of the e-book? -How did using the e-book influence your motivation?
5. Has using the e-book influenced your beliefs about your capabilities with respect to your own learning and understanding? If so, please explain how.
6. Suppose I were a new student considering taking courses that exclusively used e-books, and I asked for your advice on whether or not to take these courses. What would you tell me and why?

7. What do you think contributed to your learning and success in the course, and how did using the e-book influence this if at all?
8. Has the e-book changed how you used textbook materials for your learning in this course?
9. Has the e-book changed the places where you read and studied in this course?
10. Did you use the e-book individually, with other classmates, or both? Explain and share some examples.
11. If you could improve upon anything about the e-books, what would it be and why?
12. What else would you like to say about your experiences that you have not already said?
13. Would you take a course with an e-book again? Why or why not?

4.0 Post Participation - Interface Satisfaction & Usability Survey

Derived from: User Interface Satisfaction - Chin et al. (1988) & KOOLE ET AL. (2010)

Interface Satisfaction

How **satisfied** are you with your mobile device input and output when using GitShed?

(Scale: 0 = not at all, 1 = slightly, 2= somewhat, 3 = moderately, 4 = extremely)		
Opinion	**Input**	**Output**
Gamification		
Social Media		
Videoconferencing		

Indicate how **many times per week** you access the GitShed learning environment in each location:

Location	Number
Home	
Work	
Transit	
Waiting Room	
Outside	
Other	

System Activity
Please indicate approximately **how many times per week** you participate in **each activity:**

Activity	Number of Interactions per week
Access Learning Resources	
Contribute Learning Resources	
Earn Gamification Points	
Earn Gamification Badges	
Create Social Media Post	
Make Social Media Comments	
Videoconference with Instructors	
Videoconference with other Students	

Using the scale below indicate how **connected** you feel to others in the GitShed learning community.

(Scale: 0 = not at all, 1 = slightly, 2= somewhat, 3 = moderately, 4 = extremely)	
Opinion	**Scale Number**
Feelings of “connectedness”	

Social Technology

Using the scale below indicate the **importance** of flexible access to GitShed.com

(Scale: 0 = not at all, 1 = slightly, 2= somewhat, 3 = moderately, 4 = extremely)	
Opinion	**Scale Number**
Importance of flexible access	

Using the scale below indicate your **satisfaction** with your network connection to GitShed.com

(Scale: 0 = not at all, 1 = slightly, 2= somewhat, 3 = moderately, 4 = extremely)	
Opinion	**Scale Number**
Satisfaction with network connection	

Please rate your satisfaction with **ease of navigation** using your device in the GitShed.com environment.

(Scale: 0 = not at all, 1 = slightly, 2= somewhat, 3 = moderately, 4 = extremely)	
Opinion	**Scale Number**
Easy to navigate	

Please rate your satisfaction with **learnability ease** when using your device in the GitShed.com environment.

(Scale: 0 = not at all, 1 = slightly, 2= somewhat, 3 = moderately, 4 = extremely)	
Opinion	**Scale Number**
Easy to learn	

Using the scale below indicate how **satisfied** you feel with your **sense of control** when using the GitShed learning community.

(Scale: 0 = not at all, 1 = slightly, 2= somewhat, 3 = moderately, 4 = extremely)	
Opinion	**Scale Number**
Sense of control	

Using the scale below indicate how **satisfied** you feel with your **sense of being organized** when using the GitShed learning community.

(Scale: 0 = not at all, 1 = slightly, 2= somewhat, 3 = moderately, 4 = extremely)	
Opinion	**Scale Number**
Sense of being organized	

Using the scale below indicate how much you **"Like" to study using mobile devices** and the GitShed learning community.

(Scale: 0 = not at all, 1 = slightly, 2= somewhat, 3 = moderately, 4 = extremely)	
Opinion	**Scale Number**
"Like" to study using mobile devices	

Usability Survey

Overall Evaluation of the GitShed Mobile Device Based Learning Environment

The use of color was clear

disagree									*agree*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

The system was

difficult to use									*easy to use*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

I easily knew what to do

not at all									*very much*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

The sequence of screens was easy to understand

disagree									*agree*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

It was easy to navigate between pages

disagree									*agree*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Video-based Mobile Flip Instruction & Videoconferencing

Using video lessons on my mobile device was

hard									*easy*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Videos lessons were clearly organized

disagree									*agree*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Using video lessons simplifies learning

not at all									*very much*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

I replayed video lessons to practice and reinforce learning content

not at all									*very much*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Using videoconferencing on my mobile device was

hard									*easy*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

The ability to seek videoconferencing help if and when I need it was useful

not at all									*very much*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Videoconferencing is a good tool for providing face-to-face interaction.

Strongly disagree									*Strongly agree*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Videoconferencing is an effective tool for providing social learning interaction.

Strongly disagree									*Strongly agree*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Overall videoconferencing

is an effective method of providing face-to-face learning support.

Strongly disagree									*Strongly agree*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

was useful for the existing course and added value to my mobile learning experience

Strongly disagree									*Strongly agree*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

contributed to my overall satisfaction with MDBLE

Strongly disagree									*Strongly agree*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Overall a learning environment that sends the information via messages may be better

Strongly disagree									*Strongly agree*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Social Media & Gamification

Using GitShed social media & Facebook, Google+, etc. on my mobile device was

hard									*easy*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Using internal and external social media helped to support my learning

not at all									*very much*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

I feel that I contributed to the guitar learning community

not at all									*very much*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

I enjoyed having the gamification connection to the community as part of the learning experience

not at all									*very much*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Overall my experience using the GitShed.com Learning Community was

Frustrating									*Satisfying*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Dull									*Interesting*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Rigid									*Flexible*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Terrible									*Wonderful*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Based on my learning experience I feel that mobile devices are good for

watching video lessons

not at all									*very much*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

practicing guitar

not at all									*very much*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

collaborating with others in mobile learning communities

not at all									*very much*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

learning

not at all									*very much*
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*

Will you continue using mobile videoconferencing personally to support learning, and to access mobile device based learning environments that provide videoconferencing to support learning?

Intended Future Use	Yes	No	Maybe
Continue to use Videoconferencing personally			
Continue to use Videoconferencing through mobile device			
Accessing mobile device based learning environments that provide Videoconferencing			

Would you recommend that mobile learning environment developers continue to incorporate?

Recommendations	Yes	No	Maybe
Gamification			
Social Media			
Videoconferencing			

5.0 Post-Participation - Computer Assisted Interview

Derived from: Kissinger (2011)

Background Questions:

1. How well do you feel that you learned what you expected to learn?
2. Which features did you use most? [video lessons, learning community, learning resources, social media post, videoconferencing, blog]

(RQ1) How, if at all, do participants believe the MDBLE's FRAME design aspects (DL, DS, LS) facilitate learning?

Learning (L)-Related Question Prompts

- How did using the mobile learning environment influence your beliefs about your capabilities with respect to your own learning and understanding?
- In what ways did you feel that aspects of the learning environment (including ways in which the basic guitar lessons are designed and presented) were set up to encourage active and critical, not passive, learning?

Site Activity-Related Question Prompts

- What type of activities did you use your mobile device for in the basic guitar course?
- How did using the mobile learning environment influence your motivation?

(RQ2) What are the participants' toward mobile learning resulting from their experience with the FRAME design aspects (DL, DS, LS) of the GitShed.com MDBLE?

Device Learning (DL)-Related Question Prompts

- What do you think contributed to your learning in the basic guitar course, and how did using the mobile learning environment influence this if at all?
- What did you think overall about the use of videoconferencing in the mobile learning environment?
- How do you think the location of where you use the mobile learning environment influenced your learning?

Device Social (DS)-Related Question Prompts

- Describe what you did, how you did it, and how you felt when you used your mobile computing devices in the basic guitar course?
  -What value do you place on using the learning environment for your learning?
- In what way or ways did you receive both on-demand and just-in-time, explicit information from the learning community?

Interaction/Community (LS)-Related Question Prompts

- In what way or ways was your practice and experience, honored or your knowledge rewarded by other members of the community?
- In what ways were you recognized as a community "insider," “fast learner,” "teacher," and/or "producer" of learning resources by other members?
- How did the learning environment’s gamification aspects impact your social leaning experience?

User Recommendations-Related Question Prompts

- If you could improve upon anything about the GitShed.com mobile learning environment, what would it be and why?
- What suggestions do you have for ways that the community can offer additional basic guitar learning opportunities as part of its structure?
- Suppose I were considering taking courses that exclusively used mobile learning environments, and I asked for your advice on whether or not to take these courses. What would you tell me and why?
- What else would you like to say about your experiences that you have not already said?

****

[Debrief Interview]

Mahalo!

I just want to say thank you very much for your time today. Your contributions to this research are very valuable and will help us improve the GitShed.com web site and future mobile learning environments.

Your social media identity and image they will not be included in the results of our study. Your name will not be included on any of our documents and were kept confidential.

If you do have any questions about the study moving forward, please feel free to email me at: **ayalap@hawaii.edu**. If you don't have any more questions right now, I'm going to go ahead and conclude our research today.

Mahalo for your participation!

#####

[follow-up on observations as needed]

5.0 Post-Participation – Participant Comments

1a. How well do you feel that you have learned what you expected to learn?

I got what I got with what I put in to learn. This is the chorus to some lyrics I made up over this learning module.

Quite well

1b. Which features did you use most?

Video Lessons

Video Lessons

2a. How has using the mobile learning environment influenced your beliefs about your capabilities with respect to your own learning and understanding?

This is an interesting question. Some of the links to the survey could not be done on the mobile device. I had to use my laptop to answer the curve questions. In my attempt to use my mobile device, I had poor landscape adjustment to fit the iPhone 6.

It can be useful for my learning and teaching. It can be especially convenient with a rapid learning curve

2b. In what ways did you feel that aspects of the learning environment (including ways in which the basic guitar lessons are designed and presented) are set up to encourage active and critical, not passive, learning?

Honestly, active and critical learning takes place when a student is engaged with a number of task(s). Making your student create a video of them playing the lesson can have some major issues with those who do not want to be filmed. In fact, studies have showed that a large majority of people would have a negative response to wanting their work video as opposed to just taking a selfie. It takes a different kind of person to want to video themselves playing an instrument and showing the mistakes they made while playing in front of the camera. Even though the video is for a reasonable purpose, the participant may not feel that way about making a video. This could have a negative response of the number of participants wanting to participate in the research.

The application of the knowledge to existing songs is motivating.
The info on chord progressions and improv hints of slides and other techniques can be readily incorporated

3a. What type of activities did you use your mobile device for in the basic guitar course?

I just used the mobile device to film myself playing the guitar.
I used my cell to watch videos, read chords and fingering patterns on the neck, keeping the best via metronome and to record video footage and share it

3b. How did using the mobile learning environment influence your motivation?

Frankly, I though I was done after the first lesson. When I found out there was three, I had a negative response to wanting to move on to the other two lessons. The "staff" had to convince me to do one more lesson. In fact, I thought I was done after I posted the last survey (8) only to get an email saying I had to complete 2 more short surveys. Well, it was NOT short at all. This particular survey does not have a completion "bar" at the bottom so I know when the survey ends. I am at responder's burden at this point.
The leaning environment breeds accountability and inspiration from others while providing clarity or guidance at times

4a. What do you think is contributed to your learning in the basic guitar course?

The videos. (Is this survey going to end???) May be you can give the survey participant an outline of what is to be expected in the survey. These questions are beginning to sound alike.
I wanted to gain some new tricks to teaching and learning and having instruction videos embedded in one place made it easy

4b. How did using the mobile learning environment influence your basic guitar learning if at all?

N/A
I'd have to say, again, the thought go accountability to or for others helper me stay focused

4c. What do you think overall about the use of videoconferencing in the mobile learning environment?

Videoconferencing is useful if you are conducting a class that is scheduled in a synchronous fashion.
I need to do more of it. Synchronizing time with others can be difficult but valuable if it works out

4d. How do you think the location of where you used the mobile learning environment influences your learning?

The location might have worked if the mobile device worked in a different environment besides my apartment.
I am not sure the location matters but timing does. If you have strong Wi-Fi and few distractions it is awesome. If either of those is opposite it can be a challenge. When around other musicians or student students it is a great tool

5a. Describe what you did, how you did it, and how you felt when you used your mobile computing devices in the basic guitar course?

I felt rushed, hurried and at times annoyed at getting it done.
I watched the videos and imitated what I saw slowly until comfortable then sped up. I felt a little pressure to get it right but that was motivating.

5b. What value do you place on using the learning environment for your learning?

In theory, I can get behind different learning environments. Mobile learning is the way of the future and attention should be given to understand how it can be used to improve individual lives.
It is a great value and empowering to know I have a tutor at my fingertips. As the content increases the more use I will have. Also it is good to have others to relay with

5c. In what way or ways did you receive both on-demand and just-in-time, explicit information from the learning community?

The GitShed Administrator kept sending me prompts to move on to the next lesson and at times a little too excessive. There was a couple text from the few friends I had in this community commenting on my video and encouraging me to post the next one.

I did not have a chance to get as much interaction as possible. I appreciate the availability and could schedule things better with more interaction on y part

6a. In what way or ways was your practice and experience being honored or your knowledge rewarded by other members of the community?

This survey is way too long!!! If you are talking about the badges of even some comments, none of that matters to me. Again, this survey is way too long!!!

I got badges. That was cool. Also I appreciated the comments left by others

6b. In what ways were you recognized as a community "insider," “fast learner,” "teacher," and/or "producer" of learning resources by other members?

N/A

It was shared that I as leading in progress and it made me feel a bit more responsible to use the lessons wisely. It made the community feel real

6c. How did the learning environment’s gamification aspect impact your social leaning experience?

Badges don't work and it is not a good motivator.

I liked earning badges. I was indifferent to the competition but the badges let me know when it was time to shift focus

7a. If you could improve upon anything about the GitShed.com mobile learning environment, what would it be and why?

Make this survey shorter!!! It is way too long and you requiring open ended questions on every page is tiresome.

I would post daily or weekly prompts of theory questions to engage the community. Also a new video of a technique of the week or application with the prompt would cause people to try new ideas and share

7b. What suggestions do you have for ways that the community can offer additional basic guitar learning opportunities as part of its structure?

Here is the problem. If you think your community is going to participate at everything you put out, then you are wrong. Some people just like to support quietly. Please don't forget that there are three types of people who join a community (1) those who want to be actively engaged, (2) those who want to be slightly engaged and (3) those who just want to be there but not participate.
Ask people to offer a video lesson source per month originated from themselves or another source like megachords.com for example

7c. What else would you like to say about your experiences that you have not already said?

Everything was fine up to this survey. You said it was short--it wasn't. I did not like the fact that you did not put a completion bar at the bottom. Then I could have gauged my time. As it was, this survey too over an hour of my time that I cannot get back.
It is a good resource for me as someone who has potential students in far locations

6.0 Researcher Site Activity Observation Form

Interview & Observation Field Notes (for Researcher only)	
Observation #:	**Cycle #:**
Participant Name:	**Collection Date & Time:**
Researcher Name: Peter Ayala	**Site Location: GitShed.com**
Videoconference & Site Observation Notes: **User's verbal comments:** **Suggestions for improvement?**	

System Activity (Koole et al., 2010) (Frequency of Interactions per Week)	
Access Learning Resources	
Contribute Learning Resources	
Gamification Points	
Gamification Badges	
Social Media Post	
Social Media Comments	
Videoconferencing with Instructors	
Videoconferencing with other Students	

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